INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE TWENTY-SEVENTH MEETING OF THE REGIONAL AIRSPACE SAFETY MONITORING ADVISORY GROUP (RASMAG/27)

VIDEO TELECONFERENCE, 22 – 25 AUGUST 2022

The views expressed in this Report should be taken as those of the Meeting and not the Organization

Approved by the Meeting
and published by the ICAO Asia and Pacific Office, Bangkok

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APPENDIXES TO THE REPORT

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INTRODUCTION

Meetings

1.1 The Twenty-Seventh Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/27) was held from 22 to 25 August 2022 by Video Teleconference (VTC) from the ICAO Asia and Pacific Regional Office, Bangkok, Thailand.

Attendance

2.1 A total of 158 participants were registered for RASMAG/27 from Australia, Bangladesh, Cambodia, China, Hong Kong China, India, Indonesia, Japan, Malaysia, Mongolia, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Sri Lanka, Thailand, United States of America, Viet Nam, CANSO, IATA, IFALPA IFATCA and ICAO.

2.2 The List of Participants is at **Appendix A** to this Report.

Officers and Secretariat

3.1 Ms. Saifon Obromsook, Engineering Manager of AEROTHAI and the Monitoring Agency for the Asian Region (MAAR), chaired the meeting.

3.2 Mr. Shane Sumner, Regional Officer, Air Traffic Management/Aeronautical Information Management (ATM/AIM), ICAO Asia and Pacific Office was the Secretary of the RASMAG/27 meeting. He was assisted by Mr. Hiroyuki Takata, Regional Officer, ATM, Mr. Weng Kit Ying, ATM Officer, and Ms. Prakayphet Chalayonnawin, Programme Analysis Associate, ATM.

Opening of the Meeting

4.1 Ms. Saifon Obromsook welcomed participants to the meeting.

4.2 On behalf of Mr. Tao Ma, Regional Director of ICAO Asia and Pacific Office, Mr. Shane Sumner welcomed all participants.

Documentation and Working Language

5.1 English was used as the working language for the meeting and for all documentation.

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

5.2 A total of 43 Working Papers (WPs) and four Information Papers (IPs) were presented to the meeting.

5.3 The List of Papers is at **Appendix B** to this Report.

Conclusions, Draft Conclusions, Draft Decisions and Decisions of RASMAG – Definition

6.1 RASMAG recorded its actions in the form of Draft Conclusions, Draft Decisions and Decisions within the following definitions:

a) **Draft Conclusions** of RASMAG related to matters that are not just of a purely technical or operational nature, which need to be considered by APANPIRG;

b) **Conclusions** of RASMAG related to matters of a purely technical or operational nature, which APANPIRG had delegated authority to RASMAG to act upon;

c) **Draft Decisions** related solely to matters dealing with the internal working arrangements of the RASMAG, which need to be considered by APANPIRG; and

d) **Decisions** of RASMAG that related solely to matters dealing with the internal working arrangements of the RASMAG, which APANPIRG had delegated authority to RASMAG to act upon.

List of Draft Conclusions, Conclusions, Draft Decisions and Decisions

7.1 List of Draft Conclusions

Nil

7.2 List of Conclusions

<table>
<tr><td colspan="3">Conclusion RASMAG/27-1: CPDLC Latency Monitor value</td></tr>
<tr><td colspan="2">What: 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.</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To implement a standardized global value for latency timer in the APAC region, in alignment with the value of 300 seconds specified in the ICAO NAT Region North Atlantic Operations and Airspace Manual (NAT Doc 007).</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 25-Aug-22</td><td colspan="2">Status: Adopted by Subgroup</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☒Other: Aircraft operators</td></tr>
</table>

<table>
<tr><td colspan="3">Conclusion RASMAG/27-2: Updated Reporting of PBCS Implementation Status and Performance Monitoring Data</td></tr>
<tr><td colspan="2">What: That:
1. The revised Survey of the Status of Current and Planned Implementation of Performance-Based Separation Minima at Appendix C to the report, and the revised PBCS Action List for ANSPs at Appendix D to the 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 and 23-3</td><td>Expected impact:
☐ Political / Global
☐ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why:
1. to rationalize and simplify the survey questions; and
2. to amend the reporting dates for both the annual survey and PBCS performance monitoring data to 28 February each year, aligning with planned common reporting date for all ATM and Airspace Safety implementation and performance reporting.</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 25-Aug-22</td><td colspan="2">Status: Adopted by Subgroup</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other:</td></tr>
</table>

7.3 List of Draft Decisions

Nil.

7.4 List of Decisions

Nil

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REPORT ON AGENDA ITEMS – RASMAG/27

Agenda Item 1: Adoption of Agenda

1.1 The provisional agenda (WP/1) was adopted by the meeting. The meeting noted IP01 (List of Working and Information Papers).

Agenda Item 2: Review Outcomes of Related Meetings

Relevant Meeting Outcomes (WP/2)

2.1 The Secretariat provided briefings on the outcomes of relevant meetings, including:

a) The Ninth Meeting of the Air Traffic Management Sub-Group (ATM/SG/9) of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) was held by video teleconference from 01 to 05 November 2021.

b) The Thirty-Second Meeting of APANPIRG (APANPIRG/32) was held by video teleconference from 01 to 03 December 2021.

2.2 ATM/SG/9 had discussed RASMAG outcomes related to the AKARA – FUKUE Corridor airspace. In response to a proposal to remove the Flight Level Allocation Scheme from the airspace, ICAO had informed ATM/SG/9 that while the FLAS in this airspace should not be necessary, the current airspace project was the primary consideration. Completion of Phase 2 of that project should be the first priority, with the FLAS issue addressed separately at a later time.

2.3 ATM/SG/9 had been invited to endorse Draft Conclusion RASMAG/26-3: RVSM Approvals Data and Filing of RVSM Indicator in Flight Plans of State Aircraft. While noting the need for RVSM approval for all aircraft that included the Reduced Vertical Separation Minimum (RVSM) indicator in flight plans the meeting considered there would be considerable difficulty in sharing data on State aircraft outside the State.

2.4 APANPIRG/32 also discussed the matter of identification of non-approved airframes operating in RVSM airspace, and was informed of the outcome of ATM/SG/9 discussion. APANPIRG/32 agreed to the following Conclusion, revised from the original Draft Conclusion:

Conclusion APANPIRG/32-6: RVSM Approvals Data and Filing of RVSM Indicator in Flight Plans of State Aircraft

That, States are urged to:

1. *Liaise with their State aircraft operators to not file 'W' in item 10 of the ICAO flight plan of aircraft that are not approved for RVSM; and*
2. *Respond to a survey on RMA and State responsibility on the matter of RVSM approvals of State aircraft.*

FIT-Asia Meeting Outcomes (WP/3)

2.5 The Twelfth Meeting of the FANS Interoperability Team-Asia (FIT-Asia/12) was held by Video Teleconference from 25 to 28 July 2022.

2.6 The lower number of data link Problem Reports (PRs) submitted to the Central Reporting Agency (CRA) in the 2021 and 2022 reporting period (23 and 14, compared with 76 in 2019) reflected the decrease in air traffic due to the impact of the COVID-19 pandemic.

2.7 Responding to the Conclusion RASMAG/26-1: FANS1/A CPDLC Latency Timer, New Zealand informed the meeting that the Controller-Pilot Data Link Communications (CPDLC) 300 second latency value had been used in NZZO for four years. No significant issues had been found since implementation, and New Zealand considered their implementation had been successful. 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*.

2.8 The FIT-Asia/12 meeting had agreed to adopt the latency timer value of 300 seconds. The RASMAG/27 meeting 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 Performance-Based Communications and Surveillance (PBCS) Implementation Update

2.9 The meeting was reminded of relevant Conclusions from APANPIRG and RASMAG. A total of 19 APAC Administrations had responded to the survey prior to FIT-Asia/11 in 2021. Only four had provided their annual survey response for 2022:

Australia, Indonesia, Singapore, Thailand.

Regional Supplementary Procedures Update

2.10 The meeting was informed that the Proposal for Amendment (PfA) Serial No. APAC-S 22/06-MID/ASIA 6 had been forwarded to ICAO Headquarters for review prior its circulation to all relevant States and International Organizations in order to reach Regional Air Navigation Agreement. The PfA formalized regional procedures for the implementation of performance-based separations supported by PBCS in the following FIRs: Chennai, Kolkata, Mumbai (India), Ujung Pandang (Indonesia), Manila (Philippines), Singapore, and Sanya (China).

Standardized Reporting Format and Date for ICAO Implementation Status

2.11 The Secretariat informed the meeting of a proposed a revised due date and standardised format for the various State reports of the implementation status of the SAR, Collaborative ATFM, Collaborative AIM and the ATM contingency plan. It was proposed to align the reporting dates of the mentioned implementation status reports to a common date of 28th February each year. It was further proposed that the reporting date for the annual PBCS-related Survey of Implementation Status of Performance-Based Horizontal Separation Minima be revised to the same date.

2.12 The meeting was also informed of FIT-Asia/12 discussion of amending the annual PBCS survey form of the implementation Status of Performance-based Horizontal Separation minima and the PBCS Action List for ANSPs. Since its introduction, the survey form had remained unchanged. There were items in the survey form that did not reflect the current separation minima in PANS ATM (Doc 4444).

2.13 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 **Appendix C to the report,** and the revised *PBCS Action List for ANSPs* at **Appendix D to the 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

2.14 China had presented the aggregated regional data link performance monitoring report to FIT-Asia/12. **Table 1** summarised the aggregated Required Surveillance Performance (RSP) for Automatic Dependent Surveillance – Contract (ADS-C) in the Asia/Pacific Region. Overall ASP for the region had met the 95% criterion.

ACTUAL SURVEILLANCE PERFORMANCE - FIR AGGREGATE (ALL MEDIA TYPES)						
Region	Asia-Pacific Region					
Performance Criteria	RSP180					
Time Period	2021 January-June			2021 July-December		
Colour key: Meets criteria / 99.0%-99.9% / Under criteria	Message Counts	Criteria		Message Counts	Criteria	
		95%	99.90%		95%	99.90%
FIR		% < = 90sec	% <= 180sec		% < = 90sec	% <= 180sec
PAZA	1196520	98.89%	99.70%	1217086	98.72%	99.62%
RJJJ	1514208	98.30%	99.64%	1781319	98.39%	99.62%
KZAK	3436520	98.94%	99.69%	4305637	98.56%	99.53%
NFFF	98541	98.89%	99.54%	109885	99.19%	99.69%
NTTT	23879	99.72%	99.88%	42068	99.77%	99.89%
NZZO	151438	99.04%	99.80%	145725	99.13%	99.83%
YBBB	392893	99.49%	99.84%	518548	99.66%	99.89%
YMMM	346329	99.01%	99.52%	383003	99.50%	99.80%
VCCF	256657	98.69%	99.71%	251687	98.89%	99.91%
VECF				315611	98.67%	99.56%
VOMF	126634	98.52%	99.43%	148693	98.59%	99.46%
WSJC	205191	99.19%	99.85%	251035	99.23%	99.85%
ZLLL	142990	98.80%	99.70%	208842	98.80%	99.60%
ZWWW	75034	98.90%	99.70%	101660	98.80%	99.60%
VVTS	177227	98.73%	99.80%	188140	98.85%	99.83%
VYYF	172414	98.89%	99.56%	166438	98.99%	99.63%
RPHI	221669	99.29%	99.83%	273277	99.25%	99.83%
WAAF	66829	99.31%	99.75%	84031	99.38%	99.79%

Table 1: Asia/Pacific Region ASP (RSP180)

2.15 **Table 2** summarised the aggregated Required Communications Performance (RCP) for CPDLC the Asia/Pacific Region. Overall ACP for the region met the 95% criterion.

ACTUAL COMMUNICATION PERFORMANCE - FIR AGGREGATE (ALL MEDIA TYPES)										
Region	Asia-Pacific Region									
Performance Criteria	RCP240									
Time Period	2021 January-June					2021 July - December				
Colour key: Meets criteria / 99.0%-99.9% / 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	74627	98.79%	99.27%	98.51%	98.96%	75692	98.88%	99.20%	98.76%	99.15%
RJJJ	30889	99.69%	99.83%	99.72%	99.79%	37089	99.70%	99.82%	99.71%	99.80%
KZAK	192490	99.28%	99.51%	99.51%	99.75%	236799	98.97%	99.29%	99.22%	99.52%
NFFF	2185	99,67%	99.72%	99.86%	99.81%	3148	99.68%	99.71%	99.84%	99.77%
NTTT	730	100.00%	100.00%	100.00%	100.00%	1329	99.69%	100.00%	99.77%	100.00%
NZZO	3431	99.76%	99.88%	99.88%	99.91%	3222	99.78%	99.87%	99.90%	99.93%
YBBB	11591	99.42%	99.33%	99.60%	99.57%	14683	99.62%	99.39%	99.77%	99.58%
YMMM	13777	99.32%	99.36%	99.47%	99.51%	14850	99.48%	99.50%	99.60%	99.66%
VCCF	8037	98.68%	99.70%	99.26%	99.91%	8360	98.27%	99.57%	99.21%	99.89%
VECF						22069	99.49%	99.67%	99.49%	99.67%
VOMF	34545	99.74%	99.85%	99.85%	99.89%	56992	99.72%	99.82%	99.84%	99.89%
WSJC	14786	99.19%	99.45%	99.30%	99.46%	23916	99.16%	99.49%	99.26%	99.47%
ZLLL	1582	97.97%	98.04%	98.98%	99.11%	1759	98.06%	98.29%	98.69%	98.80%
ZWWW	147	97.27%	97.95%	98.63%	98.63%	80	100.00%	100.00%	100.00%	100.00%
VVTS	43261	95.94%	96.45%	99.43%	99.72%	44881	95.70%	96.30%	99.59%	99.77%
VYYF	47863	98.45%	98.73%	98.76%	99.05%	48746	98.67%	98.99%	99.07%	99.33%
RPHI	6412	98.48%	98.67%	99.02%	99.24%	12973	98.75%	98.91%	99.24%	99.41%
WAAF	11281	98.78%	98.99%	99.76%	99.80%	13841	99.27%	99.40%	99.85%	99.88%

Table 2: Asia/Pacific Region ACP (RCP240)

PBCS Performance Reporting Data Format

2.16 The Secretariat had informed FIT-Asia/12 that slightly different data formats were used in performance reporting templates used by different FITs in the APAC Region. The meeting agreed to keep the *Data Link Performance Analysis Reporting Templates* unchanged, although there were inconsistencies in the templates and the colour coding methods, until the publication of the new version of Doc 9869 *PBCS Manual* in 2023-2024.

Air Navigation Deficiencies Relating to Data Link Performance Monitoring and Analysis

2.17 FIT-Asia/12 had agreed to recommend the following update of data link-related ATM and Airspace Safety Deficiencies:

- retention of the following 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.*

2.18 These recommendations were included in the Deficiencies List provided for RASMAG/27 discussion and agreement in WP/41.

RASMAG/MAWG and RMACG Reports (WP/4)

2.19 The Ninth Meeting of the Regional Airspace Safety Monitoring Advisory Group Monitoring Agencies Working Group (RASMAG/MAWG/9) Virtual Meeting was held in February 2022.

2.20 The Seventeenth Regional Monitoring Agencies Coordination Group (RMACG/17) Virtual Meeting Part 1 was held in April 2022 via MS Team discussion platform, while the meeting Part 2 in a teleconference format remained to be organized in September 2022.

MAWG/9

2.21 The following matters as discussed at MAWG/9 were reported to the meeting:

- Federal Aviation Administration of the USA (FAA) trial of using Space-Based ADS-B (SBA) for Altimetry System Error (ASE) monitoring;
- Removing the 1,000 flight-hour requirement from ICAO Annex 6;
- Treatment of TCAS RA-related Large Height Deviations (LHDs);
- LHD/Large Lateral Deviation (LLD)/Large Longitudinal Error (LLE) Occurrence and Hot Spot Analysis;
- Management Process of Hot Spots for RASMAG;
- Performance-Based Communication and Surveillance (PBCS) Oversight;
- Verification of 'W' for State Aircraft in Asia/Pacific Region; and
- ADS-B Height Monitoring educational video.

2.22 Regarding the treatment of TCAS RA-related LHDs, MAAR had presented a draft proposal to serve as common guidance for APAC RMAs. Regarding the current practices that APAC RMAs used to handle TCAS RA -related reports, the different treatments of TCAS RA reports did not have much influence on the high number of Cat J LHDs in Fukuoka FIR, as reported by the Japan Airspace Safety Monitoring Agency (JASMA). A more significant factor seemed to be the volume, density, and complexity of the traffic in the Fukuoka FIR, especially in complex airspace near terminal areas. The analysis showed the drastic reduction of Category J LHD in 2020, when the traffic level decreased due to the pandemic. In other airspace, the awareness and reporting culture of TCAS RA events to an RMA was another key factor that influenced the frequency of TCAS RA-related LHDs.

2.23 The following common guidance had been provided for APAC RMAs on how to treat TCAS RA-related reports.

a) If there was an operational error leading to the RA that fit the definition of a LHD, then the RMA should treat that error as a separate LHD. The category of this LHD should correspond to the nature of that operational error;

b) For all vertical deviations as a result of the TCAS RA itself that had a magnitude of 300 feet or more;

   i. they be recorded as Category K LHDs and treated as operational errors. If the flight crew correctly followed the RA, the deviations should be recorded as Category J LHDs and treated as technical error;

   ii. if the flight crew incorrectly follow the RA, the deviations should be recorded as category K; and

c) For all non-deviations resulting from the flight crew disregarding the TCAS RA, they should be recorded as Category K LHDs and treated as operational errors.

RMACG/17

2.24 All RMAs had presented and followed up on results of their oversight activities on (as applicable) RVSM approval checks, monitoring burden and PBCS approval checks.

2.25 RMACG/17 had reviewed and adopted the proposed amendments to the RVSM Minimum Monitoring Requirement (MMR) for 2022 (**RASMAG/27 WP/4 Attachment**).

Note: In previous years RASMAG has formed a formal Conclusion supporting the use each year's revision of the MMR by RMAs. The updating of the MMR document is a routine annual activity of RMACG, and updates are published on each RMA's website. RASMAG Conclusions supporting this routine activity will no longer be proposed.

2.26 Other matters discussed by RMACG/17 included ASE performance of aircraft groups, and PBCS non-compliance reporting.

2.27 In relation to PBCS non-compliance reporting, the experience of NAARMO and PAARMO 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.

2.28 The meeting agreed that the issue should also be brought to the attention of ATM/SG/10, scheduled for October 2022. 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.

Agenda Item 3: Reports from Asia/Pacific RMAs and EMAs

JASMA AKARA Safety Improvement Update (WP/5)

3.1 JASMA provided an updates 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 1**), and remained the current status of the project.

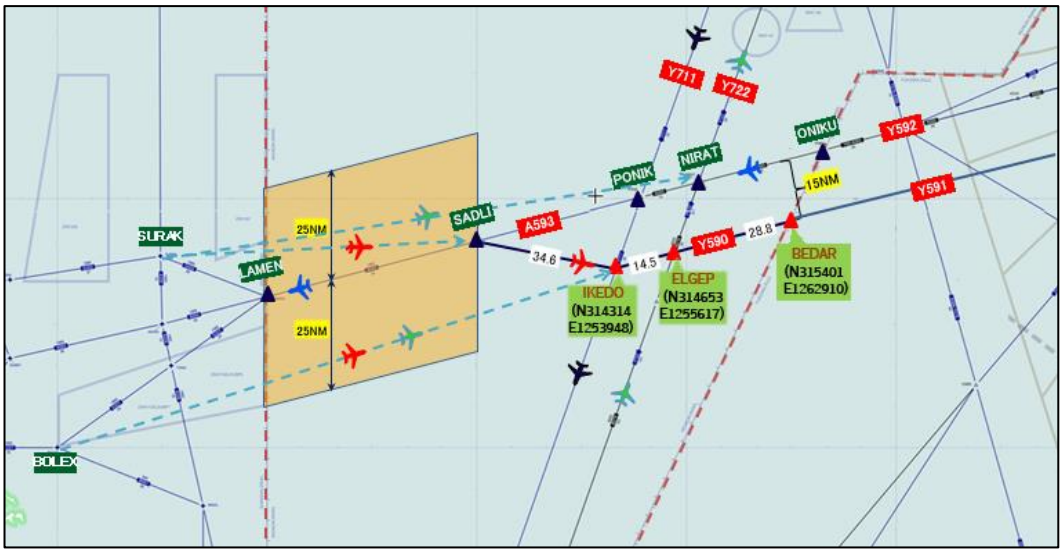

Figure 1: ATS route structure of AKARA-FUKUE Corridor in Phase 1

3.2 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).

3.3 **Figure 2** shows the ATS route structure of Phase 2.

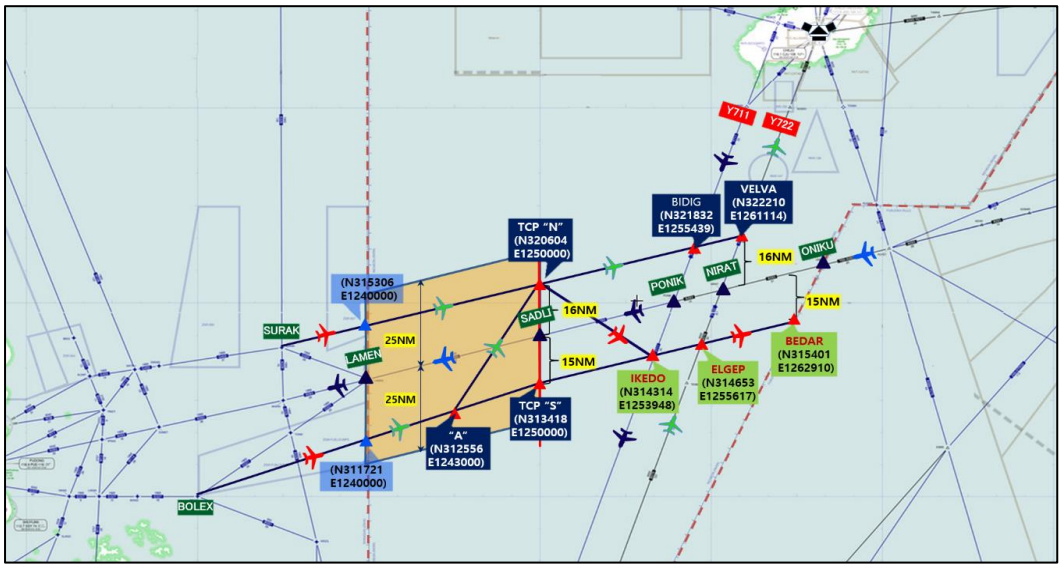

Figure 2: ATS route structure of AKARA-FUKUE Corridor Safety Improvement Plan Phase 2.

3.4 The meeting was informed of discussion of the matter at ATM/SG/9, including the summary from the report of that meeting (**Figure 3**):

6.27 Responding to the requests for ICAO comments, the meeting was informed as follows:

- The Seamless ANS Plan paragraph 7.35 had initially been developed in the consultative process used by the Asia/Pacific Seamless ATM Planning Group (APSAPG) when drafting and finalizing the first version of the Seamless ATM Plan in 2012/2013. ICAO considered FLAS did not meet expectations for seamless airspace, particularly in airspace that was well-served by surveillance and VHF communications coverage. The inclusion of the FLAS element and its limitations in the Seamless ANS Plan (formerly the Seamless ATM Plan) was a compromise reached after considerable offline discussion;
- ICAO did not have information to hand on how the 50 NM from the boundary parameter in element 7.35 had been arrived at, but it seemed likely that it was related to the 50 NM lateral separation minimum for RNAV 10/RNP 10-capable flights;
- The intent of the statement in Seamless ANS Plan element 7.35 b) was that FLAS in Category S airspace should only be utilized for safety and efficiency reasons where crossing track conflictions occurred within 50 NM of the FIR boundary. However, if surveillance coverage or surveillance data sharing was available to provide the State with surveillance covering the boundary airspace, then FLAS should not be applied.
- ICAO agreed that further discussion of the FLAS should be conducted in bilateral meetings between the affected States. However, the meeting noted that Japan considered trilateral discussion of the matter between China, Japan and Republic of Korea should be considered;
- While ICAO considered FLAS in Category S airspace should not be necessary, the current AKARA airspace project was the primary consideration. Completion of Phase 2 of that project should be the first priority, with the FLAS issue addressed separately and at a later time.

Figure 3: ATM/SG/9 - ICAO comments on the AKARA Corridor FLAS

3.5 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.

3.6 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 at an appropriate time, within the Technical Working Group (TWG) framework.

3.7 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.

3.8 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.

3.9 ICAO informed the meeting that the implementation of Phase 2 of the project was a regional matter, and would normally be expected to be resolved by the States concerned. The meeting noted that the development of the airspace improvement plan had been the subject of a TWG coordinated by ICAO Headquarters. The ICAO Asia/Pacific Office would coordinate with ICAO Headquarters (TWG Secretariat) on the matter.

2021 Analyses for the Incheon FIR AKARA Corridor Interface with Shanghai/Fukuoka/Taibei FIRs (WP/6)

3.10 PARMO provided an update on its analysis of the AKARA corridor airspace that was provided to RASMAG/26.

3.11 The December 2021 TSD received from Incheon FIR contained air traffic movements from the AKARA corridor after the route structure was changed. There were key collision risk model (CRM) parameters which were directly estimated from the TSD. The route structure change in the airspace affected specific CRM parameters. **Table 3** compared key metrics from the December 2020 TSD to the December 2021 TSD.

	Dec 2020 TSD	Dec 2021 TSD	% Change
Flying hours within AKARA Corridor	4,322.65	5,571.67	+ 29% (increase)
Number of aircraft operations on airway A593 (eastbound)	3,134	1,267	- 60% (decrease)
Number of aircraft operations on airway Y590/Y591 (westbound)	0	2,009	+ 100% (increase)
Same direction vertical occupancy	0.0176	0.0165	- 6% (decrease)
Opposite direction vertical occupancy	0.3441	0.0921	- 73% (decrease)

Table 3: Key metrics estimated from December 2020 TSD vs December 2021 TSD

3.12 The increase in the observed flying hours from 2020 to 2021could be attributed to the recovery from the COVID-19 pandemic. The second and third rows in the table showed the traffic loading on airways A593 and Y590/Y591.

3.13 The last two rows in Table 3 were vertical CRM parameters. The vertical occupancy values were metrics for the observed traffic density, specifically for aircraft operating on the same route and at adjacent flight levels. The additional unidirectional airway and the resulting division of air traffic had provided a large decrease in the opposite direction vertical occupancy. This result was a significant change for the vertical CRM used for AKARA airspace as the opposite direction vertical occupancy was a sensitive CRM parameter.

Reported LHDs for AKARA Corridor Airspace

3.14 There were twenty-one reported LHDs in 2021 for the AKARA airspace. This was an increase over the five reported LHDs in calendar year 2020. All of the twenty-one reported LHD occurrences in 2021 were classified as category E (coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility as a result of human factors issues). However, for all reported occurrences in 2021 the receiving ATC unit identified and mitigated the LHD using available surveillance, direct speech circuit, or other means. Each of the reported occurrences in 2021 had zero duration and zero levels crossed and did not contribute to the vertical collision risk estimate.

Vertical Risk Estimate

3.15 In the calculation of vertical collision risk, the time spent at incorrect flight levels and the number of flight levels transitioned without clearance were treated differently. There was a specific risk calculation for an aircraft crossing flight levels incorrectly from that used for aircraft occupying whole flight levels incorrectly.

3.16 The vertical operational risk estimate was zero for calendar year 2021. The 2021 vertical technical risk estimate of 0.21×10^{-9} fatal accidents per flight hour (fapfh) met the TLS for vertical technical risk (2.5×10^{-9} fapfh). The overall vertical risk estimate of 0.21×10^{-9} fapfh meets the overall vertical TLS (5×10^{-9} fapfh), and was a 72 percent decrease from the 2020 estimate. The vertical collision risk estimates for the AKARA airspace were shown in **Figure 4**.

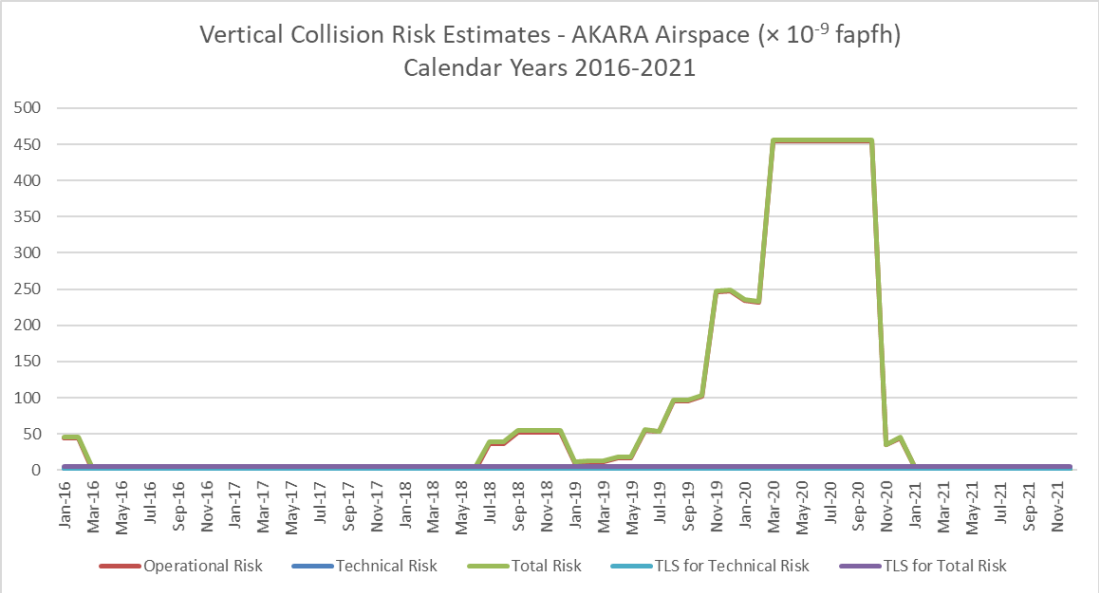

Figure 4. Twelve-month Rolling Vertical Collision Risk Estimates

3.17 ICAO noted that, while there had been a significant increase in traffic from 2020 to 2021, the December 2021 TSD indicated that traffic volume in the airspace remained more than 60% lower than December 2019.

Management Process of APAC Hot Spots (WP/7)

3.18 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 RASMAG-MAWG/9. The MAWG meeting had agreed that the process should be conducted as a trial in 2022 before finalizing. All monitoring agencies would trial the draft approach in their safety reports for RASMAG/27.

3.19 The draft process as discussed at RASMAG-MAWG/9 was provided in **RASMAG/27 WP/07 Attachment**.

3.20 The following points summarized the main RASMAG/27 discussion of this paper:

- The likelihood that hot spots that had returned negative results for two consecutive years, particularly where traffic was reduced due to the COVID-19 pandemic, could later be re-identified as a hot spot, and the need to therefore retain current hot spots until traffic levels recovered and their removal was supported by new data;

- In response to a question on whether the associated ATC task complexity and workload associated with transition to/from non-standard Flight Level Orientation Schemes (FLOS) was taken into account as a contributory factor in LHDs, MAAR replied that there were very few LHDs in the transition areas;
- The inclusion in the draft criteria of LHD of zero duration, considering that hot spots due to any error caused additional workload/complexity for ATC, the possibility that future repetition could have a duration of greater than zero, and recognizing that there are some limitations to the calculated risk based on the Collision Risk Model;

3.21 The meeting supported continuation of this activity, with a view to its future formalization.

RVSM Risk Assessment in the Brisbane, Honiara, Melbourne, Nauru and Port Moresby, FIRs – 1 January to 31 December 2021 (WP/8)

3.22 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 01 January to 31 December 2021.

3.23 **Table 4** detailed the results for the technical, operational and total risk, each of which met the TLS.

Source of risk	Risk estimate	TLS	Comparison with TLS
Technical risk	0.091×10^{-9}	2.5×10^{-9}	Below technical TLS
Operational risk	1.64×10^{-9}	-	-
Total risk	**1.73×10^{-9}**	**5.0×10^{-9}**	**Below total TLS**

Table 4: RVSM Risk Estimates for the period 1 January 2021 to 31 December 2021. The number of estimated annual flying hours was 443,496, based on the December 2020 TSD.

3.24 An assessment of safety reporting culture as proposed by the MAWG/7 meeting, measured against the reporting rate of occurrences per flight hour and grouped by attribution, indicated reports were consistently made by both pilots and ATC (**Table 5**). LHDs with Pilot/Aircrew and ATC attribution were equally reported, indicating a positive reporting culture especially if ATC were comfortable reporting on their own errors as part of a 'just culture' framework.

Attribution	Number of reports	Flight hours	Number of reports per flight hour ($\times 10^{-5}$)
Pilot/Aircrew (A, B, C)	21	443,496	4.74
ATC (D, E, F)	21	443,496	4.74
Other	6	443,496	1.35
Total	**48**	**443,496**	**10.8**

Table 5: Safety culture metric for Australia, Nauru, Papua New Guinea, and Solomon Islands by LHD attribution for the period 1 January 2021 to 31 December 2021.

3.25 **Figure 5** identified the geographic location of LHD occurrences for the period 01 January to 31 December 2021, with the radius of each circle proportional to the total risk at that location.

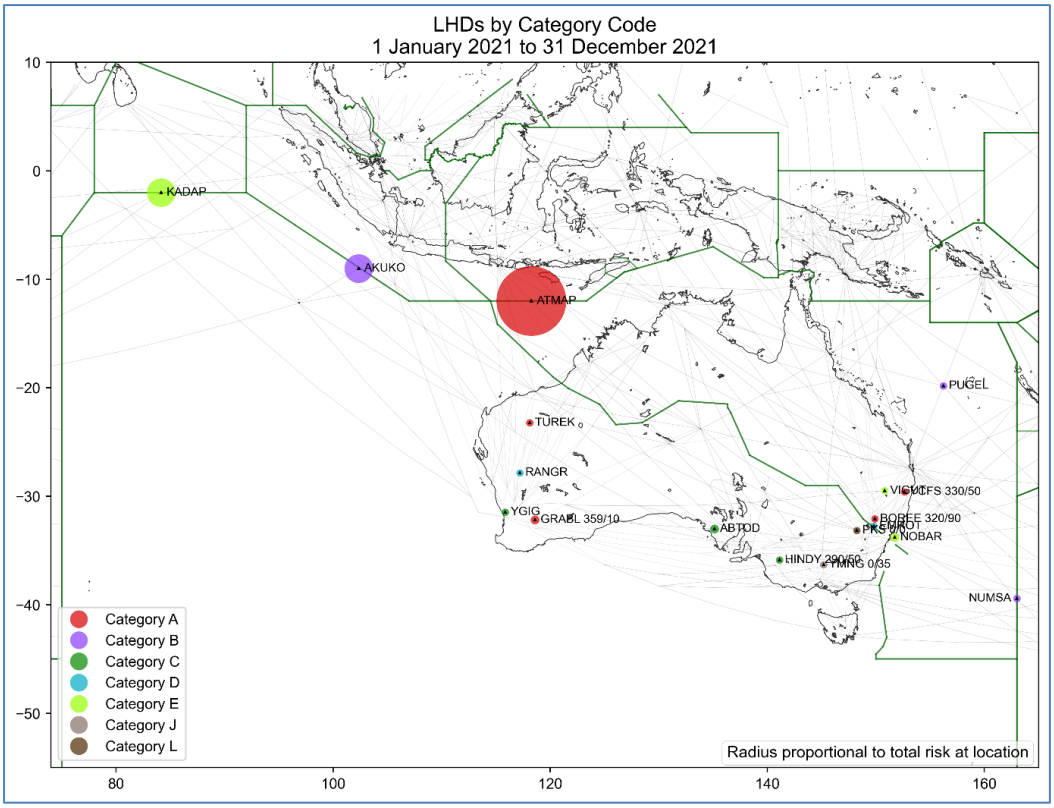

Figure 5: Geolocation of LHDs for Brisbane, Honiara, Melbourne, Nauru, and Port Moresby FIRs for the period 1 January 2021 to 31 December 2021.

3.26 The risk had increased since the value reported for the period 1 January 2020 – 31 December 2020. This was partially because AAMA had revised the process of estimating collision risk modelling (CRM) parameters from the TSD, leading to more accurate results. In addition, traffic levels generally increased in the latter part of 2021 compared to 2020 and early 2021. AAMA agreed to present a paper on CRM parameters at the next RASMAG-MAWG meeting.

3.27 In response to a query, AAMA informed the meeting that while pilots had on occasion reported LHD incidents direct to the monitoring agency, pilot reports were usually made direct to ATC (e.g. reporting a TCAS RA event), with the pilot-provided information included in the ATC report.

Progress on Risk Mitigation at Hot Spot M (WP/9)

3.28 AAMA provided information discussing the risk mitigation measures being taken at LHD hot spot M, located on the Melbourne—Colombo FIR interface. Hot spot M was added to the list of hot spots at RASMAG/24 in 2019. **Figure 6** illustrated the total number of LHDs, their duration and levels crossed. LHD category codes were provided in **Figure 7**.

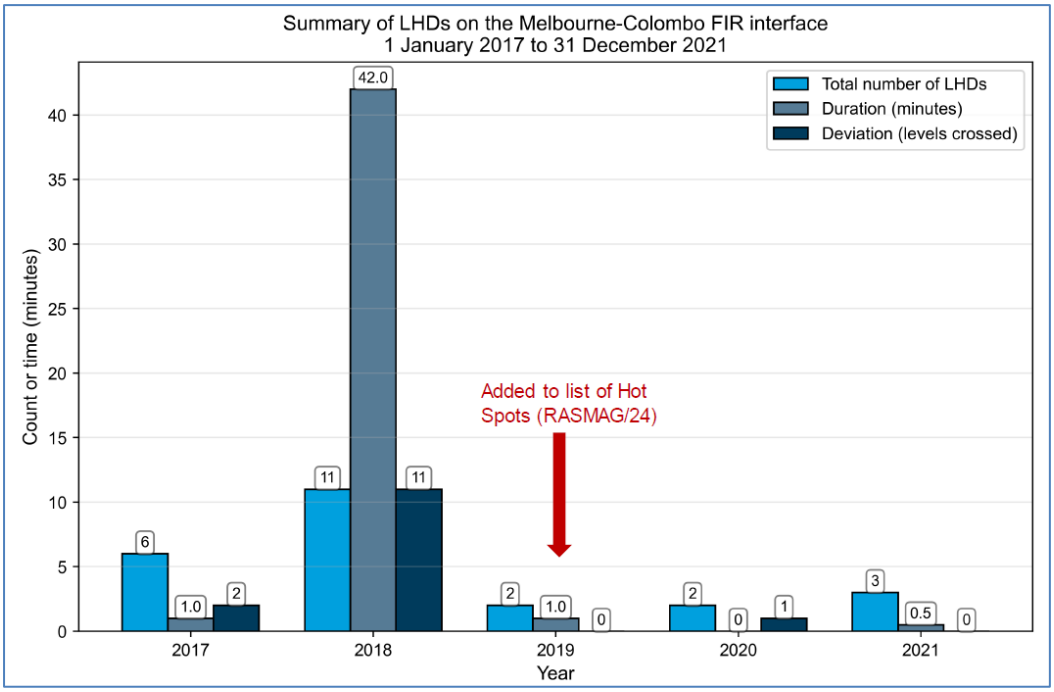

Figure 6: Total number of LHDs, their duration, and levels crossed, for the period 1 January 2017—31 December 2021.

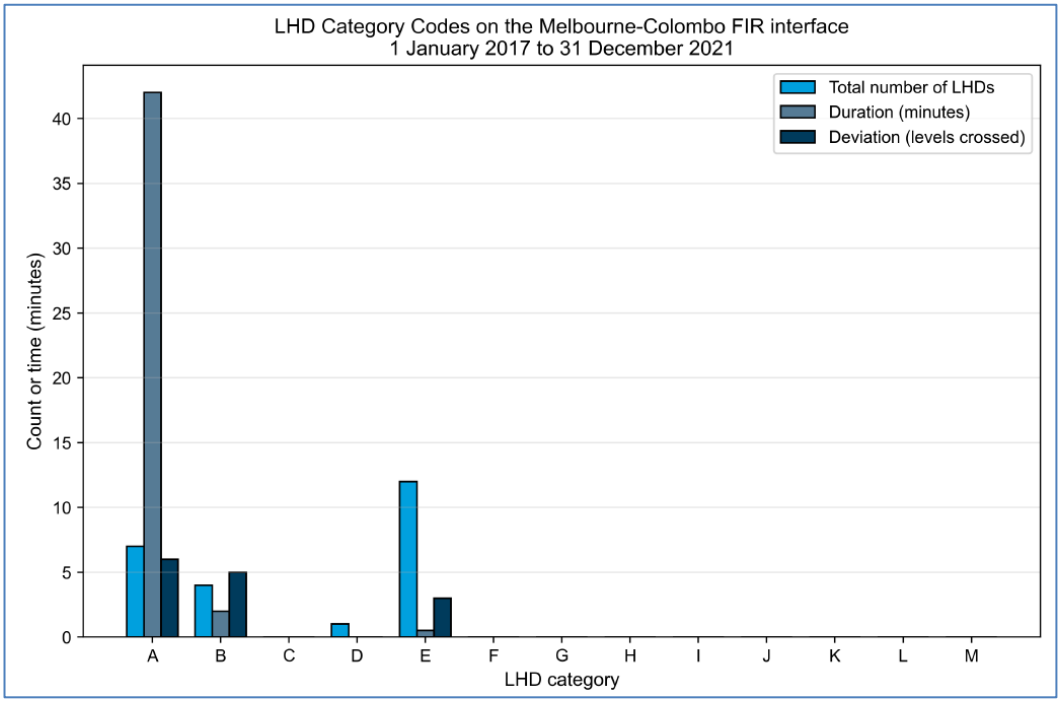

Figure 7: Total number of LHDs, duration, and levels crossed by LHD Category Code.

3.29 In the period 1 January 2017—31 December 2021, there were 11 LHDs in the Aircrew/Pilot attribution category (Category A, B, or C). Of these, four involved the Indian Navy.

3.30 There were 13 LHDs in the ATC attribution category (Category D, E, or F). Colombo was the transferring unit in 11 of these, and Melbourne was the transferring unit in two events.

3.31 There was one event involving the Indian Navy in September 2018, which involved multiple planning and operational issues. It was assessed as 41 minutes duration based on the time reported at KETIV (the closest known location to the boundary) and the time contact was established with the aircraft. This event contributed to a large proportion of the risk at Hot Spot M in 2018.

3.32 In 2020 a number of measures were taken in the Colombo FIR in order to mitigate occurrences in the ATC attribution category. For the period 1 January 2020—31 December 2021, there was one LHD of 0.5 minutes duration in the ATC attribution category. This suggested that LHDs in the ATC attribution category were decreasing on the Melbourne—Colombo FIR interface.

3.33 Since the LHDs at Hot Spot M had been decreasing and mitigation measures implemented by Colombo ACC, RASMAG/26 proposed to re-classify the FIR interface as a non-hot spot. However, establishing a suitable Point of Contact (POC) with the Indian Navy, identified as a key mitigation measure, had not yet been achieved. AAMA had agreed under RASMAG Action Item 26/4 to write to the Directorate General of Civil Aviation (DGCA) India to obtain contact details for the Indian Navy, and to provide details of the occurrences involving the Indian Navy. Correspondence by AAMA and MAAR to DGCA India was provided in **RASMAG/26 WP/9 Attachments 1 and 3**. No response had yet been received. Therefore the meeting agreed that Hot Spot M be retained.

RVSM Risk Assessment in the Jakarta and Ujung Pandang Flight Information Regions – 1 January 2021 to 31 December 2021 (WP/10)

3.34 AAMA provided an airspace safety review of RVSM airspace risk in the Jakarta and Ujung Pandang Flight Information Regions (FIRs) for the period 1 January 2021 to 31 December 2021.

3.35 The results for the technical, operational, and total risk for the RVSM implementation in Jakarta and Ujung Pandang FIRs were detailed in **Table 6**.

Source of risk	Risk estimate	TLS	Comparison with TLS
Technical risk	0.133×10^{-9}	2.5×10^{-9}	Below technical TLS
Operational risk	3.51×10^{-9}	-	-
Total risk	**3.64×10^{-9}**	**5.0×10^{-9}**	**Below total TLS**

Table 6: RVSM Risk Estimates for the period 1 January 2021 to 31 December 2021. The number of estimated annual flying hours was 303,491 based on the December 2020 TSD.

Assessment of Safety Reporting Culture

3.36 An assessment of safety reporting culture for Indonesia is shown in **Table 7**.

Attribution	Number of reports	Flight hours	Number of reports per flight hour ($\times 10^{-5}$)
Pilot/Aircrew (A, B, C)	4	303,491	1.32
ATC (D, E, F)	36	303,491	11.9
Other	1	303,491	0.33
Total	**41**	**303,491**	**13.5**

Table 7: Safety culture metric for Indonesia by LHD attribution for the period 1 January 2021 to 31 December 2021.

3.37 The high rate of reporting of occurrences with ATC attribution was an indication of a positive reporting culture, especially if ATC were comfortable reporting on their own errors as part of a 'Just Culture' framework.

China RMA Vertical Safety Report (WP/11)

3.38 The China Regional Monitoring Agency (China RMA) provided an RVSM safety report for nine Chinese FIRs (excluding Hong Kong and Taipei FIRs), and the Pyongyang FIR (Democratic People's Republic of Korea).

3.39 The 2021 RVSM risk estimates for the Chinese FIRs in **Table 8** indicated that the TLS had been met, at **2.17×10^{-9}**.

The RVSM Airspace of Chinese FIRs – estimated annual flying hours = 1625084.6 hours *(note: estimated hours based on Dec 2021 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG 26 Total Risk	*7.11×10^{-9}*	*5.0×10^{-9}*	*Above TLS*
Technical Risk	0.21×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	1.96×10^{-9}	-	-
Total Risk	**2.17×10^{-9}**	5.0×10^{-9}	**Below TLS**

Table 8: Risk Estimates for the RVSM airspace of Chinese FIRs

3.40 The 2021 RVSM risk estimate for the Pyongyang FIR indicated that the TLS had been met at **1.08×10^{-9}**, as no LHD had been reported during 2021.

3.41 In response to a query on whether reports indicating no LHD, or no reports, had been received from DPR Korea, the meeting was informed that due to the COVID-19 pandemic and other issues there had been difficulty in communication. China continued to reach out to DPR Korea seeking reports.

The Trial of Hot Spot Identification in Chinese Airspace (WP/12)

3.42 China RMA had trialled the method proposed in RASMAG-MAWG/9 to identify hot spots in Chinese airspace. This included assessing the new method using historical data for Hot Spots C, E and H, identified in 2015 and each of which had been removed by 2020. This trial indicated that Hot Spot C (2015) and Hot Spot H (2017) could be identified as hot spots using the new method, but Hot Spot E could not.

3.43 China RMA had conducted a second trial using 2021 LHD events, which resulted in no hot spot being identified.

3.44 A number of observations were made relating to the trial demonstrating potential to detect existing operational challenges, cluster size potentially impacting the consistency of results, ~~the~~ and the possibility of improved identification of operational problems as experience accumulated.

3.45 The Chair agreed with what was described in China RMA's paper regarding the hot spot identification process, especially the cluster identification step - that it was subjective to some degree, but difficult to standardize in the strict sense. (There are clustering algorithms available, but using it would probably be an overkill.) Monitoring agencies were welcome to propose ideas in this regard to the MAWG to fine tune the overall process.

JASMA Vertical Safety Report (WP/13)

3.46 JASMA provided an executive summary of the airspace safety oversight assessment of the RVSM implementation in the Fukuoka Flight Information Region (FIR). A detailed report was also provided in **RASMAG/27 WP/13 Attachment A**.

3.47 The level of risk for the reporting period from 1 January 2021 to 31 December 2021 was **9.52 x 10^{-9}**, which exceeded the target level of Safety (**Table 9**).

Japanese Airspace – estimated annual flying hours = 991,428 hours *(note: estimated hours based on Dec 2021 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG 26 Total Risk	*11.57 x 10^{-9}*	*5.0 x 10^{-9}*	*Above TLS*
Technical Risk	0.17 x 10^{-9}	2.5 x 10^{-9}	Below Technical TLS
Operational Risk	9.35 x 10^{-9}	-	-
Total Risk	**9.52 x 10^{-9}**	5.0 x 10^{-9}	**Above TLS**

Table 9: Japanese Airspace RVSM Risk Estimates

3.48 **Figure 8** presented the collision risk estimate trends for the period.

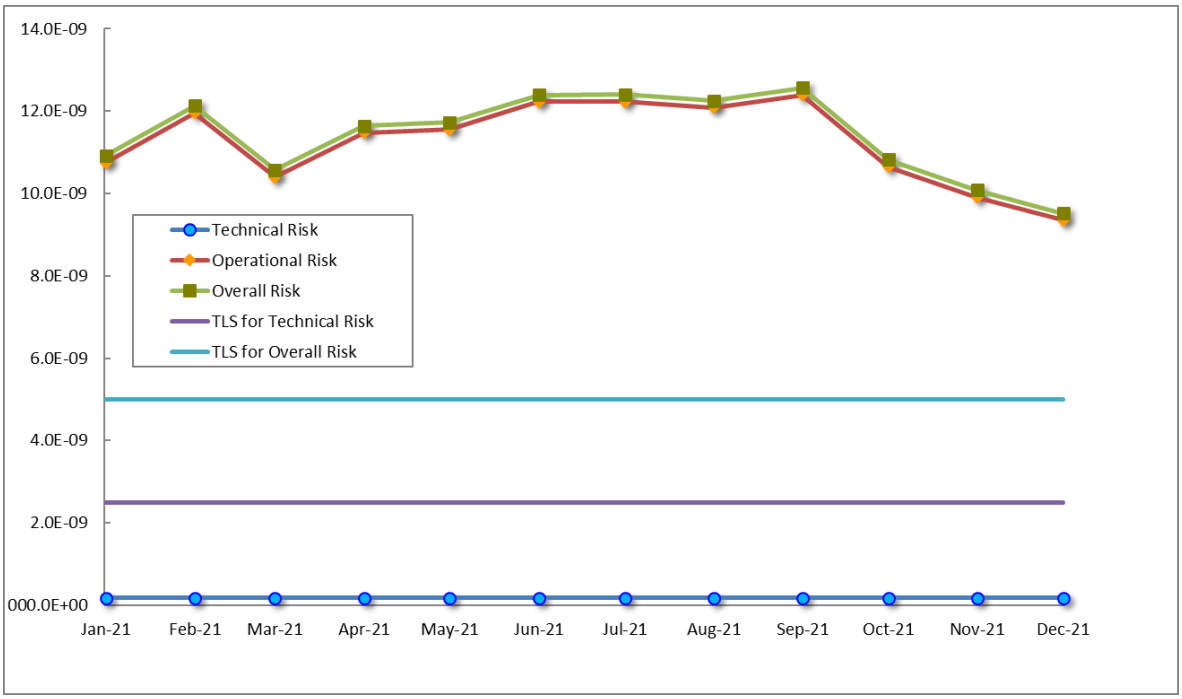

Figure 8: Japanese Airspace RVSM Risk Estimate Trends

3.49 **Figure 9** provided the geographic location of LHD reports occurred within Fukuoka FIR during the assessment period. The filled blue square symbols represent LHD location in the RVSM stratum of Fukuoka FIR. The circles represent LHD duration of 50 seconds or more.

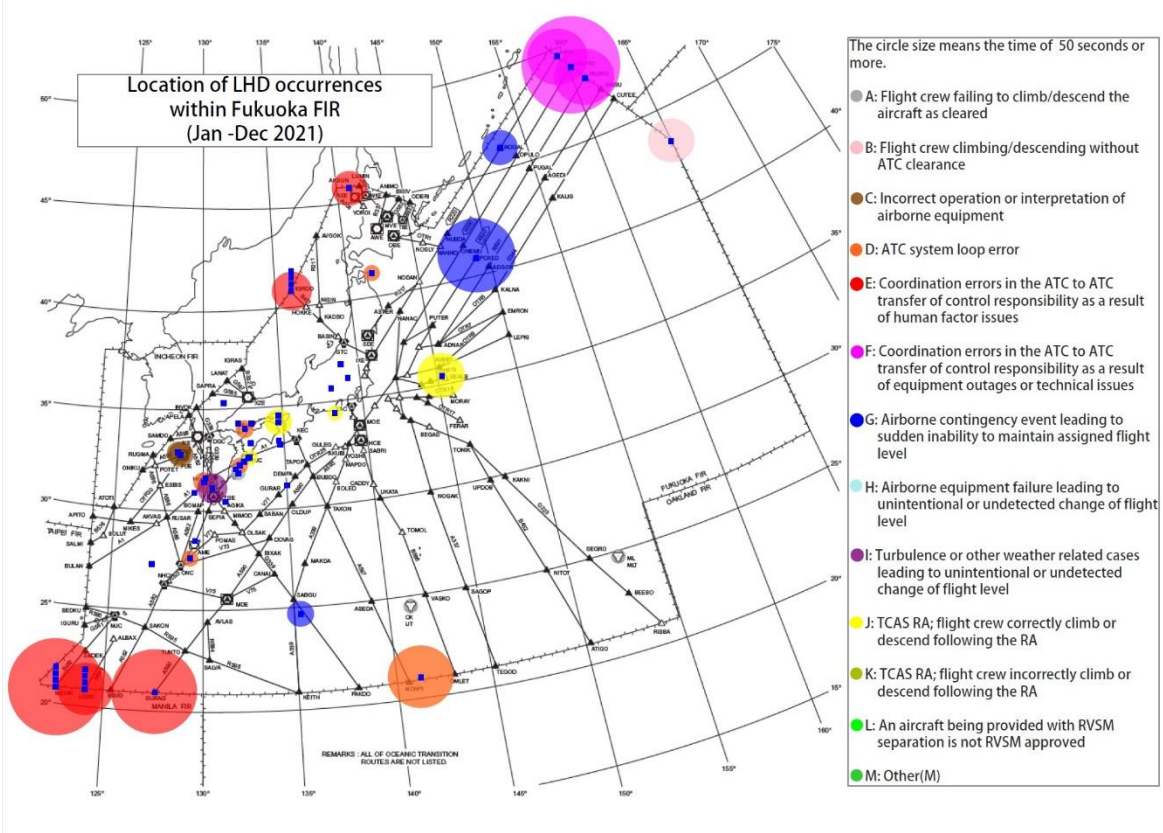

Figure 9: Geographical Location of LHDs within Fukuoka FIR

3.50 JASMA analysis of LHD trends under the COVID-19 situation indicated:

- Decreasing the number of category A LHDs might be due to the increasing opportunities that pilots could operate aircraft under the relaxation of travel restrictions;
- The increased number of category D LHDs may due to increased errors on both sides, air traffic controllers and pilots. One of the reasons was the increase of callsign confusion, which appeared to be in proportion to the traffic volume;
- Increased category D LHDs could also be due to less-experienced controllers and pilots who had obtained their license during the lower traffic situation;
- implementing technical mitigation measures (e.g. AIDC) for category E LHDs may be most effective; and
- The number of category J LHDs may be in proportion to air traffic volumes and flight hours.

3.51 A total of 11 category E LHDs occurred at Hot spot D (Fukuoka/Manila FIR boundary) in 2021. Nine of these LHDs occurred on transfer from the Manila ACC to the Fukuoka Air Traffic Management Center (ATMC) or Kobe ACC, and two LHDs occurred on transfer from Fukuoka ATMC or Kobe ACC to Manila ACC.

3.52 Five LHDs occurred at the former Hot Spot L, on the boundary between the Fukuoka and Khabarovsk FIRs. All of these were due to non-provision of flight level change information by Khabarovsk ACC.

3.53 In discussing the contribution of transitions to/from the non-standard FLOS at or near the Fukuoka/Manila FIR boundary, JASMA informed the meeting that the primary issue was the non-provision of transfer information.

JASMA Hot Spot Identification (WP/14)

3.54 Responding to the RASMAG-MAWG/9 meeting discussion of a draft process for identifying, monitoring and removing LHD hot spots, JASMA had monitored current and former hot spots around the Fukuoka FIR boundary: Hot Spot B (AKARA airspace), Hot Spot D (Fukuoka – Manila FIRs) and the former Hot Spot L (Fukuoka – Khabarovsk FIRs).

3.55 The number of LHDs in the area of the former Hot Spot L had increased to 5 in 2021 despite less traffic volume. JASMA considered whether the area should be identified and reclassified as Hot Spot L at the RASMAG/27 meeting by using the management process of hot spots that MAAR developed, as a trial.

3.56 **Table 10** represented the results of the analysis and consideration for Hot Spot L. 'Negative' means under the hot spot criteria and "Positive" means over the criteria.

Hot spot L (FIR Boundary between Fukuoka and Khabarovsk FIRs)	2017	2018	2019	2020	2021
Number of LHDs	5	1	3	1	5
Criteria: Number	12.80	10.67	8.00	8.40	8.00
Hot spot Risk (x10-9 FAPFH)	0.87	0.30	1.44	0.00	0.64
Criteria: Risk Estimate ($x10^{-9}$ FAPFH)	1.82	1.69	1.38	2.28	1.34
Criteria: TLS ($x10^{-9}$ FAPFH)	5.00	5.00	5.00	5.00	5.00
Result and Action by RASMAG meeting	Identified as Hot Spot L (RASMAG/23 in 2018)	Continue Monitering (RASMAG/24 in 2019)	Potential to non-Hot spot (RASMAG/25 in 2020)	Removed from hot spot list (RASMAG/26 in 2021)	Potential to Hot spot (RASMAG/27 in 2022)
			Legend:	Positive	Negative

Table 10: The results of analysis and consideration on Hot Spot L from 2017 to 2021

3.57 **As** a result of JASMA's analysis, the number of LHD occurrences and hot spot risk for Hot Spot L in 2017 were below criteria although the number of LHDs was the highest in the period from 2017 to 2021. On the other hand, the hot spot risk in 2019 identified was "Positive even though the number of LHDs was 3, which was not the highest during the sample period.

3.58 The number of LHDs and hot spot risk for the former Hot Spot L in 2021 were below the criteria, although the number of LHDs marked the same highest number as in 2017. According to this result, JASMA did not propose identifying and reclassifying the area as Hot Spot L at the RASMAG/27 meeting. Further analysis, consideration and discussion would be needed regarding the process during the trial phase due to apparent contradictions. JASMA also noted it may be necessary to standardize the method for identifying clusters.

3.59 MAAR responded that they could perhaps develop a general guideline of how to identify clusters. The consideration would take various factors such as the number and the locations of LHDs which are near each other in the same flow of traffic, and the shape of ATS units (airspace configuration). This would be further discussed at the next meet of the RASMAG-MAWG.

JASMA Horizontal Safety Report (WP/15)

3.60 JASMA provided the horizontal risk assessment results of the Fukuoka Flight Information Region (FIR) conducted by the Japan Airspace Safety Monitoring Agency (JASMA).

3.61 The horizontal separations based on Performance-Based Navigation (PBN) both met the TLS, with 50NM lateral achieving **0.712 x 10^{-9}** and 30NM longitudinal estimated risk at **0.014 x 10^{-9}**. The 10-minute time-based risk also met TLS at **0.034 x 10^{-9}**.

3.62 There was a total of 24 Large Lateral Deviations (LLDs) and Large Longitudinal Errors (LLEs) reported to JASMA in 2021. The top contributor belonged to Category F (Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues – 8 occurrences), followed by Category E (Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues five occurrences) and Category H (*Turbulence or weather related causes leading to a deviation in the horizontal dimension* – five occurrences).

3.63 In response to a query on the North Pacific (NOPAC) Redesign, JASMA informed the meeting that a safety assessment would be conducted before implementation of the 23 NM lateral separation minimum. The safety assessment would include consideration of LLD and LLE data, and would be discussed with the USA.

3.64 PARMO suggested that RASMAG-MAWG should discuss and clarify the difference between category F and category E LLD and LLE occurrences, in relation to cases where contingency procedures had not been correctly applied when equipment outages or technical issues occurred.

MAAR Safety Report (WP/16)

3.65 MAAR presented the results of airspace safety oversight for RVSM operations in South Asia/Indian Ocean Airspace (SA/IO), Southeast Asia Airspace (SEA), and Mongolian Airspace during 2021.

South Asia Indian Ocean Airspace

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

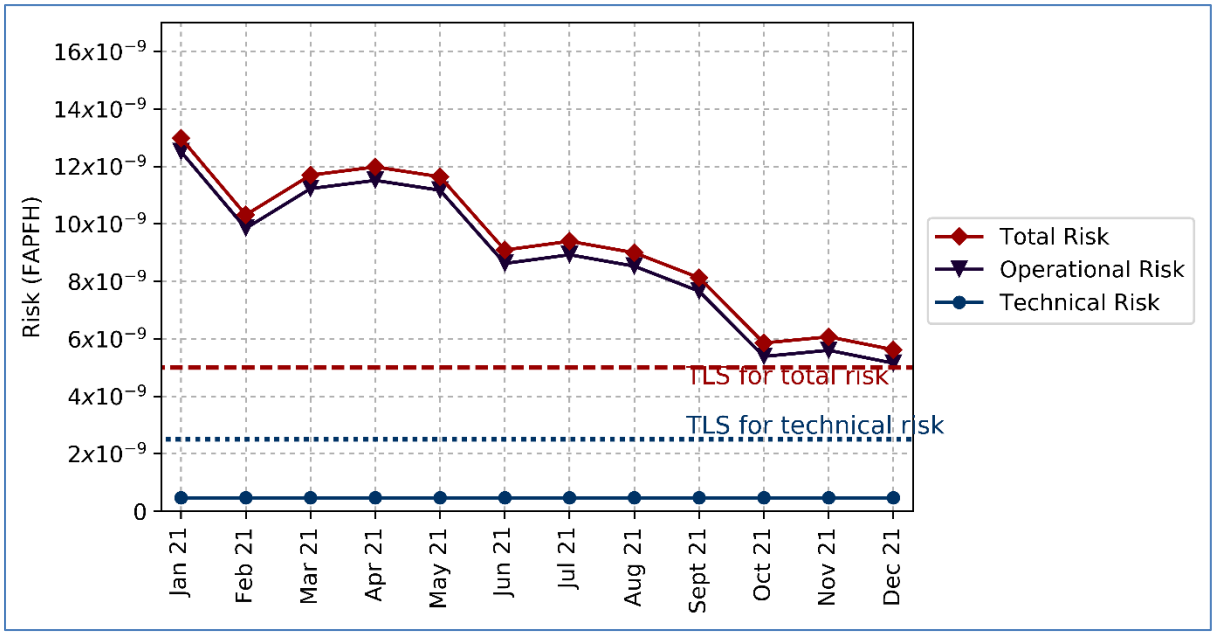

Figure 10: Trends of Risk Estimates for SA/IO RVSM Airspace

3.67 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%)

3.68 **Table 11** shows LHD clusters in SA/IO airspace analysed under the trial process introduced by RASMAG-MAWG, including the number of LHD and risk of each cluster as well as the results of checking against the criteria.

2021 Clusters (SA/IO)	**Chennai-Yangon/ Kuala Lumpur** (Hot Spot A2)	**Chennai-Mumbai-Delhi**	**Mumbai-Male**	**Mumbai-Muscat** (Hot Spot G)	**Mumbai-Sanaa** (Hot Spot G)	**Mumbai-Mogadishu** (Hot Spot F)	**Karachi -Muscat**	**Western Boundary of Kabul**	**Kabul-Lahore**
Number of LHDs	29	8	7	44	4	5	4	6	13
Check Criteria: Number >= 13.4	Positive	Negative	Negative	Positive	Negative	Negative	Negative	Negative	Negative
Risk (x 10^{-9} FAPFH)	0.05	1.31	0.20	1.35	0.07	0.12	0.00	0.49	1.56
Check Criteria: Risk >= 0.52 x 10^{-9} FAPFH	Negative	Positive	Negative	Positive	Negative	Negative	Negative	Negative	Positive
Check Criteria: Risk >= TLS	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative

Table 11: The results of identifying hot spots in SA/IO Airspace.

3.69 Hot Spots A2 and G (Mumbai – *Muscat* FIR boundary) satisfied the trial hot spot criteria. Additional clusters satisfying the criteria were Chennai-Mumbai-Delhi (Indian FIRs) and the boundary between Kabul FIR and Lahore FIR.

3.70 The following currently listed hot spots did not meet the new criteria: Hot spot G (Mumbai – Sanaa FIR boundary), Hot Spot F (Mumbai – Mogadishu FIR boundary) and Hot Spot A1 (Kolkata – Yangon FIR Boundary).

3.71 In 2020 and 2021, long-duration LHDs were mitigated and the operational risks at Hot Spots G and F were very low compared to 2019. The decreasing trend of risk at these hot spots was possibly due to the increasing awareness of the LHD issue, the traffic reduction during the COVID-19 pandemic and the implementation of Space-Based ADS-B.

3.72 Regarding the process of identifying hot spots, the LHD cluster at the boundary between Mumbai FIR and Muscat FIR (Hot Spot G) satisfied the hot spot criteria in terms of the number and the risk. MAAR considered this should remain as a hot spot. The LHD clusters at the boundary between Mumbai FIR and Sanaa FIR (Hot Spot G) and between Mumbai FIR and Mogadishu FIR (Hot Spot F) did not satisfy any of the 2021 trial hot spot criteria. However, some mitigation measures also remained unfinished, and MAAR considered these two clusters should continue to be hot spots.

3.73 The Hot Spot A1 (the boundaries between Kolkata FIR / Dhaka FIR and Yangon FIR) did not satisfy any of the three hot spot criteria in 2020 and 2021. It was reported to RASMAG/26 that the issue of LHDs over waypoints APAGO and CHILA (the Dhaka-Yangon interface) was resolved by implementation of a new procedure since June 2019 to handle traffic among Yangon, Dhaka, and Kolkata ACCs. The ADS-B data sharing between Kolkata ACC and Yangon ACC was implemented to allow the controllers to detect and resolve any issue before an aircraft passed the transfer-of-control points. If it could also be confirmed that AIDC is successfully implemented between Kolkata ACC and Yangon ACC, then the Hot Spot A1 (the boundaries between Kolkata FIR / Dhaka FIR and Yangon FIR) could be proposed to be removed from the hot spot list. Hot Spot A2 (the boundaries between Chennai FIR and Yangon FIR / Kuala Lumpur FIR) satisfies hot spot criteria in terms of the number, and therefore should remain on the hot spot list.

Southeast Asia Airspace

3.74 The 2021 RVSM risk estimate for SEA airspace indicated that the TLS for total risk had been met at **2.58 x 10^{-9}** FAPFH.

3.75 69 of the 72 reported LHDs in SEA airspace (96%) were classified as Category E.

3.76 Regarding the hot spot identification process, **Table 12** shows the number of LHDs and risk of each LHD clusters as well as the results of checking against the hot spot criteria.

2021 Clusters (SEA)	**Manila-Kobe/ Fukuoka**	**Manila-Taibei**	**Manila-Ho Chi Minh**	**Manila-Ujung Pandang**	**Singapore-Jakarta**	**Bangkok-Kuala Lumpur/ Singapore**	**Kuala Lumpur-Singapore**	**Singapore-Kota Kinabalu**
Number of LHDs	11	4	7	7	16	9	4	4
Check Criteria: Number >= 8	Positive	Negative	Negative	Negative	Positive	Positive	Negative	Negative
Risk (x 10^{-9} FAPFH)	0.45	0.07	0.77	0.36	0.23	0.14	0.05	0.04
Check Criteria: Risk >= 0.24 x 10^{-9} FAPFH	Positive	Negative	Positive	Positive	Negative	Negative	Negative	Negative
Check Criteria: Risk >= TLS	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative

Table 12: The results of identifying hot spots in SEA Airspace

3.77 According to the result in Table 12, the following clusters satisfied the hot spot criteria:

- Manila-Kobe/Fukuoka boundary (Hot Spot D);
- Manila-Ho Chi Minh boundary (Hot Spot D);
- Manila-Ujung Pandang boundary (Hot Spot D);
- Singapore-Jakarta boundary (Hot Spot J); and
- Bangkok- Kuala Lumpur/Singapore boundary.

3.78 **LHD Hot Spot D (Manila FIR and adjacent FIRs)** were first identified as hot spots in 2015. The number of LHDs and the operational risk had improved due to several safety enhancement activities including the new ATM system, the enhanced surveillance capability, the implementation of ADS-C/CPDLC and partial implementation of AIDC. However, the number of LHDs and the total operational risk along Manila FIR boundaries increased in 2021. The total operational risk in 2021 was almost as high as the total operational risk in 2019, which was in the normal traffic situation before the COVID-19 pandemic. The significant increase in the number of LHDs and the high operational risk were at Manila-Fukuoka, Manila-Ho Chi Minh and Manila-Ujung Pandang boundaries. The distribution of LHDs and operational risk are detailed in **Table 13**.

Boundary	**Number of LHDs**			**Number of non-zero-duration LHDs**			**Operational Risk (10^{-9} FAPFH)**		
	2019	**2020**	**2021**	**2019**	**2020**	**2021**	**2019**	**2020**	**2021**
Manila-Kobe/Fukuoka	15	5	11	1	2	4	1.36	0.49	**0.45**
Manila-Ho Chi Minh	20	4	7	0	0	3	0	0	**0.77**
Manila-Hong Kong	17	5	2	0	2	0	0	0.19	0
Manila-Kota Kinabalu	11	2	2	3	1	0	0.08	0.37	0
Manila-Sanya	0	2	0	0	0	0	0	0	0
Manila-Singapore	17	3	2	5	0	0	0.28	0	0
Manila Taibei	16	3	4	0	0	1	0	0	0.07
Manila-Ujung Pandang	3	0	7	1	0	2	0.02	0	**0.36**
Manila-Oakland	0	0	2	0	0	0	0	0	0
Total	**99**	**24**	**37**	**10**	**5**	**10**	**1.74**	**1.05**	**1.65**

Table 13: The number of LHDs, non-zero-duration LHDs and operational risk in 2019, 2020 and 2021 along Manila FIR boundaries

3.79 Regarding the process of identifying hot spots, this was the first time that the LHDs along Manila FIR boundaries had been broken up into different clusters. In 2021, the LHD clusters at Manila FIR boundary interfacing with Kobe/Fukuoka, Ho Chi Minh, and Ujung Pandang satisfy the hot spot criteria, while the other interfaces do not. MAAR suggested to keep watch on all Manila FIR boundaries (Hot Spot D) and maintain it on the LHD Hot Spot list because some mitigations still remained to be implemented. The spikes in the number of LHDs and operational risk in 2021 particularly at Manila-Fukuoka, Manila-Ho Chi Minh and Manila-Ujung Pandang boundaries also needed to be monitored

3.80 The meeting considered that the LHD cluster at the Bangkok-Kuala Lumpur/Singapore boundary be closely monitored with a view to its inclusion in the list of hot spots in 2023 if necessary.

Mongolian Airspace

3.81 The 2021 RVSM risk estimate for Mongolian airspace indicated that the TLS for total risk had been met at **0.81×10^{-9}** FAPFH. In 2021 there was one LHD reported in Mongolian airspace. The aircraft was detected before crossing the transfer of control point (from Irkutsk ACC), and therefore contributed zero operational risk.

APANPIRG Deficiencies

3.82 MAAR received 2021 TSD from all States except Afghanistan.

3.83 The 2021 LHD reports from Yangon FIR were submitted late and could not be investigated by the adjacent FIRS. These LHDs are therefore not included in this report.

3.84 MAAR proposed that the Deficiency recorded against Afghanistan for non-provision of safety-related data be retained.

COVID-19 Impact

3.85 In discussion of hot spots, the meeting considered that the reduction in air traffic caused by the COVID-19 pandemic continued to impact safety assessment at hot spots. It was therefore agreed that all current hot spots should be retained, with a view to re-examining them in 2023 in the context of any increase in traffic levels.

Side Meeting – Hot Spot D

3.86 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. A summary of discussion is provided in **Appendix E to this report**.

SEASMA Safety Report (WP/17)

3.87 Singapore's South East Asia Safety Monitoring Agency (SEASMA) provided a horizontal safety assessment report for operations on ATS routes N892, L625, N884 and M767 within the South China Sea during 2021. This assessment was based on RNP10 performance and concluded that the TLS established for lateral and longitudinal separation standards were satisfied at **0.017×10^{-9}** and **0.375×10^{-9}** respectively.

3.88 The number of LLEs had reduced from three in 2020 to zero in 2021 while the number of LLDs remained zero.

3.89 In response to a query on State reporting, SEASMA informed the meeting that there was no indication of non-reporting. Improved ATM automation systems, stabilized technology and better ATC awareness of hot spots were likely to have contributed to the reduced number of occurrences.

BOBASMA Horizontal Safety Monitoring Report (WP/18)

3.90 The Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) presented the horizontal safety assessment for the Bay of Bengal/Arabian Sea Indian Ocean airspace during the period January to December 2021. The 50NM lateral and longitudinal risks remained below the Target Level of Safety (TLS) at **1.09397×10^{-9}** and **1.07689×10^{-9}**.

3.91 In December 2021, the average number of flights in the three Indian FIRs were 50% of the corresponding total in 2019, which is a slight increase from the 32% observed in December 2020. Thus, as in the previous year, a reduced collision risk was expected although not as low as in 2020. There was one Category E LLD and nil LLE reported in 2021.

Identified Airspace Risk Occurrences in Indian FIRs (WP/19)

3.92 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.

3.93 There was 1 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. **Table 14** summarized the LHD reports.

Area Control Centre	**LHD reports Filed**	**LHD Categories**		
		B	**D**	**E**
Chennai	42		1	41
Delhi	1	1		-
Kolkata	2			2
Kuala Lumpur	15			15
Lahore	3			3
Male	5			5
Mumbai	61	1	3	57
Muscat	15			15
Sanaa	4			4
Yangon	1			1
Total	**149**	**2**	**4**	**143**

Table 14: Summary of LHD Reports for the period January to December 2021

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

PARMO Vertical Safety Monitoring Report (WP/20)

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

Pacific Airspace

3.96 The 2021RVSM risk estimate for Pacific airspace indicated that the TLS had not been met at **28.21 × 10^{-9}** (**Table 15 and Figure 11**).

Pacific Airspace – estimated annual flying hours = 1,176,737.3 hours *(note: estimated hours based on Dec 2021 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG 26 Total Risk	*22.04 × 10^{-9}*	*5.0 ×10^{-9}*	*Above TLS*
Technical Risk	0.11 × 10^{-9}	2.5 × 10^{-9}	Below Technical TLS
Operational Risk	28.31 × 10^{-9}	-	-
Total Risk	**28.21 × 10^{-9}**	5.0 × 10^{-9}	**Above TLS**

Table 15: Pacific Airspace RVSM Risk Estimates

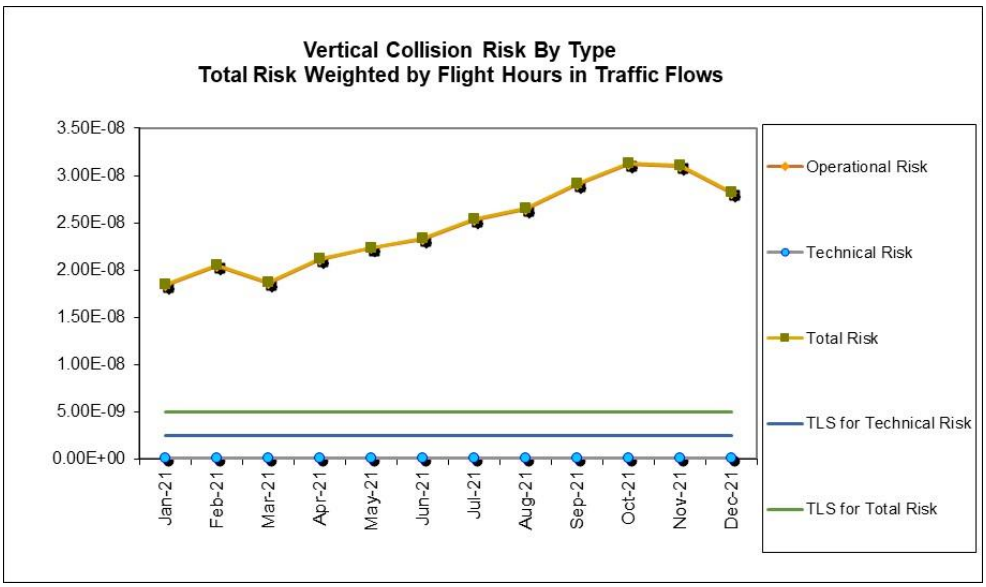

Figure 11: Pacific Airspace RVSM Risk Estimate Trends

3.97 The largest contributors to the vertical collision risk estimate are 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.

3.98 **Figure 12** provided the geographic location of risk bearing LHD reports within Pacific Airspace during the assessment period.

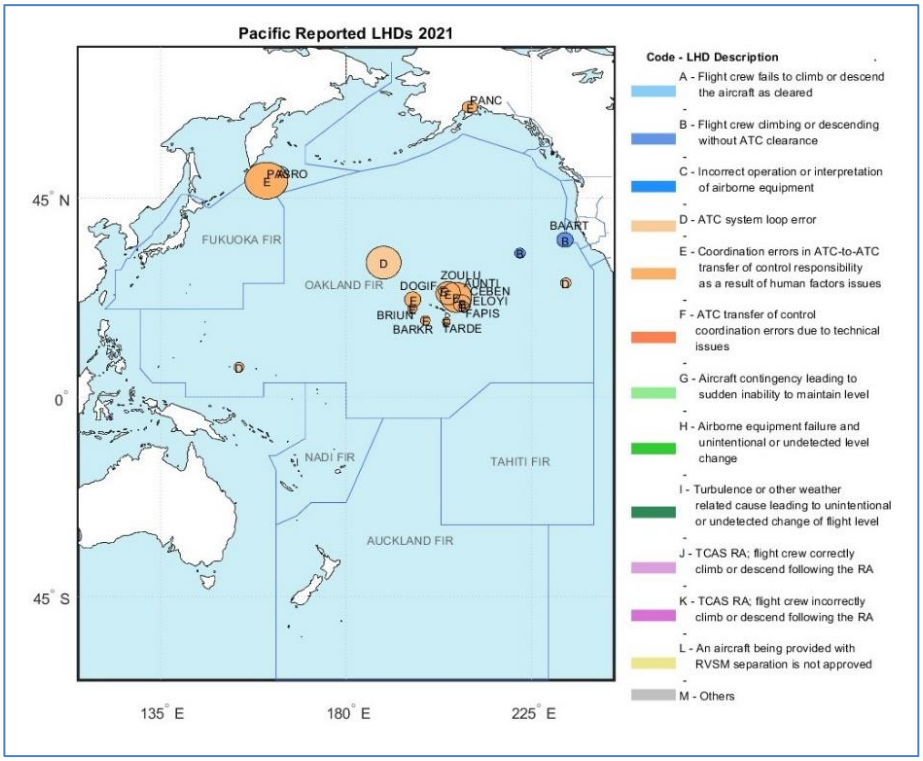

Figure 12: Pacific Airspace – Risk Bearing LHD

Northeast Asia Airspace

3.99 **Table 16** summarizes North East Asia airspace RVSM technical, operational, and total risks.

North East Asia Airspace – estimated annual flying hours = 83,991.4 hours ***(note: estimated hours based on Dec 2021 traffic sample data)***			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG 26 Total Risk	0.23×10^{-9}	5.0×10^{-9}	*Below TLS*
Technical Risk	0.04×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	0.00×10^{-9}	-	-
Total Risk	**0.04×10^{-9}**	5.0×10^{-9}	**Below TLS**

Table 16: North East Asia Airspace RVSM Risk Estimates

3.100 There were three LHDs reported in North East Asia airspace in 2021. All were Category E (**Figure 13**).

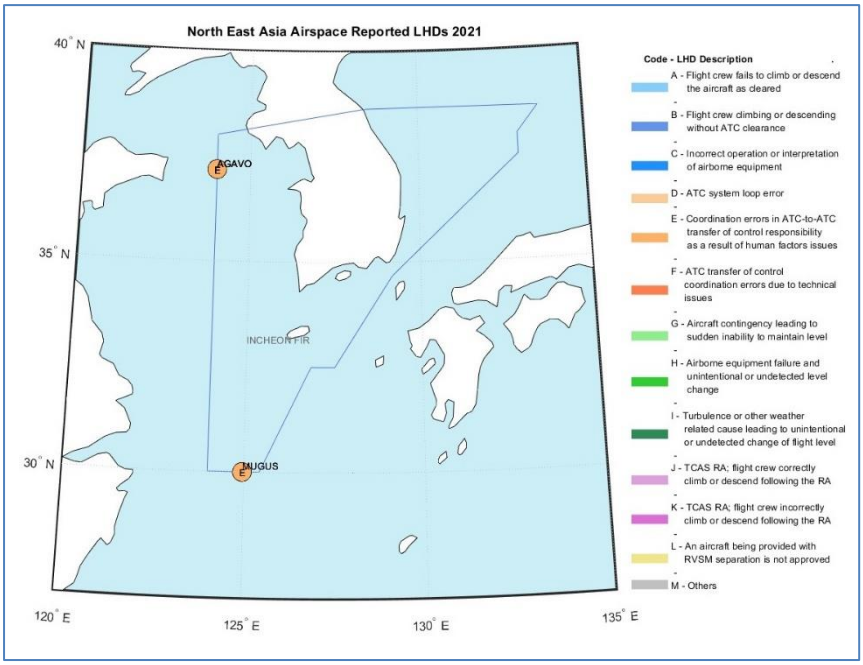

Figure 13: North East Asia Airspace – Reported LHDs

Central East Pacific Traffic Flow Assessment for Calendar Year 2021 (WP/22)

3.101 PARMO presented the 2021 vertical risk assessment for the Central East Pacific (CEP) traffic flow in Pacific airspace. This area was designated as Hot Spot N at RASMAG/24.

3.102 The CEP traffic flow contained air traffic between mainland North America and Hawaii. **Figures 14 and 15** show the location of the CEP route system structure and observed flight numbers from August 2019 to May 2022.

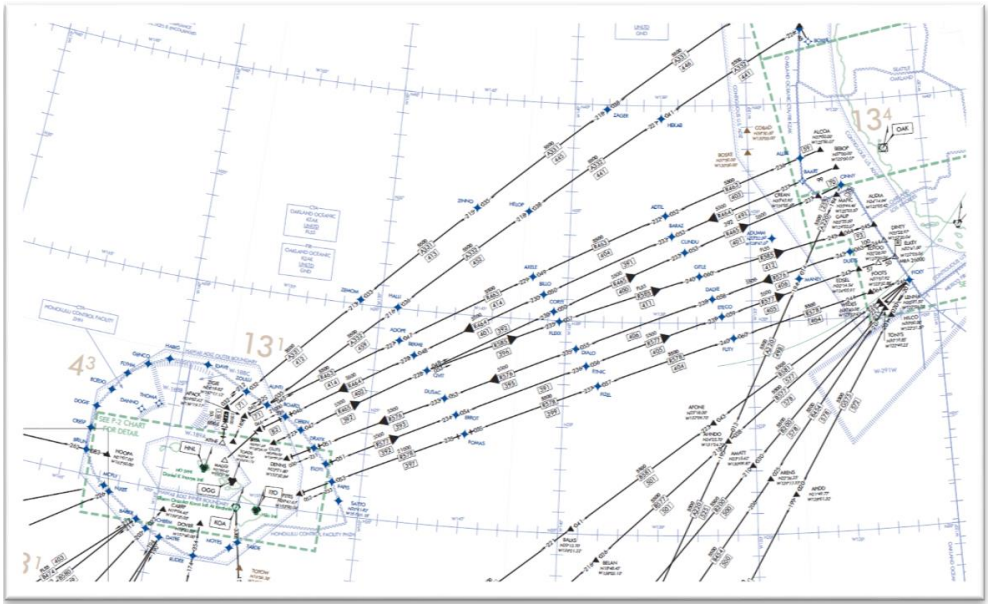

Figure 14: CEP route system

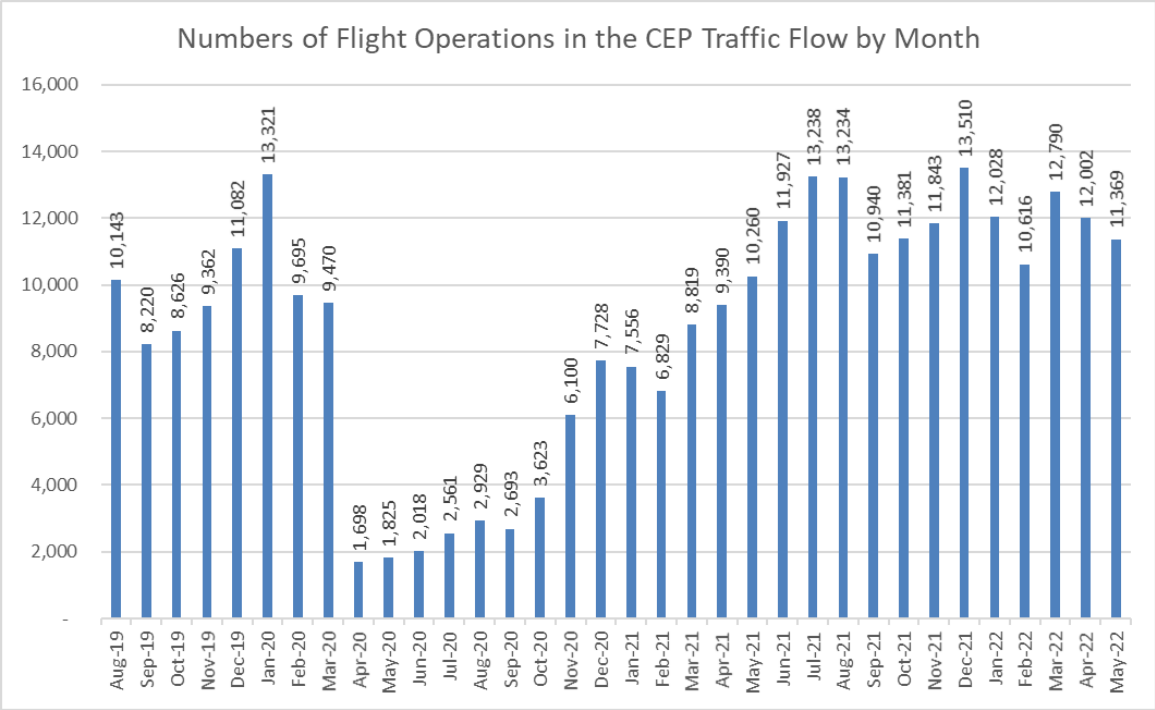

Figure 15: Observed number of flight operations in the CEP by month

3.103 In the calendar year 2021 there were 42 reported LHDs for the CEP. There had been 29 in 2020. **Table 17** showed the number of reported LHDs and total duration by category in the CEP for 2020 and 2021. **Figure 16** shows the locations of the reported LHDs within the CEP in 2021.

	2020		**2021**	
Category	**No. LHD**	**Duration(min)**	**No. LHD**	**Duration (min)**
A	1	1	1	0
B	5	18	6	21
E	21	68.1	34	128.6
I	0	0	1	0
M	2	10	0	0
Total	**29**	**97.1**	**42**	**149.6**

Table 17: Reported LHD Occurrences for CEP 2020 vs 2021

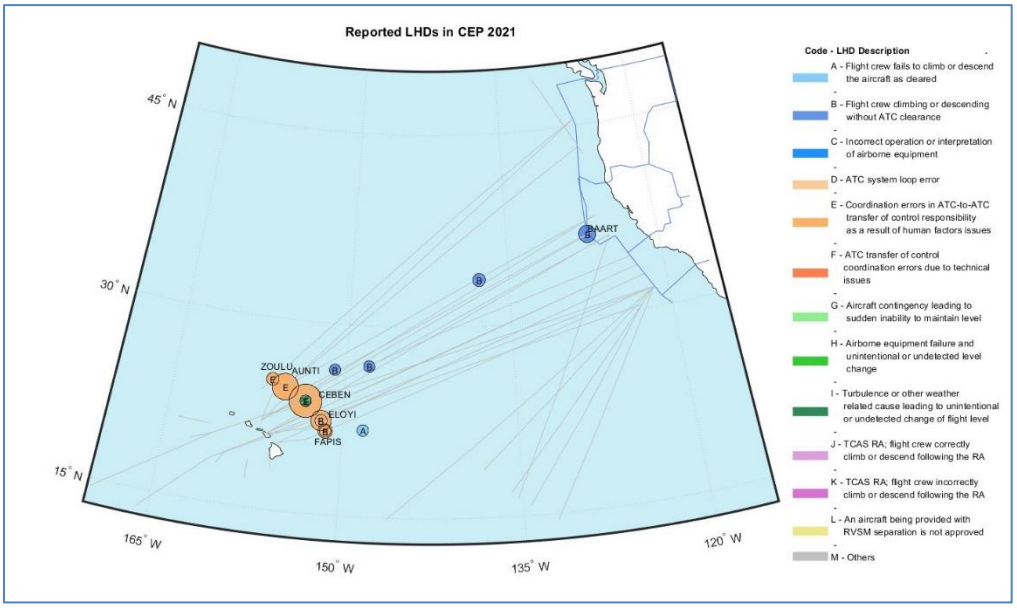

Figure 16: Reported LHDs within the CEP Traffic Flow – 2021

3.104 The overall vertical risk for the CEP in 2021 was 23.7×10^{-9} fapfh, a value that exceeded the target level of safety (TLS). This value represented an increase from that reported in 2020. **Figure 17** shows the four-year trend for the CEP vertical collision risk estimates.

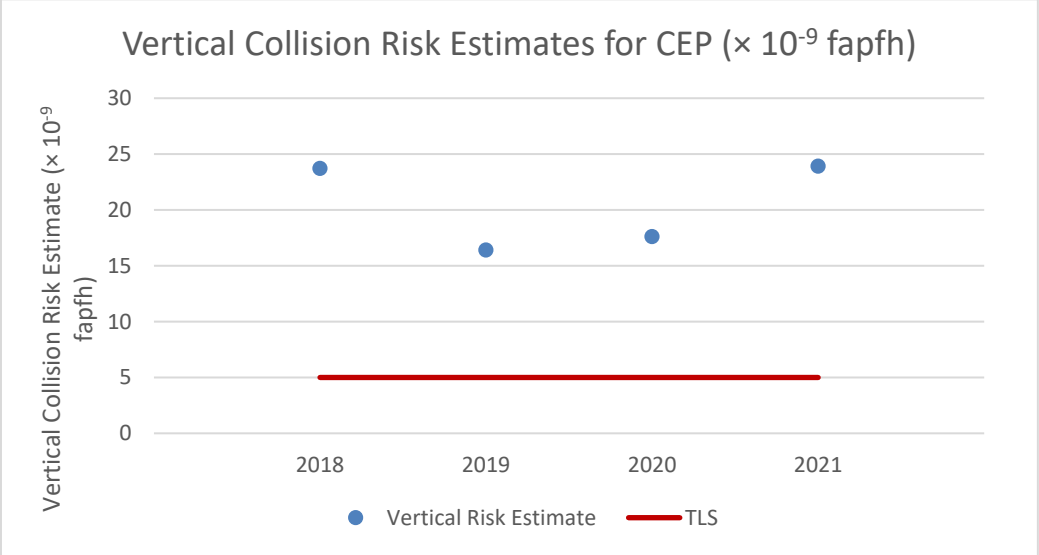

Figure 17: CEP vertical collision risk estimates by calendar year

3.105 In response to a query on whether the number of flight levels crossed in category B occurrences contributed significantly to the total risk, PARMO informed the meeting that the risk for levels crossed accounted for a smaller value when compared to time spent at an incorrect level due to the rate of climb or descent, which directly affected the risk calculation.

3.106 IFALPA asked whether occurrences due to contingency events were included in the analysis. PARMO informed the meeting that in some reported occurrences, pilots were able to employ the appropriate in-flight contingency procedures, for example lateral offset from route before changing flight level. These reported occurrences were recorded, but were considered to be mitigated by in-flight contingency procedure. These reported occurrences had zero duration and were not counted in the operational risk estimates.

PARMO Horizontal Safety Monitoring Report (WP/21)

3.107 PARMO submitted its horizontal safety monitoring report for 2021. The 30/50NM lateral, 30NM and 50NM longitudinal risks were all estimated to meet the TLS at **1.74×10^{-9}**, **4.08×10^{-9}** and **2.22×10^{-9}** respectively. Of the 111 reported LLDs and LLEs, 100 (90%) were Category E, while six (5%) were as a result of Category A root causes (*Flight crew deviates without ATC clearance in the horizontal dimension*). **Table 18** shows the trends in the number of reported LLDs by category for 2018 to 2021.

LLD Category	2018	2019	2020	2021
A	14	9	6	6
B	7	3	1	1
C	0	0	0	0
D	2	1	0	3
E	9	11	1	2
F	0	0	0	0
G	1	2	0	0
H	0	0	1	0
I	0	0	0	0
J	1	0	1	1
Totals	34	26	10	13

Table 18: Trends in reported LLDs by category, 2018 - 2021

3.108 There were thirteen reported LLDs for calendar year 2021. This is a slight increase in the overall number of reported LLDs received by PARMO compared to calendar year 2020.

3.109 The high number of category E reported LLEs were due to reports for transfer errors between HCF and Oakland Oceanic FIR. There were 98 such reported category E LLEs in 2021. **Table 19** shows the trends in the number of reported LLEs by category for 2018 to 2021.

LLE Category	2018	2019	2020	2021
A	0	1	0	0
B	1	0	0	0
C	0	0	0	0
D	0	0	0	0
E	2	62	64	98
F	1	1	0	0
G	0	0	0	0
H	0	0	0	0
I	1	0	0	0
Totals	5	64	64	98

Table 19: Trends in reported LLEs by category, 2018 - 2021

Asia/Pacific Consolidated Safety Report (WP/23)

3.110 MAAR presented a combined summary of the safety analysis results for the Asia/Pacific Region, on behalf of the Asia/Pacific RMAs and EMAs. The Asia/Pacific Consolidated Safety Report is provided in **Appendix F to this report**. The following information summarizes the Safety Report.

3.111 The report was divided into the Pacific (PAC) area, and Asia area (**Figure 18**).

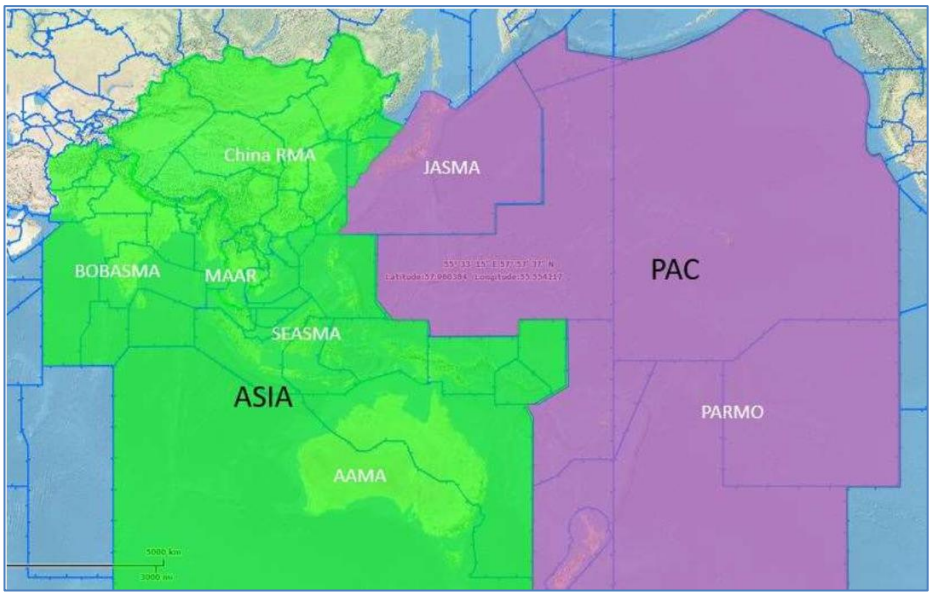

Figure 18: Asia and Pacific Safety Reporting Areas

Pacific Area Vertical Collision Risk

3.112 The estimated vertical collision risk for 2021 for the PAC area did not meet TLS. (**Table 20**). The overall risk vertical risk had been increasing from 2016 to 2021 due to improvements in reporting culture.

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 20: Pacific Area Vertical Collision Risk 2021

3.113 The PAC vertical collision risk estimates had been above TLS and trending upwards each year from 2016 to 2019. 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 21**)

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 21: Pacific Area Vertical Collision Risk Estimates 2016 – 2021

3.114 There was a total of 123 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 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

3.115 The estimated horizontal collision risk for 2021 for the PAC area met TLS in all longitudinal and lateral risk categories. (**Table 22**)

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	Above TLS

Table 22: Pacific Area Horizontal Collision Risk 2020 – 2021

3.116 There was a total of 137 109 LLDs and 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 Vertical Collision Risk

3.117 The estimated vertical collision risk for 2021 for the Asia area met TLS. (**Table 23**). The overall risk continued to decline since 2017 due to various safety improvement initiatives, but remained above TLS.

Asia Area – annual flying hours = 5,021,298 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}	-	-
2021 Vertical Overall Risk	**4.03×10^{-9}**	5.0×10^{-9}	**Below TLS**

Table 23: Asia Area Vertical Collision Risk 2021

3.118 The Asia vertical collision risk estimates had been above TLS each year from 2016 to 2019, but 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 24**). The 2021 vertical collision risk estimate was below TLS.

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 24: Asia Area Vertical Collision Risk Estimates 2016 –2021

3.119 There was a total of 379 LHDs reported in the Asia area in 2021, with total duration 339 minutes and 115 levels crossed.

Asia Area Horizontal Collision Risk

3.120 The estimated horizontal collision risk for 2021 for the Asia area met TLS in all longitudinal and lateral risk categories. (**Table 25**)

Asia Area – annual flying hours = 333,153 hours		
2021 Asia Area	**Risk Estimation**	**Remarks**
30NM Lateral Risk	0.0015	Below TLS
50NM Longitudinal Risk	1.02	Below TLS
2020 Asia Area	**Risk Estimation**	**Remarks**
30NM Lateral Risk	0.0004×10^{-9}	Below TLS
50NM Longitudinal Risk	0.85×10^{-9}	Below TLS
2019 Asia Area	**Risk Estimation**	**Remarks**
30NM Lateral Risk	0.0001×10^{-9}	Below TLS
50NM Longitudinal Risk	0.25×10^{-9}	Below TLS

Table 25: Asia Area Horizontal Collision Risk 2019 - 2021

3.121 There was one LLDs and LLEs reported in the Asia area in 2021, with a duration of 29 minutes.

Reporting Rate of LHDs, LLDs and LLEs

3.122 **Table 26** shows the number of LHD, LLD and LLE reports for 2016 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.

3.123 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.

3.124 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 26: Total LHD, LLD and LLE Reports, and Reports per Flying Hours, 2017 - 2021

Hot Spots

3.125 **Table 27** summarizes current LHD Hot Spots, the FIRs involved, the year of identification, and status remarks.

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 27: LHD Hot Spots in the Asia/Pacific Region

3.126 The meeting considered that all current hot spots should be retained due to the continuing reduced traffic resulting from the COVID-19 pandemic. This would be reviewed at RASMAG/28.

3.127 IFATCA stressed the need for robust ATC training to ensure compliant use of new technology and application of contingency procedures when system operation failed.

3.128 The Chair requested that the Consolidated Safety Report be attached to the RASMAG/27 report to APANPIRG/33, and be provided as a link in the APANPIRG/33 report to the Air Navigation Commission and Council.

Agenda Item 4: Airspace Safety Monitoring Documentation and Regional Guidance Material

LHD Material Package (WP/24)

4.1 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).

4.2 ICAO Doc 9574 *RVSM Implementation Manual* Chapter 5 specified that ATC authorities were responsible for reporting LHDs to the responsible RMA. During its teleconference in February 2022 the RASMAG-MAWG decided that the LHD Material Package 2016 should be reviewed and presented to RASMAG, to help 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.**

4.3 The meeting was invited to provide feedback on the package to MAAR by 30 September 2022.

Agenda Item 5: Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific Region

The Process to Extract Large Height Deviation (LHD) Reports from AEROTHAI Incident Database (WP/25)

5.1 MAAR presented the updated LHD reporting process between AEROTHAI (Thailand) and MAAR, by direct access to the incident database. The updated process aimed to make sure that MAAR received as many LHDs as possible while not imposing additional workload on Bangkok ACC and the LHD POC for the Bangkok FIR.

5.2 The meeting was informed of the current Standard Operating Procedures (SOPs), and the results of a review of the LHD reporting process. Under the new process, MAAR staff accessing the AEROTHAI reporting system could directly extract occurrences that could potentially be classified as LHDs. The process was conducted at least once per week to make sure that the relevant information was still available. MAAR and the Bangkok FIR LHD POC had promoted the reporting of LHDs and their classification to the Bangkok ACC controllers to raise awareness, enhance understanding and improve the quality of occurrence reports.

5.3 States were urged to utilize ANSPs' existing occurrence reporting mechanisms to collect airspace occurrence reports.

JASMA Further Analysis on Category A &B LHD (WP/26)

5.4 Responding to IFALPA's request for further information, JASMA presented a further analysis of Category A and B LHDs in the Fukuoka FIR in 2020 and 2021.

5.5 Analysis of the monthly trend of flights in the Fukuoka FIR in 2020 indicated there was a significant drop in flights from February to April 2020.

5.6 Of five Category A events that occurred in 2020, one occurred in January, three in April and one in October. All occurred during daytime. Four were domestic flights, with the LHD event occurring within one hour of departure. The fifth event was an international flight, and occurred 3.5 hours after departure. JASMA had considered that, in the case of the domestic flights, decreasing opportunities for pilots to operate aircraft may have been a causal factor.

5.7 Four Category A and B LHD events had occurred within Fukuoka FIR in 2021. Three Category A events occurred in the daytime, involving domestic flights within 1 hour of departure. The fourth event, a Category B LHD, occurred in the Pacific Ocean airspace and involved an international flight with a flight time until the LHD occurrence of about 5.5 hours.

5.8 JASMA did not consider the three Category A LHD occurrences in 2021 were due to the decreasing opportunities for pilots to operate aircraft as the number of domestic flights in Japan had shown a recovery trend since the 3rd quarter of 2020. It was considered that one of the factors of Category A and B LHDs in 2021 could be less-experienced pilots who had obtained their license during reduced traffic situations, and were on duty in a current situation that they had never experienced.

5.9 A contributory factor in the three Category A LHDs was pilots being unable to comply with ATC altitude restrictions. JASMA informed the meeting that in one case radio frequency congestion had contributed to the pilots not informing ATC that they were unable to comply with the restriction. Continued and detailed analysis would be needed.

Reporting Culture and Mitigation Activities to Reduce LHD Incidents in Indonesia Airspace (IP/2)

5.10 Information was provided on RVSM in Indonesia's airspace, reporting culture and mitigation activities implemented to reduce LHD incidents.

Treatment of TCAS RA-Related LHDs – Category J in Indonesia (IP/3)

5.11 The meeting was informed of the handling of LHD related to TCAS RA in Indonesia, including stakeholder engagement, incident analysis, recommendations arising and regulatory direction to the ANSP.

JASMA Assessment of Non-RVSM-Approved Aircraft (WP/27)

5.12 JASMA presented a list of operator-aircraft combinations operating within the RVSM airspace of Fukuoka FIR with no registration of RVSM in the approval databases as of July 2022. A total of 17 airframes were identified from Australia, China, Philippines and USA.

5.13 The meeting was informed that the Australian-registered aircraft was now RVSM approved.

China RMA Assessment of Non-RVSM-Approved Aircraft (WP/28)

5.14 China RMA presented a monthly check of flight plan data against the combined RVSM approval database up to July 2022. 61 suspected non-approved aircraft had been detected, from Austria, Cayman Islands (UK), China (Macau), China (Taiwan), Finland, Iceland, Indonesia, Iran, Ireland, Luxembourg, Malaysia, Netherlands, Philippines, Romania, Russian Federation, Singapore, Tanzania, Thailand, Turkey, Ukraine, USA and Uzbekistan.

5.15 MAAR informed the meeting that all 24 aircraft from States for which MAAR was responsible had recently been approved, and were now included in the global approvals database.

MAAR Assessment of Non-RVSM Approved Aircraft (WP/29)

5.16 MAAR presented the result of an annual audit that detected 21 aircraft from Australia, Cayman Islands, Fiji, Indonesia, Ireland, Kazakhstan, Kenya, Kyrgyzstan, Malaysia, Mongolia, Philippines and USA that operated in RVSM airspace without valid RVSM approvals in the RMA's database.

5.17 For the first time in RASMAG history there was no long-term repeat rogue aircraft in the list. The minor increase in rogue aircraft from 19 in 2021 was most likely due to a higher number generated by the monthly Flight Plan (FPL)-based audit than in prior years.

5.18 All 21 States under MAAR responsibility had already adopted the new F2 form, and filled in RSP180/RCP240 approval fields.

5.19 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.

5.20 AAMA informed the meeting that the Australian-registered aircraft detected by MAAR was now RVSM-approved.

PARMO RVSM Traffic Compliance Monitoring (WP/30)

5.21 An assessment of non-State-approved operators using the RVSM airspace in the Pacific and a portion of North East Asia overseen by PARMO for the period from December 2021, based on PARMO approvals records as of April 2022, was presented to the meeting. The assessment identified 18 operations from eight States (Argentina, Australia, Azerbaijan, France, Republic of Korea, Panama, UK (Cayman Islands) and USA)

5.22 Experience had shown that the primary systematic reason for failure to match operations and approvals was a delay in State notification of the approval status of some operators to the appropriate RMA. The importance of timely notification was emphasized. Due to the long delay between the minimum traffic sample collected in December 2021 and reporting of the audit data in August 2022 most of the aircraft identified had been confirmed as approved, or had been addressed.

5.23 In order to further investigate the issue of false identification, quantify the lag from individual States, and identify aircraft that were actually unapproved, PARMO would conduct monthly traffic audits within FAA-delegated oceanic airspace (Oakland and Anchorage) for the reporting year 2022 and provide the resulting data at the next RASMAG meeting. The data could be used to consider if increasing the minimum traffic sample reporting data for future regional audits would produce a more meaningful audit result.

Survey Outcome for Continuance of 'W' Check for APAC State Aircraft (WP/31)

5.24 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.

5.25 15 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.

5.26 MAAR informed the meeting that they would present this result to the upcoming RMACG/17 (Part II) meeting.

5.27 USA informed the meeting that a paper on State Aircraft RVSM status would be presented at the ICAO Assembly 41st Session in September/October 2022. The meeting was invited to take Assembly outcomes from the paper into consideration in future activities.

MAAR Rogue State Aircraft on the European Bulletin (WP/32)

5.28 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) was provided to the meeting. 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.

5.29 ICAO European Air Navigation Planning Group (EANPG) meetings had been exploring potential actions that States could take to address and minimize the number of aircraft on the bulletins, particularly those that had been listed for extended periods.

5.30 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.

5.31 **Table 28** 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 28: Number of Rogue Aircraft on the European Bulletin (States under MAAR responsibility)

5.32 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.

5.33 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.

5.34 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. The European action on this subject would be highlighted at ATM/SG/10. States could also use the information to encourage more cooperative behaviour by their State aircraft operators.

MAAR States' Responses to the Removal of the 1,000 Flight Hour Portion of the RVSM Height Monitoring Requirement from ICAO Annex 6 (WP/33)

5.35 At the Sixteenth RMACG virtual meeting NAARMO proposed to remove the 1,000 flight-hour portion of the recurrent RVSM height monitoring requirement specified in ICAO Annex 6, that *a minimum of two aeroplanes of each aircraft type grouping of the operator have their height keeping performance monitored, at least once every two years or within intervals of 1,000 flight hours per aeroplane, whichever period is the longer*. Annex 6 Part 1 paragraph 7.2.9 referred.

5.36 RMACG had agreed in principle, and, to fulfil a consequent Action Item, MAAR had administered a questionnaire to collect information regarding any aircraft operators that were currently fulfilling the LTHM requirement based on the 1,000 flight hour basis.

5.37 19 of the 21 MAAR Administrations responded to the survey, and agreed with the proposal. One State proposed that small operators (e.g. having only one or two aircraft) should be permitted to continue to use the 1,000 flight-hour criterion.

5.38 The meeting endorsed the planned action: MAAR would present the survey finding to the upcoming RMACG/17 (Part II) meeting, scheduled for 19 to 23 September 2022.

PARMO RVSM Long Term Height Monitoring Burden (WP/34)

5.39 An assessment of the monitoring burden associated with the Long Term Height Monitoring (LTHM) requirements for airframes for which PARMO was the responsible RMA was provided to the meeting. PARMO approvals and global monitoring records as of 30 June 2022 were used to assess the monitoring burden.

5.40 The total number of airframes identified as being RVSM approved by a state of registry under PARMO responsibility was 553, with a resultant monitoring burden of 114, and a total 14 aircraft not successfully monitored within the past two years (or 1,000 flight hours, whichever was the longer). A detailed list of the monitoring burden per State under PARMO responsibility was provided in **RASMAG/27 WP/34 Appendix A**.

5.41 The number of unmonitored aircraft in this assessment was significantly more than last year, as space-based ADS-B data was previously used but was no longer available to PARMO. In response to a query on PARMO future access to space-based ADS-B, the meeting was informed that the cost was high, and the FAA was going through a cost-benefit analysis process, the results of which would become public later in the year. PARMO had provided substantial input to the process in terms of airspace safety monitoring benefits.

NAARMO Long Term Height Monitoring Burden (IP/4)

5.42 The meeting was provided with an assessment of the monitoring burden associated with the long-term height monitoring requirements for airframes for which the North American Approvals Registry and Monitoring Organization (NAARMO, covering the airspace of USA, Canada and Mexico) was the responsible RMA, based on NAARMO approvals and global monitoring records as of 30 June 2022.

China RMA LTHM Burden Estimate Update (WP/35)

5.43 China detailed its expected monitoring burden for aircraft registered and operated by China and DPR Korea to meet the LTHM requirement, based on the RVSM approvals database at the end of June 2022. Detailed information was provided in **RASMAG/27 WP/35 Appendix A**.

5.44 The total number of aircraft approved for RVSM by China was 4202, and the resultant monitoring burden was 689 airframes. The current outstanding monitoring burden was 105 airframes from 40 Chinese operators. 49 aircraft required on-board monitoring, and China RMA was coordinating with the operators to complete the plan.

5.45 For DPR Korea, the total number of RVSM-approved airframes was four, all of which were overdue for monitoring. Due to the COVID-19 pandemic China RMA was unable to conduct on-board height keeping performance monitoring of the four aircraft. China RMA would continue to coordinate with DPR Korea and conduct the monitoring as soon as possible.

5.46 In response to a query, China informed the meeting that the four DPR Korea aircraft were not believed to be equipped with ADS-B OUT. China would ask whether there were any plans to retrofit them.

JASMA LTHM Burden Estimate Update (WP/36)

5.47 JASMA presented the current monitoring burden for aircraft registered and operated by Japan to meet Annex 6 LTHM requirements, as of June 2022.

5.48 The total number of RVSM-approved airframes was 885, and the total monitoring burden was 182. Taking into account aircraft which were approved for RVSM for the first time or were conducting height monitoring with the past two years, the outstanding burden was 4 airframes (2.2%).

5.49 The airframes remaining to be monitored were operated by small operators, and may have had flight hours that had not reached 1,000 hours in the recent two years.

5.50 A draft Form 4 (F4) provided in **RASMAG/27 WP/27 Attachment B** was a proposal from JASMA to confirm and check the flight hours of aircraft where the operator was taking advantage of the 1,000 hours monitoring requirement. The proposal would be presented for discussion at the RMACG/17 meeting in September.

5.51 In response to a query on the use of ADS-B for height monitoring in Japan, JASMA informed the meeting that operating budgets had been severely constrained by the COVID-19 pandemic. The first priority for ADS-B data, when installed, would be operational ATS surveillance.

APAC Consolidated LTHM Compliance Status (WP/37 and SP/1)

5.52 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.

5.53 Pakistan had the highest percentage of remaining monitoring burden at 73%. It was noted that 70% of Pakistan operators had contacted the MAAR for 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.

APANPIRG List of Deficiencies Consideration

5.54 **Table 29** 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 29: List of States having monitoring burden over 30% as of 30 June 2022

5.55 Regarding the States listed in Table 29, the meeting was informed that the EGMU service had remained unavailable in the past year. MAAR therefore proposed, and the meeting agreed, that consideration of States to include in the Deficiencies List should be delayed until RASMAG/28.

5.56 Information had been received indicating Afghanistan's remaining monitoring burden has 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 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.

5.57 The Chair proposed that States should encourage aircraft operators to retrofit ADS-B OUT capability where feasible, as it would provide a significant improvement in height monitoring capability.

JASMA Assessment of Non-PBCS Approved Aircraft (WP/38)

5.58 JASMA presented a list of operator-aircraft combinations operating within the Pacific Ocean airspace of the Fukuoka FIR with no registration of PBCS approval. **Figure 19** represents the number of aircraft operating in the airspace, the percentage that included PBCS indicators in their flight plans, and the percentage that were confirmed to be PBCS approved, for the period from April 2020 to June 2021.

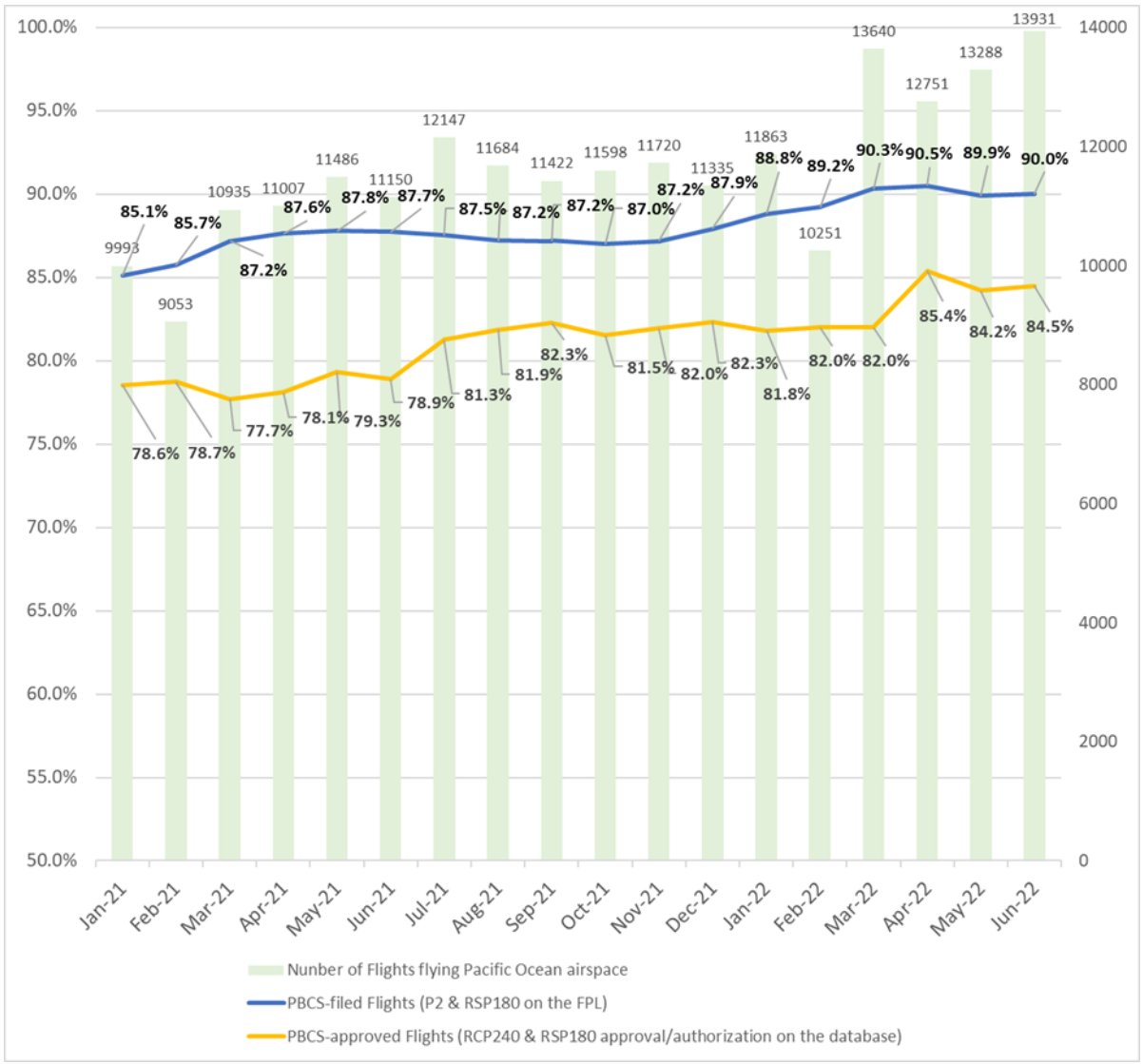

Figure 19: Aircraft filing PBCS indicators in flight plans versus PBCS-approved aircraft in the database – Fukuoka FIR

5.59 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.

5.60 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.

5.61 The meeting was informed that Japan and USA had 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.

5.62 USA commented that, unlike RVSM, some States did not issue specific approvals for RSP/RCP, which would make the traffic cross-check more difficult. This remained an outstanding issue to discuss at the RMACG.

China RMA's Duties Supporting PBCS Monitoring (WP/39)

5.63 China RMA informed the meeting of duties assigned by the Civil Aviation Administration of China (CAAC) to support PBCS operations in China. New provisions regulating PBCS operational performance, issue identification, investigation and resolution would soon be promulgated by CAAC, in which the duties of China RMA would be clarified. The provisional version of the regulation was currently being circulated to industry for feedback, and was expected to be finalized shortly – tentatively by the end of 2022.

5.64 China RMA supported CAAC in the following tasks:

a. PBCS operational approval collection and validation;

b. Reported problem investigation and tracking;

c. Reviewing datalink performance of operators and service providers;

d. General evaluation of the Chinese PBCS operation;

e. Data sharing with ICAO fellow agencies.

5.65 PBCS approval information on Chinese operators were now available on enquiry, and sharing of data would also be available once the provisions were published.

Competent Airspace Safety Monitoring Organizations List (WP40)

5.66 The meeting updated the *RASMAG List of Competent Airspace Safety Monitoring Organizations* (**Appendix G to the Report**).

Agenda Item 6: Air Navigation Services Deficiencies

ANS Deficiencies List (WP41)

6.1 The meeting reviewed the APANPIRG ATM and Airspace Safety Deficiency List and agreed to make the following recommendation to APANPIRG/33, as recorded in **Appendix H to this Report**:

a) Addition of a new Deficiency:

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)

Brunei Darussalam.

Agenda Item 7: Any Other Business

ATM Points of Contact (WP/42)

7.1 Meeting participants were requested to review and updated the ATM Points of Contact (**RASMAG/27 WP/42 Attachment A**) as appropriate.

Agenda Item 8: Review and Update RASMAG Task List

RASMAG Terms of Reference and Task List (WP/43)

8.1 The meeting reviewed the RASMAG Terms of Reference, and reviewed and updated the RASMAG Task List (**Appendix I to this Report**).

Agenda Item 9: Date and Venue of the Next RASMAG Meeting

9.1 The venue and dates for the next MAWG meeting was tentatively planned as a Video Teleconference for early 2023.

9.2 Subject to the COVID-19 pandemic abating to allow travel, the RASMAG/28 meeting would be tentatively planned for the July – August 2023 period in Bangkok, Thailand. Any Administration wishing to host the RASMAG/28 meeting should contact the ICAO APAC Regional Office.

Closing of the Meeting

10.1 In closing, the Chair thanked participants for their contributions to the meeting.

List of Participants

	STATE/NAME		TITLE/ORGANIZATION
1.	**AUSTRALIA (3)**		
	1.	Ms. Mary D'Souza	Senior Risk Intelligence Specialist Airservices Australia **AUSTRALIA**
	2.	Ms. Amelia Gontar	Risk Intelligence Specialist Airservices Australia **AUSTRALIA**
	3.	Mr. Rubai Amin	Risk Intelligence Specialist Airservices Australia **AUSTRALIA**
2.		**BANGLADESH (3)**	
	4.	Mr. Md. Kamal Miah Sarker,	Deputy Director (SMS) Civil Aviation Authority of Bangladesh **BANGLADESH**
	5.	Mr. Md. Abdullah Al Faruk	Assistant Director (ATM) Civil Aviation Authority of Bangladesh **BANGLADESH**

	STATE/NAME		TITLE/ORGANIZATION
	6.	Mr. Baharul Hayat Bipul	Assistant Director (ATM) – Supervisor/OJTI Civil Aviation Authority of Bangladesh **BANGLADESH**
3.		**CAMBODIA (5)**	
	7.	Mr. Oun Makara	Chief of Air Traffic Service Air Navigation Standard and Safety Department State Secretariat of Civil Aviation **CAMBODIA**
	8.	Mr. Khlen Vuthy	Director of ATS Operation Cambodia Air Traffic Services **CAMBODIA**
	9.	Mr. Vichheka Buntong	ATM Supervisor Cambodia Air Traffic Services **CAMBODIA**
	10.	Mr. Soeung Seyma	ATM Training Manager Cambodia Air Traffic Services **CAMBODIA**
	11.	Mr. Ngel Damrong	ATM Officer Cambodia Air Traffic Services **CAMBODIA**

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4.	**CHINA (3)**		
	12.	Mr. Jingwei Li	Senior Engineer Air Traffic Management Bureau of CAAC **CHINA**
	13.	Mr. Yongyue Chen	Engineer China RMA **CHINA**
	14.	Mr. Yang Hong	Engineer China RMA **CHINA**
5.	**HONG KONG, CHINA (5)**		
	15.	Ms. Susanna Lui	Acting Chief, Air Traffic Management Standards Civil Aviation Department, Hong Kong China **HONG KONG, CHINA**
	16.	Ms. Erin SIU	Senior Safety Manager Civil Aviation Department, Hong Kong China **HONG KONG, CHINA**
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	18.	Mr. Alex NG	Senior Safety and Quality Officer (En route) Civil Aviation Department, Hong Kong China **HONG KONG, CHINA**
	19.	Mr. Wentz LAU	Safety & Quality Officer (En-route) Civil Aviation Department, Hong Kong China **HONG KONG, CHINA**
6.	**INDIA (4)**		
	20.	Mr. Amit Bhaumik	General Manager Airports Authority of India (AAI) **INDIA**
	21.	Mr. A P Udayanarayanan	Joint General Manager, Air Traffic Control Airports Authority of India (AAI) **INDIA**
	22.	Mr. Jayabalan Masivayana	Assistant General Manager Airports Authority of India (AAI) **INDIA**
	23.	Mr. Jagadeesh Kumar Kondala	Manager ATM Airports Authority of India (AAI) **INDIA**

	STATE/NAME		TITLE/ORGANIZATION
7.	**INDONESIA (32)**		
	24.	Mr. Iyan Andri Permadi	Air Navigation Inspector Directorate General of Civil Aviation **INDONESIA**
	25.	Mr. Tian Kusdinar	Directorate General of Civil Aviation **INDONESIA**
	26.	Mr. Maruli Tua Edison Saragih	Air Navigation Inspector Directorate General of Civil Aviation **INDONESIA**
	27.	Ms. Annisa Dwi Kurniati	Air Navigation Inspector Directorate General of Civil Aviation **INDONESIA**
	28.	Mr. Adin Eka Fiyanzar	Air Navigation Inspector Directorate General of Civil Aviation **INDONESIA**
	29.	Mr. Arian Nurrahman	Directorate General of Civil Aviation **INDONESIA**
	30.	Ms. Dewi Larasati	Air Navigation Inspector Directorate General of Civil Aviation **INDONESIA**

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	31.	Ms. Dewi Rosaria	Air Navigation Inspector Directorate General of Civil Aviation **INDONESIA**
	32.	Mr. Jayardi Maulana Marsa	Flight Operation Inspector DGCA Indonesia, Directorate of Airworthiness and Aircraft Operations **INDONESIA**
	33.	Ms. Meilani Eka Donggori	Airworthiness Inspector Directorate General of Civil Aviation **INDONESIA**
	34.	Mr. Reynold Widodo	Flight Operation Inspector Directorate General of Civil Aviation **INDONESIA**
	35.	Mr. Andreas Pallo	Airworthiness Inspector Directorate General of Civil Aviation **INDONESIA**
	36.	Mr. Ferry Haristya	Flight Operation Inspector Directorate General of Civil Aviation **INDONESIA**
	37.	Mr. Novy Pantaryanto	AirNav Indonesia **INDONESIA**

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	38.	Mr. Hermanto Hermanto	Junior Manager of Safety Information AirNav Indonesia **INDONESIA**
	39.	Mr. R. Alit Yuliawan Prihadhi	Manager of Compliance and Safety Information AirNav Indonesia **INDONESIA**
	40.	Mr. Christ Yonathan Walenta	Safety Compliance Junior Manager AirNav Indonesia **INDONESIA**
	41.	Mr. Inwan Nuddin Airnav Indonesia	APP-TWR Manager AirNav Indonesia **INDONESIA**
	42.	Mr. Ronald Halasan Sibarani	Inspector of Safety AirNav Indonesia **INDONESIA**
	43.	Mr. Rino Laharto	Jr. Manager of Upper airspace Dev AirNav Indonesia **INDONESIA**
	44.	Mr. Alam Mubarak	AirNav Indonesia **INDONESIA**

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	45.	Mr. Justinus Aries Pancoro	AirNav Indonesia **INDONESIA**
	46.	Mr. Eka Doni	AirNav Indonesia **INDONESIA**
	47.	Mr. Raden Triaswanto	Manager of Safety, Security and Standard Airnav Indonesia **INDONESIA**
	48.	Mr. Imam Nurdin	AirNav Indonesia **INDONESIA**
	49.	Mr. M. Ridho Juliansyah	Junior Manager of Operations Safety and Security JATSC AirNav Indonesia **INDONESIA**
	50.	Mr. Agung Windiarto	AirNav Indonesia **INDONESIA**
	51.	Mr. Ryan Asyari Yulianto	Air Traffic Controller AirNav Indonesia **INDONESIA**

	STATE/NAME		TITLE/ORGANIZATION
	52.	Mr. Adri Gustibela	Air Traffic Controller AirNav Indonesia **INDONESIA**
	53.	Mr. Hafidz Kuncoro Jati	AirNav Indonesia **INDONESIA**
	54.	Mr. Iksan Nur Aslam	Air Traffic Controller, Makassar Air Traffic Services Centre Airnav Indonesia **INDONESIA**
	55.	Mr. Dion Fatkurrohman	Air Traffic Controller AirNav Indonesia **INDONESIA**
8.	**JAPAN (15)**		
	56.	Mr. Yasuhiro Marutsuka	Special Assistant to the Director JASMA/Japan Civil Aviation Bureau **JAPAN**
	57.	Ms. Makoto Ishida	Air Traffic Management Controller Japan Civil Aviation Bureau **JAPAN**

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	58.	Mr. Hitoshi Sasaki	Air Traffic Management Controller Japan Civil Aviation Bureau **JAPAN**
	59.	Mr. Shigeki Motomura	Air Traffic Management Controller Japan Civil Aviation Bureau **JAPAN**
	60.	Mr. Tsubasa Omori	Air Traffic Controller Fukuoka Area Control Center **JAPAN**
	61.	Ms. Hiromi Kaneko	Air Traffic Management Controller Japan Civil Aviation Bureau **JAPAN**
	62.	Ms. Ikuko Kudo	Air Traffic Controller Japan Civil Aviation Bureau **JAPAN**
	63.	Mr. Kenichi Yamakawa	Air Traffic Management Controller Japan Civil Aviation Bureau **JAPAN**
	64.	Mr. Shogo Chazono	Air Traffic Controller Japan Civil Aviation Bureau **JAPAN**

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	65.	Ms. Nozomi Yagi	Air Traffic Management Controller Japan Civil Aviation Bureau **JAPAN**
	66.	Mr. Yasutaka Hashimoto	Air Traffic Controller Fukuoka Area Control Center Japan Civil Aviation Bureau **JAPAN**
	67.	Mr. Kohei Wada	Air Traffic Controller Japan Civil Aviation Bureau **JAPAN**
	68.	Mr. Takayoshi Murozono	Air Traffic Controller Japan Civil Aviation Bureau **JAPAN**
	69.	Mr. Kenichi Furukawa	Director Department of Research and Study Service Air Traffic Control Association Japan **JAPAN**
	70.	Mr. Koji Kato	Director Research & Planning Service Air Traffic Control Association Japan **JAPAN**

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9.	**MALAYSIA (4)**		
	71.	Mr. Osman Bin Md Salleh	Deputy Director (A) Sabah Region Air Navigation Services Operation Division Civil Aviation Authority of Malaysia **MALAYSIA**
	72.	Ms. Nur A'fifah Mansor	Senior Assistant Director Air Navigation Services Technical Division Civil Aviation Authority of Malaysia **MALAYSIA**
	73.	Ms. Gillian Masudal	Senior Assistant Director Air Navigation Services Operation Division Civil Aviation Authority of Malaysia **MALAYSIA**
	74.	Ms. Farhana Mohamad Khairrudin	Senior Assistant Director Air Navigation Services Safety Division Civil Aviation Authority of Malaysia **MALAYSIA**
10.		**MONGOLIA (1)**	
	75.	Ms. Mandukhai Baasandorj	Safety Manager Air navigation policy department Civil Aviation Authority of Mongolia **MONGOLIA**

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11.	**NEPAL (2)**		
	76.	Mr. Dinesh Raj Ghimire	Deputy Director Civil Aviation Authority of Nepal (CAAN) **NEPAL**
	77.	Mr. Rabindra Maharjan	Deputy Director in ANS Safety Standard Department Civil Aviation Authority of Nepal (CAAN) **NEPAL**
12.	**NEW ZEALAND (1)**		
	78.	Mr. Edmund Heng	Technical Specialist Aeronautical Services Civil Aviation Authority of New Zealand **NEW ZEALAND**
13.	**PAKISTAN (5)**		
	79.	Capt Irum Raza	OPS and REG Pakistan Civil Aviation Authority – DAAR **PAKISTAN**
	80.	Mr. Muhammad Asif	Senior Deputy Director (ATS) Pakistan Civil Aviation Authority – DAAR **PAKISTAN**

	STATE/NAME		TITLE/ORGANIZATION
	81.	Mr. Muhammad Asif Azam	Senior Deputy Director (ATS) Pakistan Civil Aviation Authority – DAAR **PAKISTAN**
	82.	Mr. Shabbir Ahmed	Senior Additional Director AAR Pakistan Civil Aviation Authority **PAKISTAN**
	83.	Mr. Muhammad Ahmad Rasheed	Senior Assistant Director (ATS) Pakistan Civil Aviation Authority **PAKISTAN**
14.	**PHILIPPINES (8)**		
	84.	Capt. Carlito P. Sobrevega	Flight Operation Control Safety Inspector I Flight Operations Department Flight Standards Inspectorate Service Civil Aviation Authority of the Philippines **PHILIPPINES**
	85.	Ms. Marianne O. Mamuad	Air Traffic Management Officer V, ATS-SMS Air Traffic Service Civil Aviation Authority of the Philippines **PHILIPPINES**

	STATE/NAME		TITLE/ORGANIZATION
	86.	Ms. Ruby Anna T. Lalugan	Air Traffic Management Officer IV, ATS-SMS Air Traffic Service Civil Aviation Authority of the Philippines **PHILIPPINES**
	87.	Ms. Anna Liza D. Chiefe	Air Traffic Management Officer III, Manila ACC Air Traffic Service Civil Aviation Authority of the Philippines **PHILIPPINES**
	88.	Ms. Kharen G. Fontecha	Air Traffic Management Officer III, Manila ACC Air Traffic Service Civil Aviation Authority of the Philippines **PHILIPPINES**
	89.	Ms. Sharon B. Perez	Air Traffic Management Officer III, Manila ACC Air Traffic Service Civil Aviation Authority of the Philippines **PHILIPPINES**
	90.	Mr. Agustin V. Cabrera	Aviation Services Safety Inspector II, ATMSID Aerodrome and Air Navigation Safety Oversight Office Civil Aviation Authority of the Philippines **PHILIPPINES**

	STATE/NAME		TITLE/ORGANIZATION
	91.	Mr. Ferdinand B. Sanchez	Aviation Services Safety Inspector I, ATMSID Aerodrome and Air Navigation Safety Oversight Office Civil Aviation Authority of the Philippines **PHILIPPINES**
15.	**REPUBLIC OF KOREA (6)**		
	92.	Mr. Junho Lee	Assistant Director Ministry of Land, Transport and Maritime Affairs, Republic of Korea **REPUBLIC OF KOREA**
	93.	Mr. Yohan Sung	Assistant Manager Ministry of Land, Transport and Maritime Affairs, Republic of Korea **REPUBLIC OF KOREA**
	94.	Ms. Joo Kyunghee	ATC Operation Assistant Director **REPUBLIC OF KOREA**
	95.	Mr. Hyeong-cheol Kwon	Airspace and Flight Procedure ATMO, MOLIT, Republic of Korea **REPUBLIC OF KOREA**

	STATE/NAME		TITLE/ORGANIZATION
	96.	Mr. Im Jaekyoung	Air Traffic Controller Air Traffic Management Ministry of Land, Infrastructure and Transport **REPUBLIC OF KOREA**
	97.	Ms. Jihyun Lee	Researcher Korea Institute of Aviation Safety Technology **REPUBLIC OF KOREA**
16.	**SINGAPORE (6)**		
	98.	Mr. Andrew Wee	Deputy Director (Safety & Standards) Civil Aviation Authority of Singapore (CAAS) **SINGAPORE**
	99.	Ms. Kheng Whee Tan	Head (Air Navigation Services Safety and Security) Civil Aviation Authority of Singapore **SINGAPORE**
	100.	Mr. Han Jun Chew	ATC Manager Civil Aviation Authority of Singapore (CAAS) **SINGAPORE**
	101.	Ms. Valerie Sim	ATC Specialist (Safety) Civil Aviation Authority of Singapore (CAAS) **SINGAPORE**

	STATE/NAME		TITLE/ORGANIZATION
	102.	Ms. Liang Fen Wong	Specialist (ANS Safety and Security) Civil Aviation Authority of Singapore **SINGAPORE**
	103.	Mr. Wen Pei Goh	Lead Air Traffic Control Officer Civil Aviation Authority of Singapore (CAAS) **SINGAPORE**
17.	**SRI LANKA (6)**		
	104.	Mr. Lushan Fernando	Director – Operations Civil Aviation Authority of Sri Lanka **SRI LANKA**
	105.	Ms. Thilini Herath	Senior Civil Aviation Inspector – ATMSP Civil Aviation Authority of Sri Lanka **SRI LANKA**
	106.	Mr. Thilina Warnasinghe	Senior Civil Aviation Inspector Civil Aviation Authority of Sri Lanka **SRI LANKA**
	107.	Mr. Nalaka Gunawardena	Designated Senior Aviation Inspector Civil Aviation Authority of Sri Lanka **SRI LANKA**

	STATE/NAME		TITLE/ORGANIZATION
	108.	Mr. Nagalingam Navajeevan	Civil Aviation Inspector ATMSP Civil Aviation Authority of Sri Lanka **SRI LANKA**
	109.	Ms. Priyasha Hettiarachchi	Air Traffic Controller Airport and Aviation Services (Sri Lanka) Ltd. **SRI LANKA**
18.	**THAILAND (13)**		
	110.	Ms. Pranchalee Makarasut	Air Operator Inspection Division Senior Officer The Civil Aviation Authority of Thailand **THAILAND**
	111.	Ms. Korawee Petcharat	Air Operator Inspection Division Senior Officer The Civil Aviation Authority of Thailand **THAILAND**
	112.	Mr. Todsapon Wachirakowit	Flight Operation Inspector The Civil Aviation Authority of Thailand **THAILAND**
	113.	Mr. Thapanapat Srimoonsang	Officer The Civil Aviation Authority of Thailand **THAILAND**

	STATE/NAME		TITLE/ORGANIZATION
	114.	Ms. Saifon Obromsook	Engineering Manager (Safety Management System) Aeronautical Radio of Thailand Limited **THAILAND**
	115.	Ms. Rinthida Jorntes	Executive Safety Management System Officer Aeronautical Radio of Thailand Ltd. **THAILAND**
	116.	Ms. Chantima Sritiapetch	Senior System Engineer Aeronautical Radio of Thailand Ltd. **THAILAND**
	117.	Mr. Dolsarit Somseang	Senior Systems Engineer (Safety Management System) Aeronautical Radio of Thailand Ltd. **THAILAND**
	118.	Mr. Ponkrit Sawedsud	Safety Management Engineer Aeronautical Radio of Thailand Ltd. **THAILAND**
	119.	Mr. Raksit Soontornmalai	Safety Management System Officer Aeronautical Radio of Thailand Ltd. **THAILAND**

	STATE/NAME		TITLE/ORGANIZATION
	120.	Mrs. Roykrong Tulananda	Chief (Specialist), Investigation and Flight Data Analysis Department Operations Department Thai Airways International Public Company Limited **THAILAND**
	121.	Waralan Kumpiranont	Aircraft Engineer, Quality Assurance Department, Technical Department Thai Airways International Public Company Limited **THAILAND**
	122.	Capt. Thammarat Thammalikhit	SMS Administrative Assistant Thai Airways International Public Company Limited **THAILAND**
19.	**UNITED STATES OF AMERICA (11)**		
	123.	Mr. Shayne Campbell	Senior Air Traffic Representative, Asia Pacific Federal Aviation Administration Air Traffic Organization, System Operations **SINGAPORE**
	124.	Ms. Christine Falk	Operations Research Analyst Federal Aviation Administration Separations Standards Analysis **UNITED STATES OF AMERICA**

	STATE/NAME		TITLE/ORGANIZATION
	125.	Ms. Rachel Stagliano	Mathematician Federal Aviation Administration Separations Standards Analysis **UNITED STATES OF AMERICA**
	126.	Mr. Jose Perez	Computer Specialist Federal Aviation Administration **UNITED STATES OF AMERICA**
	127.	Mr. John Warburton	Manager, Separation Standards Analysis Enterprise Services Test & Evaluation Division Federal Aviation Administration **UNITED STATES OF AMERICA**
	128.	Ms. Marie Gale	Project Analyst Federal Aviation Administration Separation Standards Analysis Branch **UNITED STATES OF AMERICA**
	129.	Ms. Holly King	Supervisory Air Traffic Control Specialist Federal Aviation Administration **UNITED STATES OF AMERICA**
	130.	Ms. Kimberly Fowler	Foreign Affairs Specialist Federal Aviation Administration Air Traffic Safety Oversight Service **UNITED STATES OF AMERICA**

	STATE/NAME		TITLE/ORGANIZATION
	131.	Ms. Danielle Crudden	Air Traffic Safety Inspector Air Traffic Safety Oversight Service Federal Aviation Administration **UNITED STATES OF AMERICA**
	132.	Ms. Susan Oberhofer	Computer Scientist Federal Aviation Administration Separation Standards Analysis Branch **UNITED STATES OF AMERICA**
	133.	Ms. Tracy Sivley	Program Analyst – Contract Support Federal Aviation Administration Separation Standards Analysis Branch **UNITED STATES OF AMERICA**
20.	**VIET NAM (8)**		
	134.	Mr. Ho Doan Trang	Officer Civil Aviation Authority of Viet Nam **VIET NAM**
	135.	Mr. Nguyen Huu Duc	Official Civil Aviation Authority of Viet Nam **VIET NAM**
	136.	Mr. Lưu Văn Chiều	Official Civil Aviation Authority of Viet Nam **VIET NAM**

	STATE/NAME		TITLE/ORGANIZATION
	137.	Mr. Ngo The Vinh	Director of Safety, Quality and Security Department -SQS Dept. Viet Nam Air Traffic Management Corporation **VIET NAM**
	138.	Mr. Nguyen Manh Thang	Deputy Director of Safety and Quality and Security Department Viet Nam Air Traffic Management Corporation **VIET NAM**
	139.	Mr. Cao Thanh Phuc	Official of Safety, Quality and Security Department -SQS Dept. Viet Nam Air Traffic Management Corporation **VIET NAM**
	140.	Ms. Minh Khanh Nghiem Thi	International Relations Official Viet Nam Air Traffic Management Corporation **VIET NAM**
	141.	Ms. Hanh Hoa Bui	Official Viet Nam Air Traffic Management Corporation **VIET NAM**
21.	**CANSO (1)**		
	142.	Mr. Poh Theen Soh	Director, Asia Pacific Affairs CANSO **SINGAPORE**

	STATE/NAME		TITLE/ORGANIZATION
22.	**IATA (5)**		
	143.	Mr. Blair Cowles	Regional Director, OSS – Safety & Flight Ops, Asia-Pacific International Air Transport Association (IATA) **SINGAPORE**
	144.	Mr. Jose Fernandez	Assistant Director, Safety & Flight Operations International Air Transport Association (IATA) **SINGAPORE**
	145.	Mr. Bin Hu	Manager, Operations Safety and Security International Air Transport Association (IATA) **SINGAPORE**
	146.	Mr. Imshik Shin	Deputy General Manager – CNS/ATM Korean Air **REPUBLIC OF KOREA**
	147.	Mr. Neeraj Biala	Head - Flt Ops Safety Security & International Affairs Tata-SIA Airlines Limited **INDIA**
23.	**IFALPA (3)**		
	148.	Captain Max Matsumoto	Captain IFALPA **JAPAN**

	STATE/NAME		TITLE/ORGANIZATION
	149.	Mr. Kanit Atisuthapoch	Captain IFALPA **THAILAND**
	150.	Captain Min Kim	IFALPA Director IFALPA **REPUBLIC OF KOREA**
24.	**IFATCA (2)**		
	151.	Ms. Cheryl YC Chen	EVP IFATCA – Asia and Pacific **CANADA**
	152.	Mr. John Wagstaff	Representative IFATCA **CANADA**
25.	**ICAO (7)**		
	153.	Mr. Shane Sumner	Regional Officer, Air Traffic Management ICAO Asia and Pacific Regional Office **THAILAND**
	154.	Mr. Hiroyuki Takata	Regional Officer, Air Traffic Management ICAO Asia and Pacific Regional Office **THAILAND**

	STATE/NAME		TITLE/ORGANIZATION
	155.	Ms. Sunok Lee	Regional Officer, Air Traffic Management ICAO Asia and Pacific Regional Sub-Office **CHINA**
	156.	Mr. Vijay Kumar Mishra	Regional Officer, PBN ICAO Asia and Pacific Regional Sub-Office **CHINA**
	157.	Mr. Zhifeng Xu	Regional Officer, Air Traffic Management ICAO Asia and Pacific Regional Sub-Office **CHINA**
	158.	Mr. Weng Kit Ying	Air Traffic Management Officer ICAO Asia and Pacific Regional Office **THAILAND**
	159.	Ms. Prakayphet Chalayonnawin	Programme Analysis Associate, Air Traffic Management ICAO Asia and Pacific Regional Office **THAILAND**

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International Civil Aviation Organization

Twenty-Seventh Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/27)

Video Teleconference, 22 – 25 August 2022

PROVISIONAL LIST OF PAPERS

(Presented by the Secretariat)

LIST OF WORKING PAPERS

NUMBER	AGENDA	TITLE	PRESENTED BY
WP/1	1	Provisional Agenda	Secretariat
WP/2	2	Relevant Meeting Outcomes	Secretariat
WP/3	2	FIT-Asia Meeting Outcomes	Secretariat
WP/4	2	Outcomes of RASMAG-MAWG and RMACG Meetings	RASMAG Chair
WP/5	3	JASMA AKARA Safety Improvement Update	JASMA
WP/6	3	2021 Analyses for the Incheon FIR AKARA Corridor Interface with Shanghai, Fukuoka and Taipei FIRs	PARMO
WP/7	3	Management Process of APAC Hot Spots	MAAR
WP/8	3	RVSM Risk Assessment in the Brisbane, Honiara, Melbourne, Nauru and Port Moresby Flight Information Regions	AAMA
WP/9	3	Progress on Risk Mitigation at Hot Spot M	AAMA
WP/10	3	RVSM Risk Assessment in the Jakarta and Ujung Pandang Flight Information Regions	AAMA
WP/11	3	China Vertical Safety Report	China RMA
WP/12	3	The Trial of Hot Spot Identification in Chinese Airspace	China RMA
WP/13	3	JASMA Vertical Safety Report	JASMA
WP/14	3	JASMA Hot Spot Identification	JASMA
WP/15	3	JASMA Horizontal Safety Report	JASMA
WP/16	3	MAAR Vertical Safety Report	MAAR
WP/17	3	SEASMA Safety Report	SEASMA
WP/18	3	BOBASMA Horizontal Safety Monitoring Report	BOBASMA
WP/19	3	Identified Airspace Risk Occurrences within Indian Airspace	BOBASMA
WP/20	3	PARMO Vertical Safety Monitoring Report	PARMO
WP/21	3	PARMO Horizontal Safety Report	PARMO
WP/22	3	Central East Pacific Traffic Flow Assessment for Calendar Year 2020	PARMO

NUMBER	AGENDA	TITLE	PRESENTED BY
WP/23	3	Asia/Pacific Consolidated Safety Report	MAAR
WP/24	4	LHD Material Package 2022	MAAR
WP/25	5	The Process to Extract LHD from AEROTHAI Incident Database	MAAR
WP/26	5	JASMA Further Analysis on Category A&B LHD	JASMA
WP/27	5	JASMA Assessment of Non-RVSM Approved Aircraft	JASMA
WP/28	5	China RMA Assessment of Non-RVSM Approved Aircraft	China RMA
WP/29	5	MAAR Assessment of Non-RVSM Approved Aircraft	MAAR
WP/30	5	PARMO RVSM Traffic Compliance Monitoring	PARMO
WP/31	5	Survey Outcome – Continuance of 'W' Check for APAC State Aircraft	Secretariat
WP/32	5	MAAR Rogue State Aircraft on the European Bulletin	MAAR
WP/33	5	MAAR States' Responses to Removal of the 1000 Flight-Hour Portion of the RVSM Monitoring Requirement	MAAR
WP/34	5	PARMO RVSM Long Term Height Monitoring Burden	PARMO
WP/35	5	China RMA LTHM Burden Estimate Update	China RMA
WP/36	5	JASMA LTHM Burden Estimate Update	JASMA
WP/37	5	APAC Consolidated LTHM Compliance Status	MAAR
WP/38	5	JASMA Assessment of Non-PBCS Approved Aircraft	JASMA
WP/39	5	China RMA's Duties Supporting PBCS Monitoring	China RMA
WP/40	5	Competent Airspace Safety Monitoring Organizations List	Secretariat
WP/41	6	ATM and Airspace Deficiencies List	Secretariat
WP/42	7	ATM Points of Contact	Secretariat
WP/43	8	RASMAG Terms of Reference and Task List	Secretariat

LIST OF INFORMATION PAPERS

NUMBER	AGENDA	TITLE	PRESENTED BY
IP/1	-	List of Working Papers (WPs) and Information Papers (IPs)	Secretariat
IP/2	5	Reporting Culture and Mitigation Activities to Reduce LHD Incidents in Indonesia Airspace	Indonesia
IP/3	5	Treatment of TCAS RA-Related LHD in Indonesia	Indonesia
IP/4	5	NAARMO Long Term Height Monitoring Burden	NAARMO

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SURVEY OF THE STATUS OF CURRENT AND PLANNED IMPLEMENTATION OF PERFORMANCE-BASED HORIZONTAL SEPARATION MINIMA

Instructions:

1. Complete the Survey at least once annually and return by email to the ICAO APAC Regional Office (apac@icao.int) **by NOT LATER THAN 28 FEBRUARY ~~30 APRIL~~ EACH YEAR.**

2. **Administrations that provide ATC Separation Services in Category R airspace[1]:**
   – Complete all sections of the form.

3. **Administrations that do not provide separation services in Category R airspace:**
   – Complete Section 1 Group A (question A3), Group D and E
   Refer ICAO Doc 9869 – PBCS Manual Appendix A refers.

[1] The Asia/Pacific Seamless Air Navigation Services Plan defines Category R Airspace: [1] Category R: remote en-route airspace with Air Traffic Services (ATS) HF or CPDLC communications and outside the coverage of ground-based surveillance mote.

1. Has your State completed any of the following preparations for PBCS implementation?					
	Task Group	**Task ID**	**TASK descriptor**	**Y/N**	**If NO, Planned Date**
PBCS Implementation Task List	Group A	A-1	AIP (Prescription of an RCP/RSP specification. Also see B-3 below)		
		A-2	PBCS policies, objectives supporting safety oversight of ANSP PBCS operations		
		A-3	PBCS policies, objectives supporting safety oversight of Aircraft Operator and Aircraft System PBCS operations		
		A-4	Proposal for Amendment to ICAO Doc 7030 - *Regional Supplementary Procedures* for PBCS operations , if applicable		
	Group B	B-1	PBCS Implementation Plan		
		B-2	Target dates for PBCS and relevant ATM operations		
		B-3	RCP/RSP specifications		
		B-4	PBCS awareness		
	Group C	C-1	Operational concepts and procedures for PBCS operations		
		C-2	ATM automation system changes to use flight plan RCP/RSP indicators		
		C-3	ATM automation changes for PBCS monitoring		
		C-4	Confirm initial ANSP compliance with RCP/RSP specifications		
	Group D	D-1	Aircraft operator readiness		
		D-2	Confirm initial operator and/or aircraft type/system compliance with RCP/RSP		
	Group E	E-1	PBCS monitoring, analysis and reporting - post implementation		

				Y/N	If NO, Planned Date
2. Does your State submit data link problem reports to a recognized Central Reporting Agency (CRA)					
3. Does your State monitor and analyze data link performance in accordance with the following specifications and report the analysis to a recognized FANS Interoperability Team (FIT)?					
Communication Specifications & Interoperatability Standards	Normal	RCP240	FANS1/A CPDLC		
	Alternate	RCP400	SATVOICE		
		RCP400	HF		
Surveillance Specifications & Interoperatability Standards	Normal	RSP180	FANS1/A ADS-C		
	Alternate	RSP400	SATVOICE		
		RSP400	HF		
4. Has your State implemented or planned to implement the following performance-based horizontal separation minima?					
Navigation Specifications & Applicable ATM Operations	RNAV/RNP	RNAV/RNP 10, RNP 4, RNP 2	50 NM Lateral Separation *Communication other than direct controller-pilot voice*		
		RNAV/RNP 10, RNP 4	50 NM Longitudinal Separation *RCP/240 and RSP/180*		
		RNP 4 or RNP 2	30 NM Longitudinal Separation		
			30 NM Lateral Separation *In cases where the ANSP has considered there is insufficient operational benefit to justify the investment in the change from 30 NM to 23 NM.*		
			23 NM Lateral Separation		
			Other planned or implemented separations dependent on RCP240/RSP180. *Please also provide the DOC 4444 PANS-ATM reference.*		

1. ANSP action items

1.1 Register on CRA website at www.fans-cra.com.

1.2 Establish means to extract FANS1A analysis data for CPDLC and ADS-C using guidance provided in ICAO Doc 9869 PBCS Manual Appendix D.

1.3 Filter extracted data FANS1A analysis data for CPDLC and ADS-C using guidance in PBCS Manual Appendix D.

1.4 Establish means to perform analysis of CPDLC RCP and ADS-C RSP at a suitable interval (usually monthly, but specific interval will be determined by local factors such as volume of data).

1.5 Investigate any performance degradation identified during monthly analysis.

1.6 Report non-compliance with RCP/RSP specifications to CRA.

1.7 Support CRA non-compliance investigations.

1.8 Report any aircraft that are filing as PBCS qualified but showing non-compliance with RCP and RSP 95% normal operating criteria to your state CAA and RMA.

1.9 Withdraw the use of performance-based separation minima requiring PBCS where aircraft data link performance is not compliant with RCP and RSP 95% operating criteria.

1.10 Implement an analysis of service availability to determine the impact of reported unplanned outages in your airspace (usually annually).

1.11 Implement local procedures and training to ensure operational staff log FANS1/A problems identified during operations to enable subsequent investigation.

1.12 Implement local investigation process for reported FANS1/A problems.

1.13 Implement CRA website reporting of confirmed FANS1/A problems.

1.14 If implementing PBCS, sign up to Global PBCS Charter on CRA website.

2. ANSP Reports to FIT-Asia

2.1 Compile PBCS RCP and RSP performance report for the year from January to December, per regional reporting guidelines, using the template provided on the Asia/Pacific Regional Office website.

2.2 Ensure the PBCS performance data for the reporting year is provided to the ICAO Secretariat by not later than 28 February each year for inclusion in aggregated regional data reporting to FIT-Asia, RASMAG and APANPIRG.

2.3 Complete the Survey of the Implementation Status of Performance-Based Horizontal Separation Minima using the form available on the Asia/Pacific Regional Office website, and submit to the ICAO Secretariat by not later than 28 February each year.

2.4 FIT-Asia States: Compile report on PBCS system performance and availability observed in your FIR ~~and~~, including comment on operational impact of observed outages, results of analysis of problems and corrective action taken, and submit the report to FIT-Asia each year using the Working Paper template provided for the meeting.

2.5 Non-FIT-Asia/States: Compile report on PBCS system performance and availability observed in your FIR and, including comment on operational impact of observed outages, results of analysis of problems and corrective action taken, and submit the report to the relevant FIT in the format determined by the FIT.

2.6 ~~Ensure report is compiled and available by 31 March each year. to allow adequate time for RASMAG report to be compiled.~~

3. FIT-Asia Reports to RASMAG

3.1 Nominated ANSP compile draft aggregated regional performance report ~~RASMAG report~~ from individual FIR reports for review at each year's FIT-Asia meeting.

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RASMAG/26 SIDE MEETING – LHD HOT SPOT M

SUMMARY OF DISCUSSION

1.1 Attending Administrations and International Organizations:

Japan (including JASMA), Republic of Korea, Philippines, Thailand (including MAAR), IFATCA

1.2 The meeting was informed of the rise in the number of LHDs/LLEs/LLDs on the Manila-Fukuoka FIR interface, especially the transfers from the Manila FIR, despite the reduction in traffic during the pandemic.

1.3 Manila ACC responded to JASMA that Manila's ATM System (TopSky-ATC) has a function that alerts the controller if the actual altitude is different from the transferred altitude, and described to JASMA the current surveillance coverage over the Manila-Fukuoka FIR interface.

1.4 Manila ACC presented in detail the analysis of the factors contributing to the errors, mostly due to the dynamic configuration changes as a result of manpower management during the pandemic. The mitigations mostly focus on training aspects of the existing and new controllers.

1.5 JCAB and IFATCA recommended Manila ACC to also look at the management of team resources that can better help catching these errors, taking into consideration the human limitations. An example was shared by a representative from JCAB how their supervisor helps the controllers check the transfer conditions.

1.6 IFATCA was informed by JASMA and the Manila ACC that the errors are not likely attributable to the FLAS transitions.

Attachments:

- Philippines Form A LHD Analysis 2022
- Philippines Form B LHD Preventative Mitigation Measures 2022

ATTACHMENT A

FORM A - LHD Analysis

Due to the continuing prevalence of LHDs, States are encouraged to conduct further investigation and provide in-depth analyses of LHDs, especially those induced by their responsible ATS units. The purpose is not to apportion blame on any organizations but to understand the underlying root causes in order to develop safety mitigations to prevent reoccurrence. In case of significant occurrences (such as long duration LHDs), States are encouraged to provide an analysis for each occurrence. For other occurrences, States can provide analysis of a group of similar occurrences. ***Please, return the filled form to maar@aerothai.co.th.***

1. Organization: Civil Aviation Authority of the Philippines

2. Date of Analysis: August 19, 2022

3. If it is a single occurrence - Please provide occurrence date, call sign*, and location:

4. If it is a group of occurrences – Please describe the nature of occurrences:

No FL revision/ No EST revision (Cat E)

5. Details of the analysis: Please provide detailed description of the followings

Description of Occurrence(s)

No revision in time and/or flight level.
No transfer information.
ATC-to-ATC readback-hearback error

Contributing Factors and Mitigations

-Contributing factors/causes: Please describe ***all*** factors leading to such occurrence(s)
-**Mitigations/controls/barriers**: Please describe any measure which could be used to prevent/detect LHD occurrence(s), or reduce their duration. Also, please describe existing barriers which could be improved.

Procedures/LOAs –which could be non-existent, inappropriate, not strictly adhered to, or needed review

Contributing factors/causes	Mitigations/controls/barriers
1. Lacking mastery of existing procedures resulting in non-adherence to the required standards. - Very gradual improvement in competency among new ATCs due to pandemic-related policies that affects workforce movement and training efficiency. 2. Implementation of several procedures due to the individual requirements of each adjacent ACCs and due to varying sector airspace configurations that contributes to the overall complexity. - During pandemic, there is a need to deploy ATCs in several sector positions with each position having different airspace configurations and procedures from others.	- Re-imposition of periodic training/proficiency sessions to reiterate procedures (started November to December 2021). - Regular ATMS proficiency training is already implemented in 2022. - Safety promotion videos were released to ATCs in 2021 to constantly remind ATCs of important procedures.

- During pandemic, there is a frequent change in ATC sector airspace configurations and ATC roles to match available workforce and associated capabilities (e.g., Merging of multiple sectors, change of roles due to rating limitations, etc.) 3. Comprehensive discussions with ATCs involved in the SOR were minimal during pandemic. Online safety meeting was conducted but not as effective as face-to-face meeting. - Pandemic-related policies are affecting personnel movement. 4. Briefing and debriefing were mostly limited to the use of messaging applications which is not as effective as face-to-face briefing.	- Pre-pandemic schedules are gradually adopted in Nov 2021 to increase capacity and address possible safety issues related to reduced sectors. - Conducted safety assessment regarding safe minimum operating sectors. - The regular face-to-face safety discussions with ATCs involved in SOR were resumed in March 2022. - Improved on-line briefing procedures were adopted in 2022 as interim due to outbreak of omicron variant in Q1 2022.
Human Factor Issues –ex. fatigue, workload, competency, English proficiency, teamwork, situational awareness	
Contributing factors/causes	**Mitigations/controls/barriers**
Fatigue caused by extended work duty due to manpower shortages during pandemic. The additional roles or responsibilities associated to the bigger airspace volume assumed adds to the overall complexity and therefore contributes to ATC workload. Confusion attributed to frequent merging of sectors in varying airspace partition combinations during pandemic. Due to the low number of training sessions conducted, new ATCs are easily overwhelmed by the numbers of procedures in each different ATC sectors. (e.g. surveillance and non-surveillance procedures, AIDC versus voice coordination procedures, different communication and surveillance capabilities and methods, separations, etc.)	- Adopted a "*new normal*" work schedule to address manpower shortage and to improve the capacity by operating more ATC sectors per shift while maintaining compliance with the revised pandemic safety protocols. - Memorandum on fatigue management were disseminated. Manila ACC conducted fatigue survey and participated in Mental Health Webinars. - Re-imposition of periodic training/proficiency sessions to reiterate procedures (November to December 2021).

Overall diminished competency of the Manila ACC workforce due to ATC rating and proficiency issues. Seasoned ATCs/Trainor are redeployed in other ATS facilities and replaced by a group of newly graduate ATCs that are lacking ratings and experience. Also, the several months of lean traffic volume contributed to the ATC proficiency problem.	- Robust implementation of facility rating training program (march 2022 to present). Facility ratings are awarded to 17 ATCs in the first half of 2022. The original target is only 10 new ratings in one year time. Safety assessment regarding recovery to normal ATS were conducted.
Systems/Equipment –ex. equipment failures, unserviceability, usability, reliability, poor design	
Contributing factors/causes	**Mitigations/controls/barriers**
1. Regressions were observed after ATM system software update (Sept 2021). While some of these issues were already corrected by the vendor after a month, there were still a few regressions that remain unpatched and may have caused additional workload to ATC. (e.g. System lag or system unresponsive to user inputs) 2. Increased occurrence of AIDC errors after ATM system updates.	- Collaboration with system vendor and engineers to investigate open problem reports and deployment of corrective patches. - A technical working group was formed to address the future rehabilitation and improvement of the existing ATM system. - Reconfiguration of system dataset.
Other Factors – ex. training, staffing, clearly defined roles and responsibilities, workplace condition, weather	
Contributing factors/causes	**Mitigations/controls/barriers**
Pandemic protocols - Rising of COVID-19 positive cases. - Reduced training efficiency due to staffing and movement restrictions.	
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ATTACHMENT B

FORM B - LHD Preventive/Mitigation Measures

Due to the continuing prevalence of LHDs, States are urged to provide a list of measures planned or taken to minimize LHDs (including detection of LHD occurrences and actions taken to reduce LHD duration). Please list all actions planned or taken by your organization, including comments on their effectiveness and ***return the completed form to maar@aerothai.co.th***.

1. Organization: Civil Aviation Authority of the Philippines

2. Date of analysis: August 19, 2022

3. Hotspot/Area (example: eastern boundary of FIR A):

4. Please provide detailed description of the followings:

No.	Preventive/mitigation measures planned/taken	Target/actual effective date	Progresses/difficulties	Comments on effectiveness of mitigations
1	Conducted numerous training sessions related to ATC proficiency, procedure review, and facility ratings.	Started Nov-Dec 2021 Regular training sessions resumed Q1 2022	- Initially conducted as online training – not as efficient as face-to-face medium. - Intermittent Internet connections. - Face-to-face sessions resumed in Q1 2022	- Improved knowledge/skills. - Promoted active participation of all ATCs by requiring each one to have a presentation. - Online sessions not as effective as face-to-face medium.
2	Conducted an improved online ATC briefing before shift duty.	Q1 2022	- Conducted Online VTC - Intermittent internet connections	- Not as effective as face-to-face sessions.
3	Resumption of face-to-face safety-related discussions with ATCs involved in the SOR.	Q1 2022	- Face-to-face medium for discussion is restored starting Q1 2022 - Difficulties in arranging discussion	- Sharing of lessons learned, recommendations and comments to reduce the safety occurrences.

			sessions due to conflict in ATC work schedule.	
4.	Continue engagement with Fukuoka ACC and ATMC regarding AIDC implementation (subject to the preparedness of Japan) .			

5. Is there anything the RMA/RASMAG/ICAO can assist with related to LHDs? :

2021 Asia Pacific
Consolidated Safety Report

RASMAG/27
22 - 25 August 2022

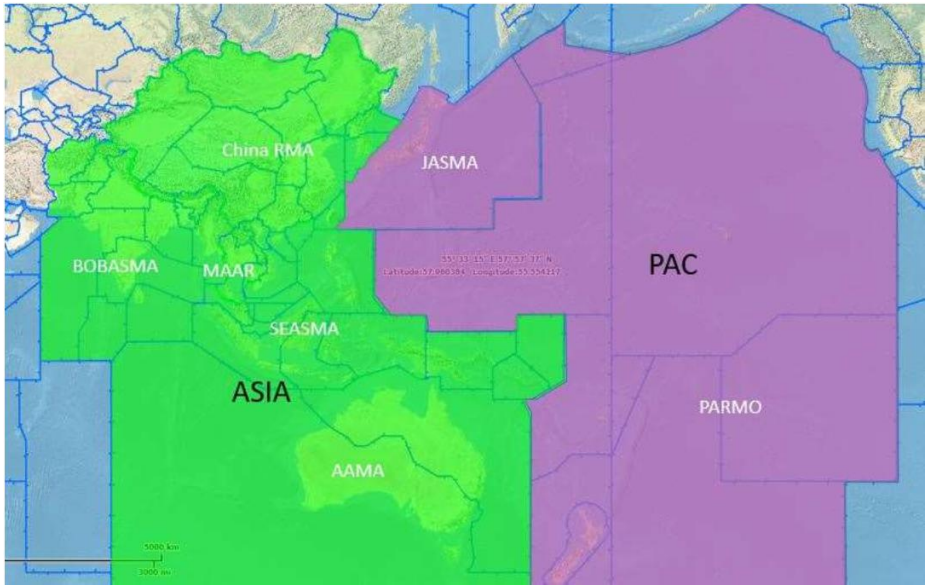
Outline

- 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)

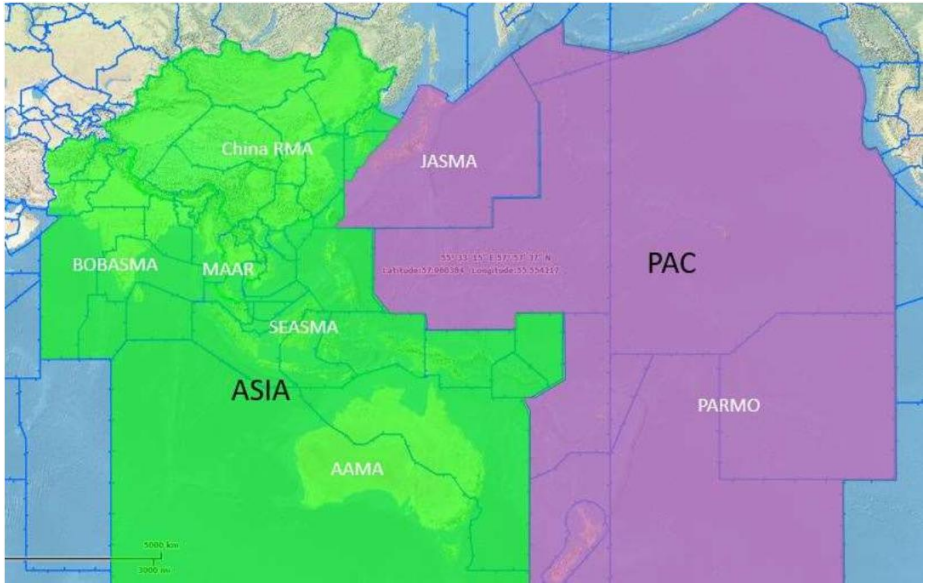
Traffic between North America and Asia, or North America and South Pacific States

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

Monitoring Agencies :

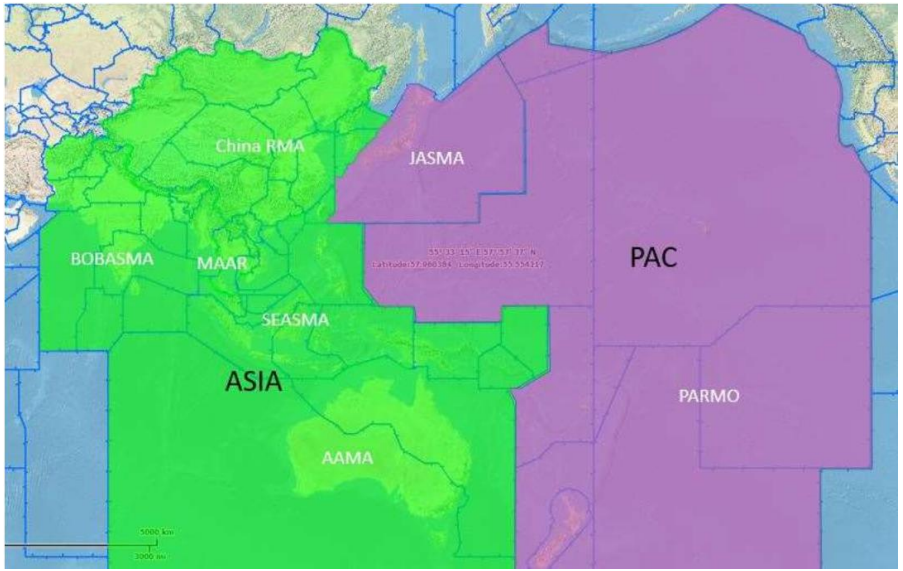
RMAs (Verical): JASMA, PARMO

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

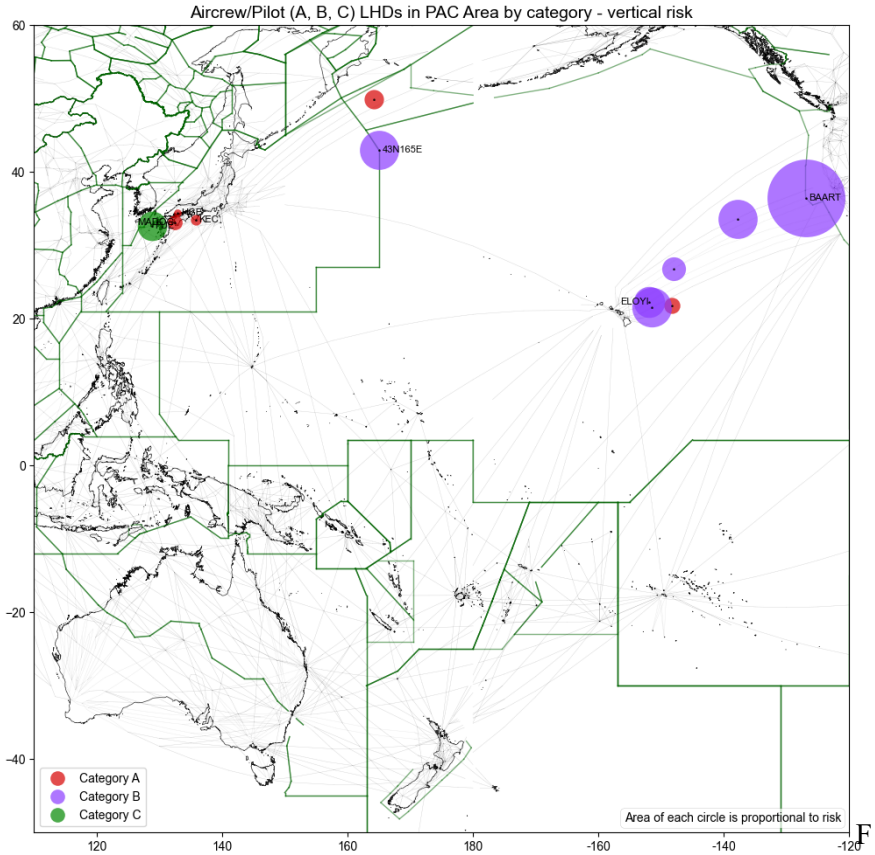
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	10	52	1	175
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne 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

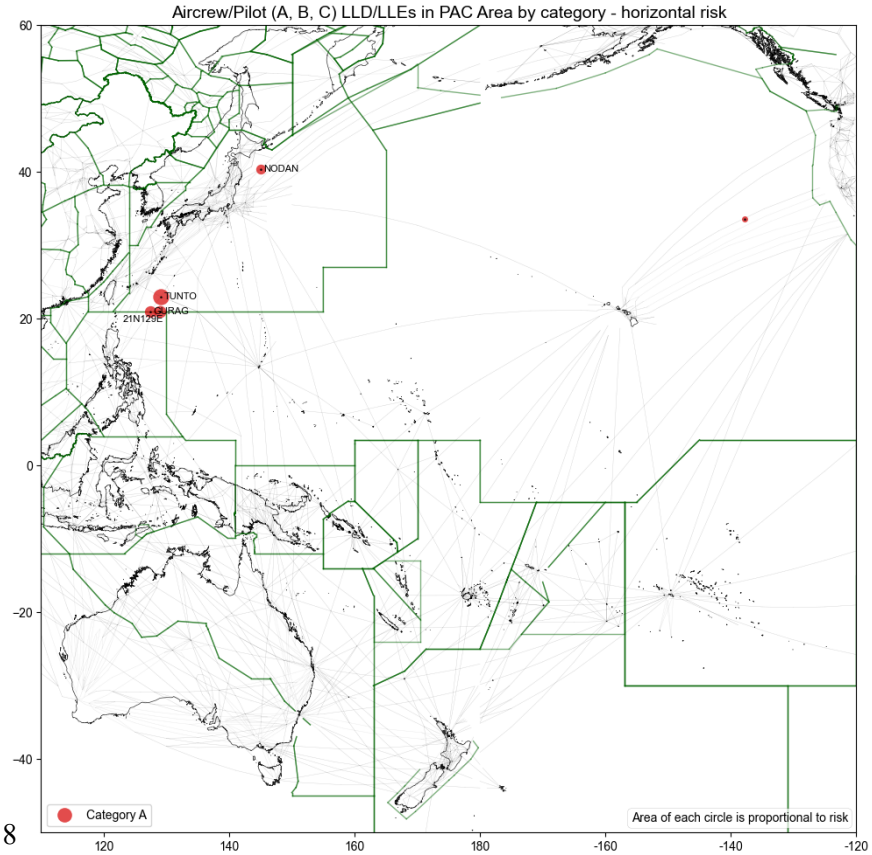
PAC : Summary of LLDs and LLEs

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**

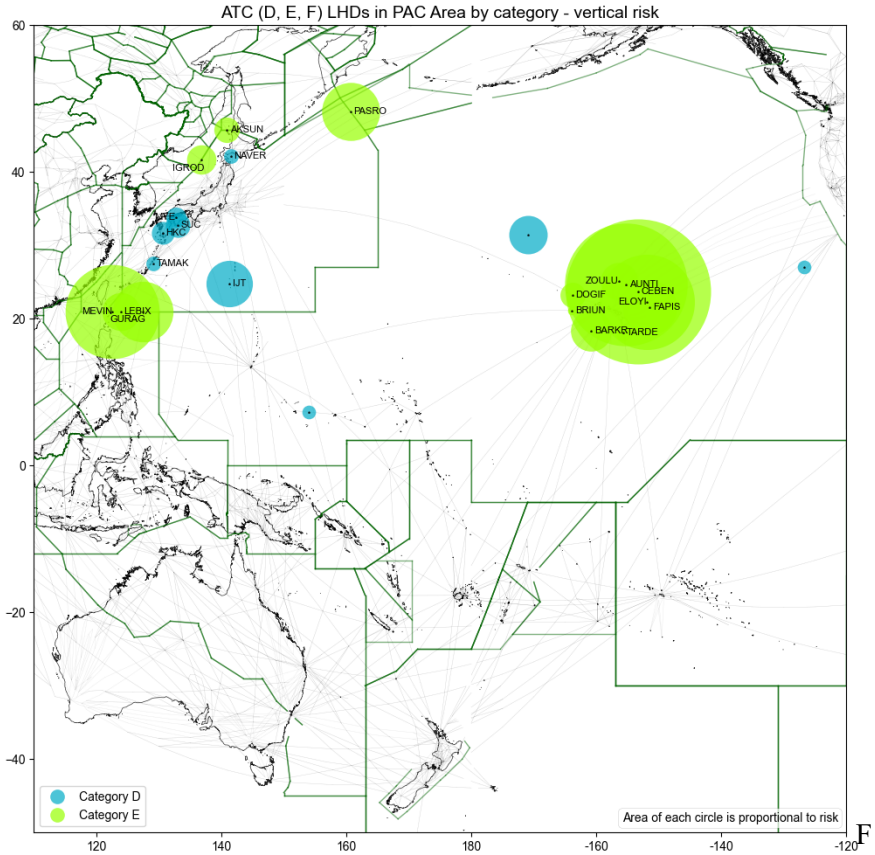
PAC : Geolocation of LHDs/LLDs/LLEs

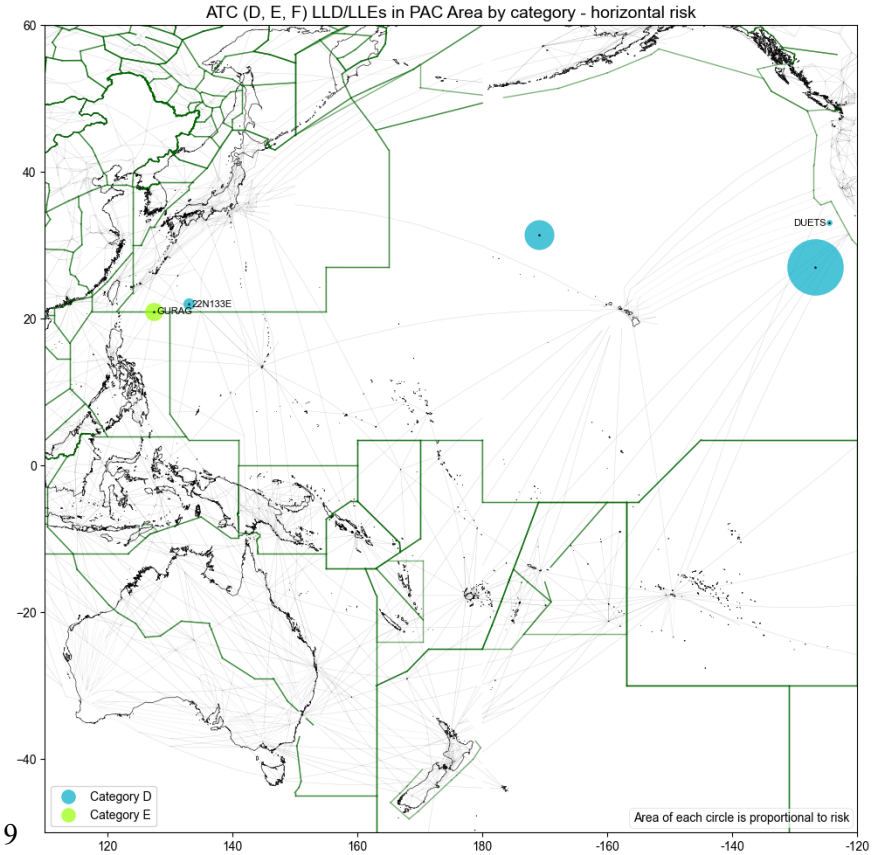
PAC : Aircrew/Pilot (A, B, C)



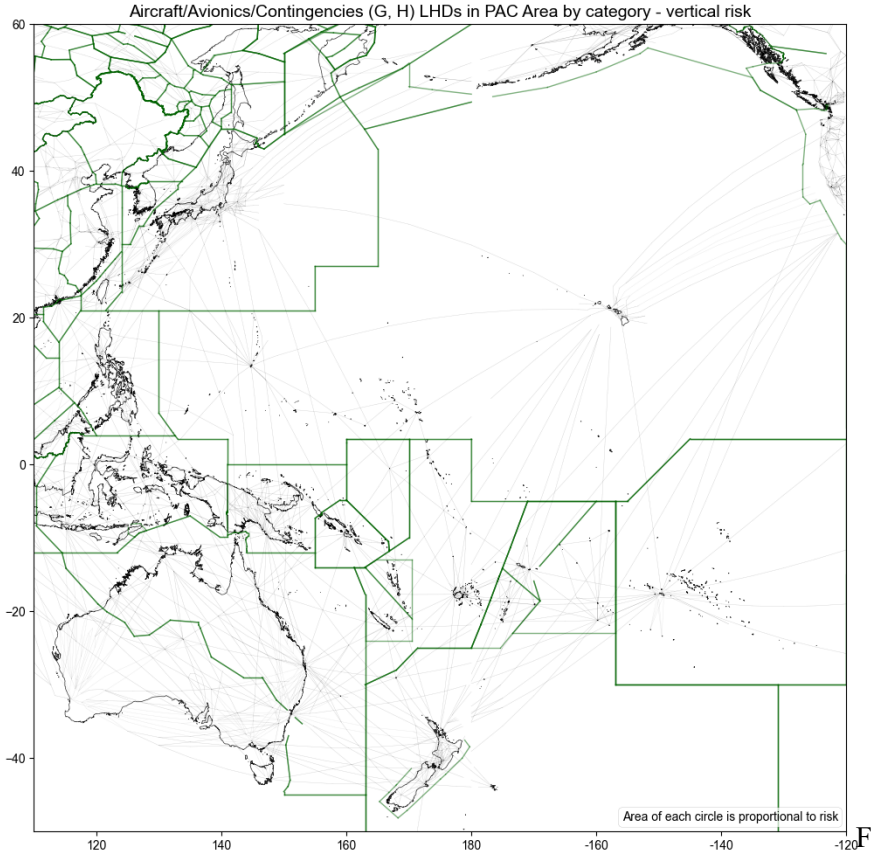


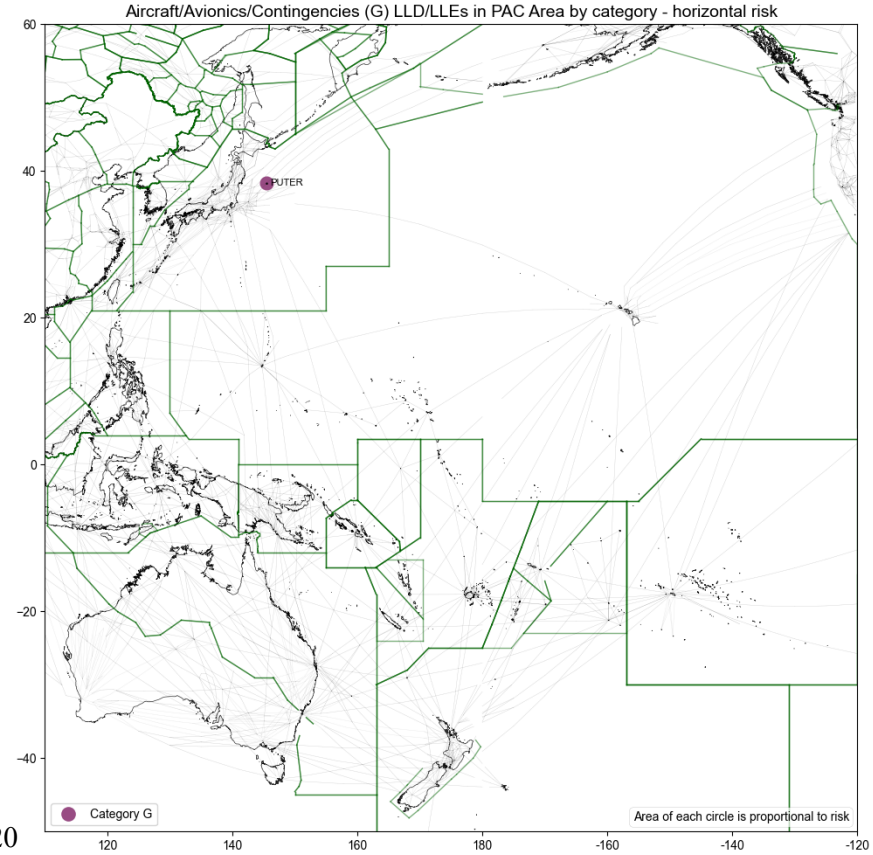
PAC : ATC (D, E, F)


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
BARKE
AUNTI
CEBEN
ELOYI
FAPIS
TARDE
Category D
Category E
Area of each circle is proportional to risk

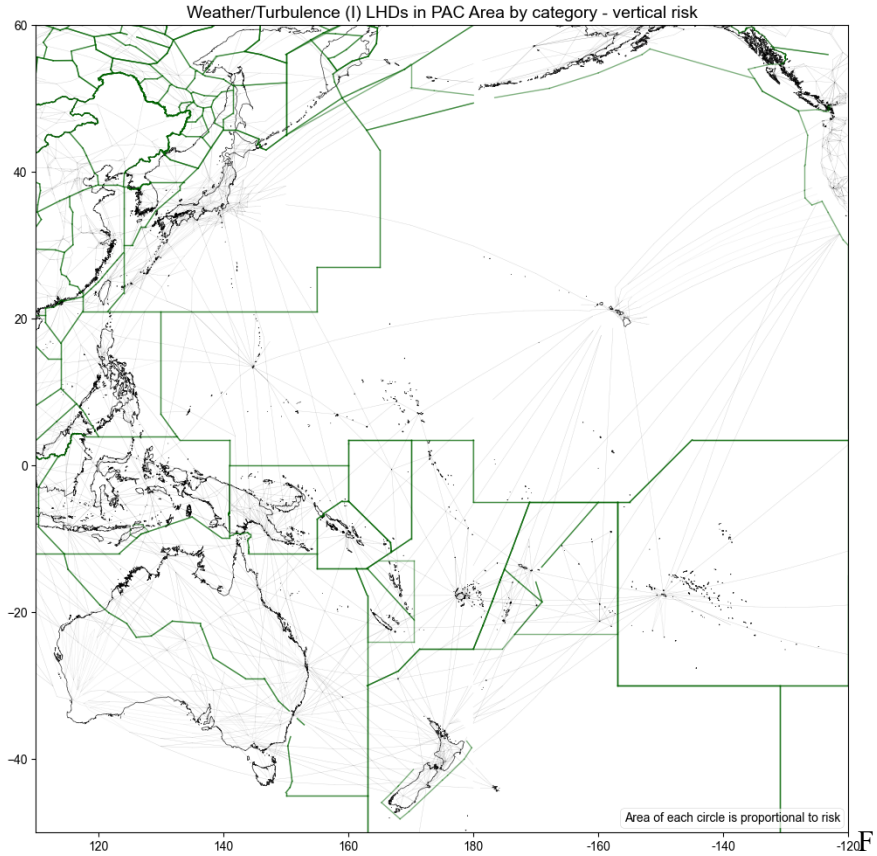

ATC (D, E, F) LLD/LLEs in PAC Area by category - horizontal risk
DUETS
22N133E
GURAG
Category D
Category E
Area of each circle is proportional to risk

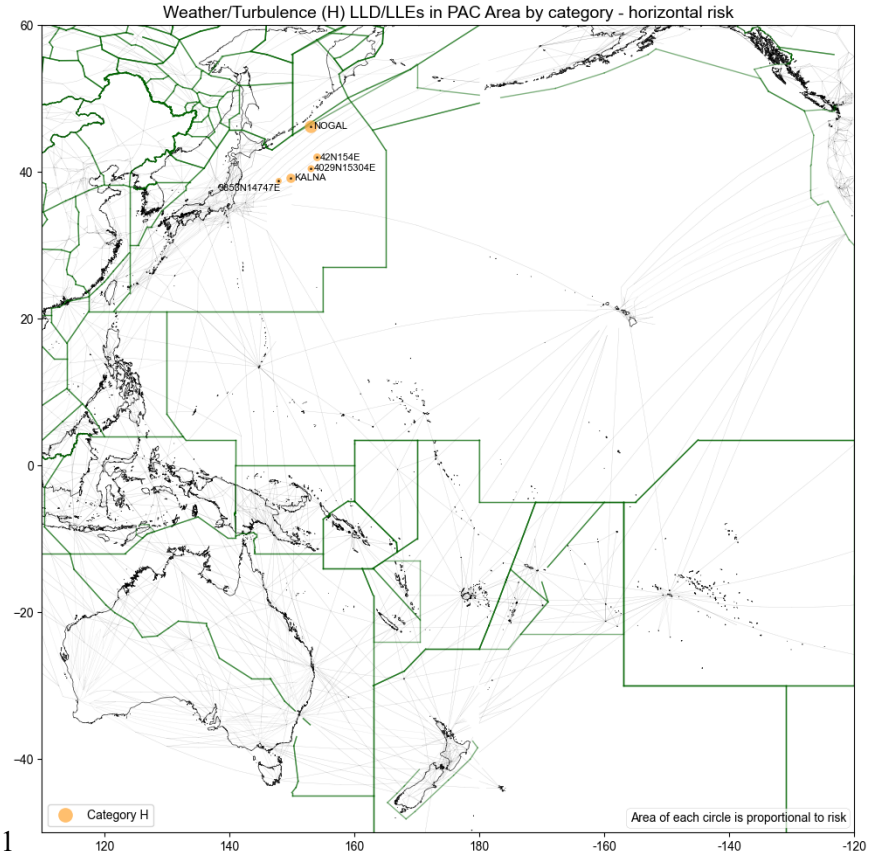
PAC : Aircraft Avionics/Contingencies (G, LHD:H)



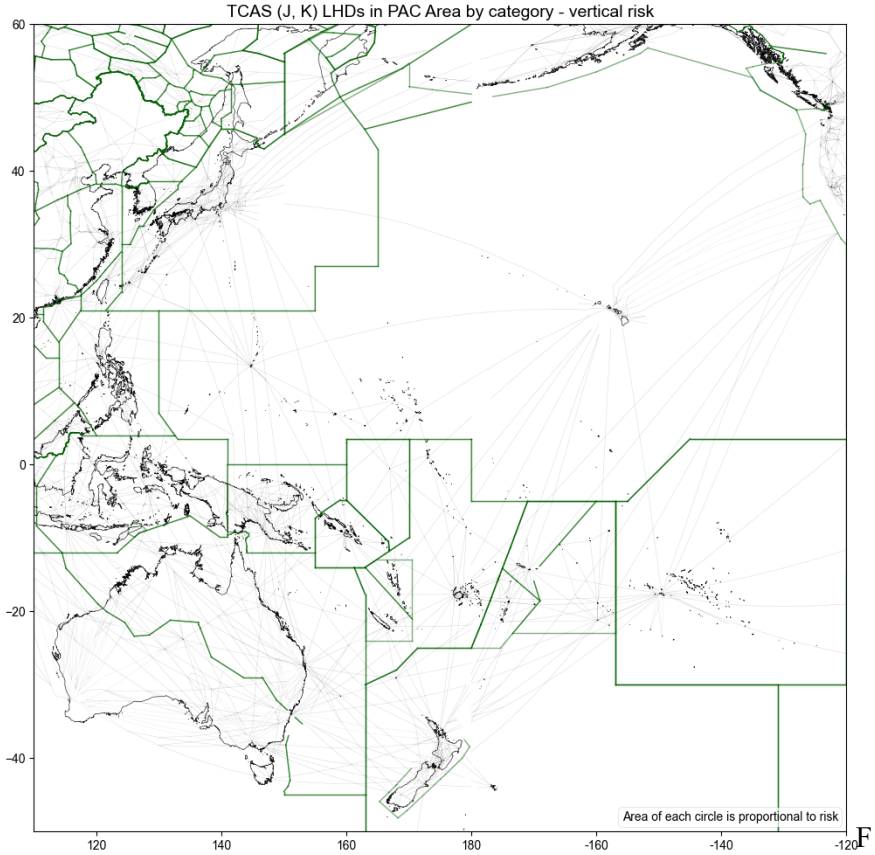


PAC : Weather/Turbulence (LHD:I, LLD/LLE:H)





PAC : TCAS (LHD:J, K)



PAC : Hot Spots

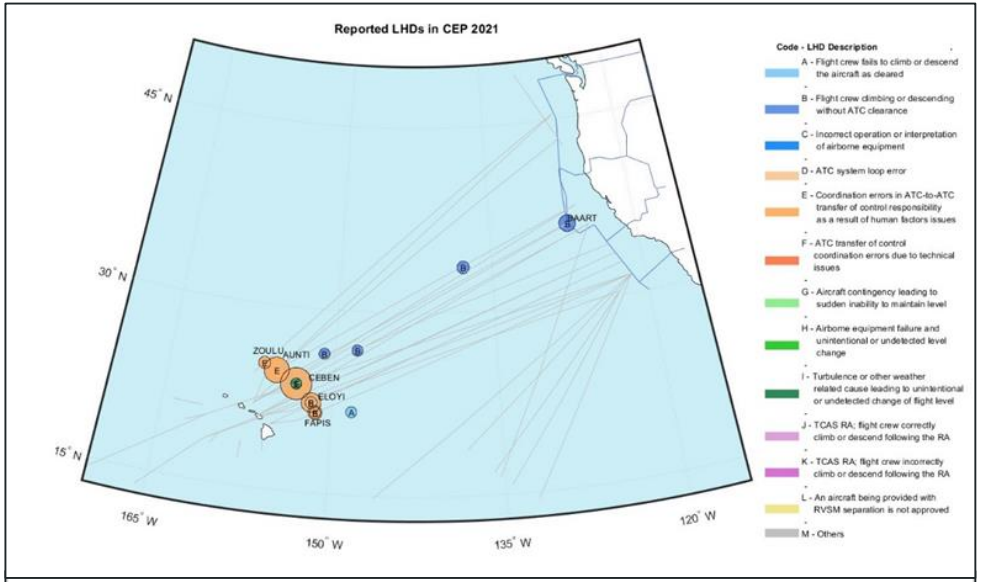
PAC : LHD Hot Spot N (North America - Hawaii CEP)

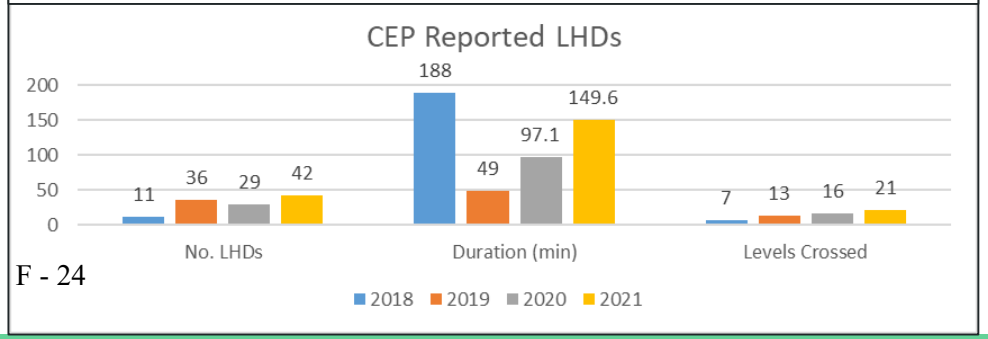
Nature of Occurrences : In 2018, several long duration LHDs were reported. Category E LHDs are the largest contribution to the estimate of risk in 2019, 2020 and 2021.

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

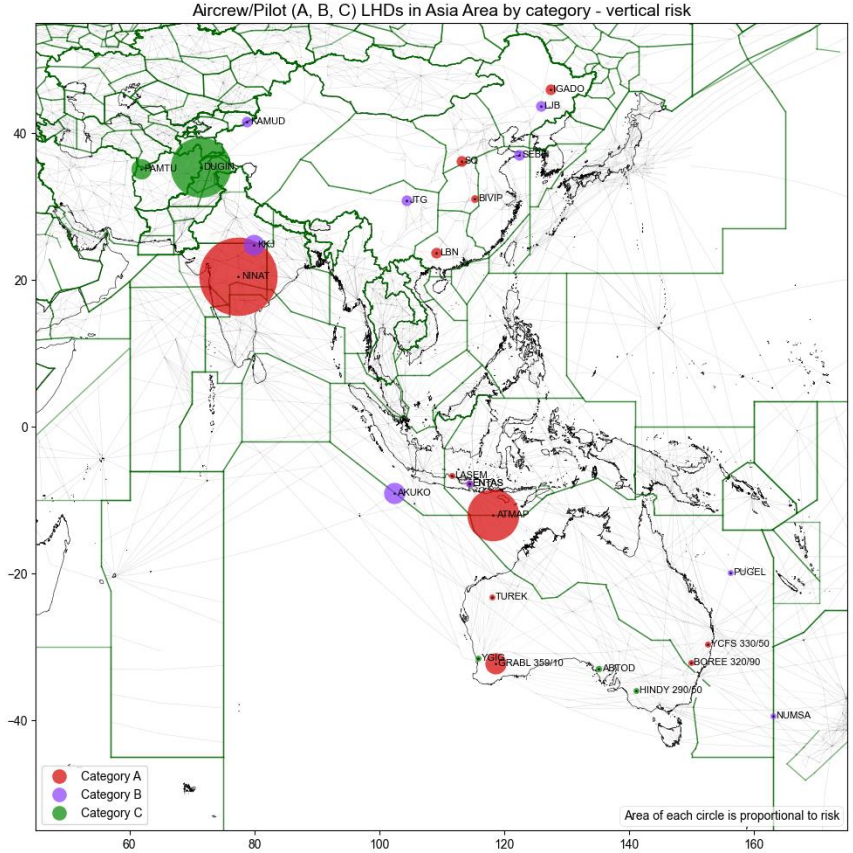
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	0	0	0	0
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne 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

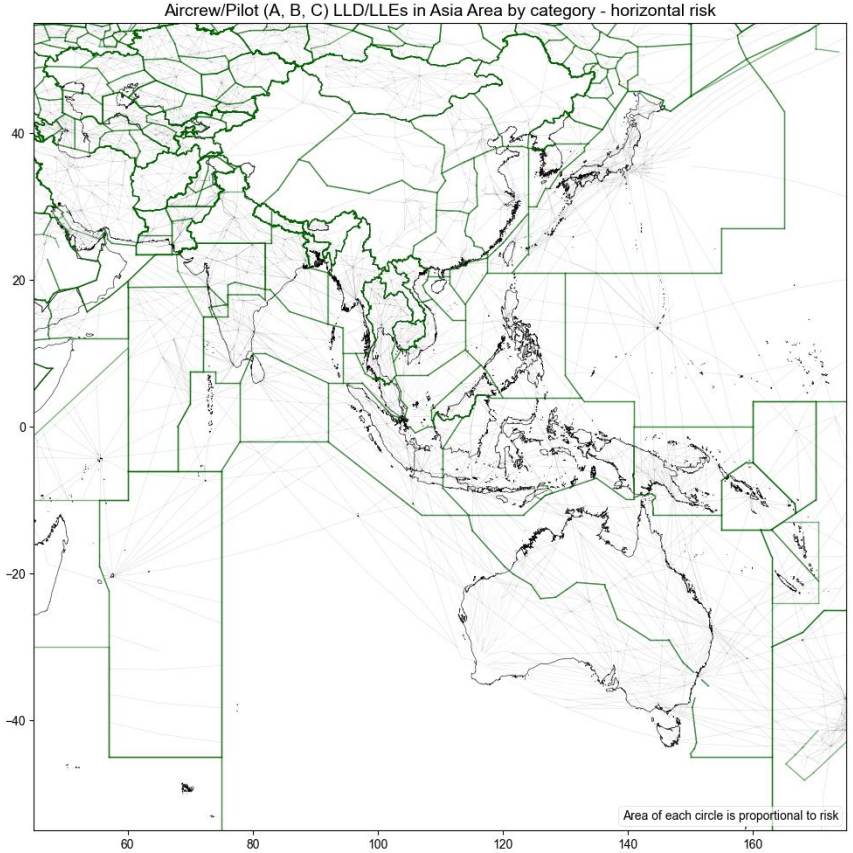
Asia : Summary of LLDs and LLEs

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**

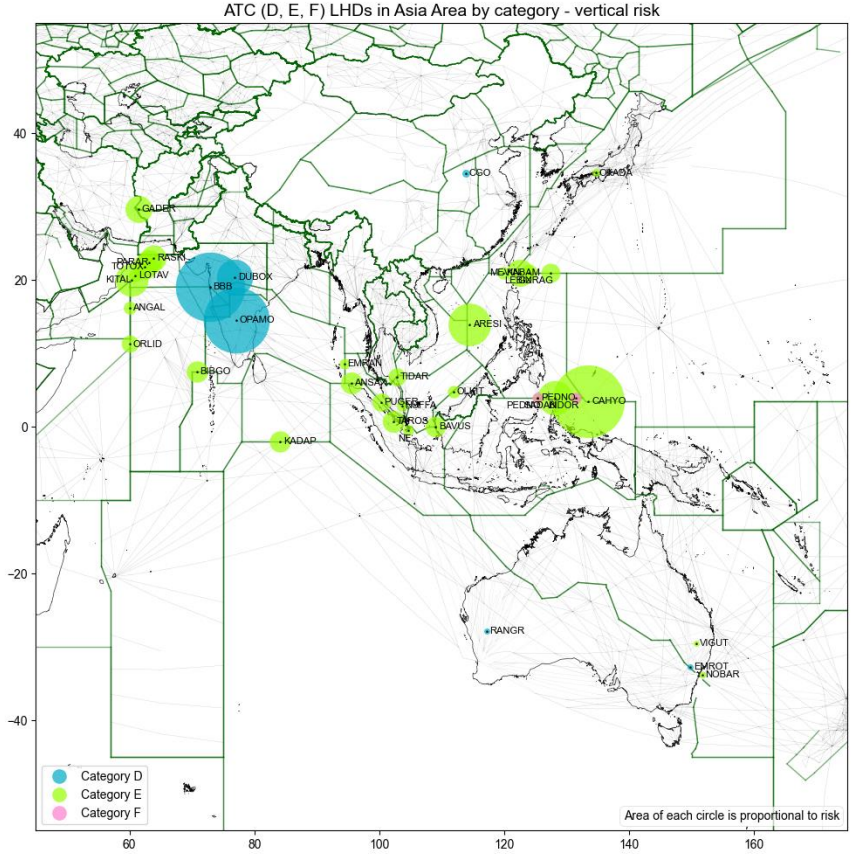
Asia : Geolocation of LHDs/LLDs/LLEs

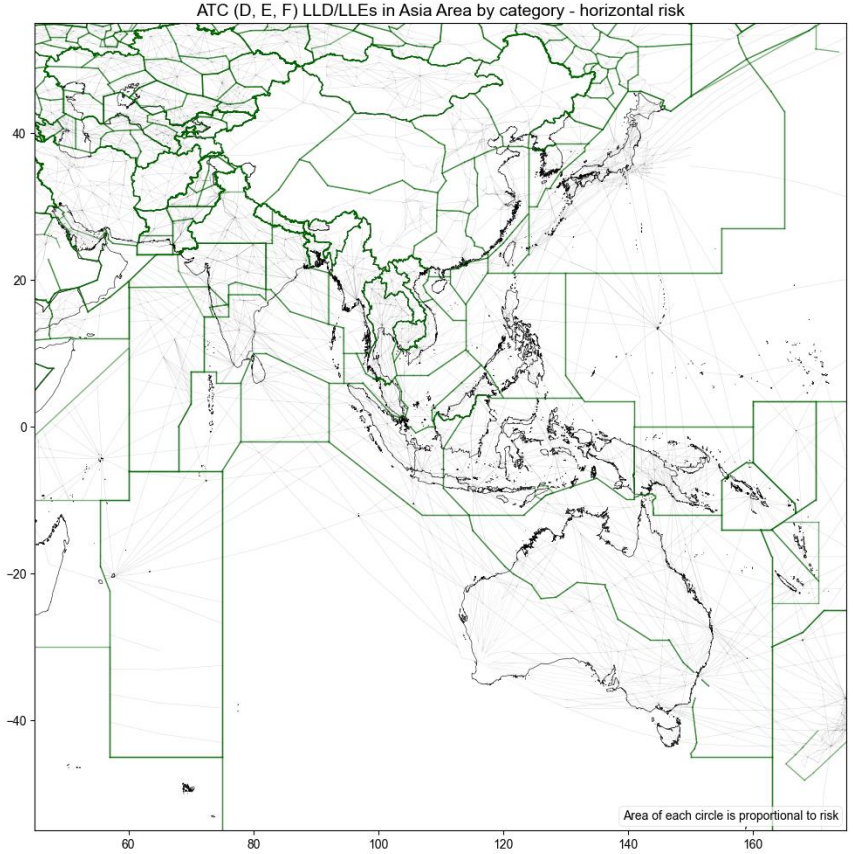
Asia : Aircrew/Pilot (A, B, C)



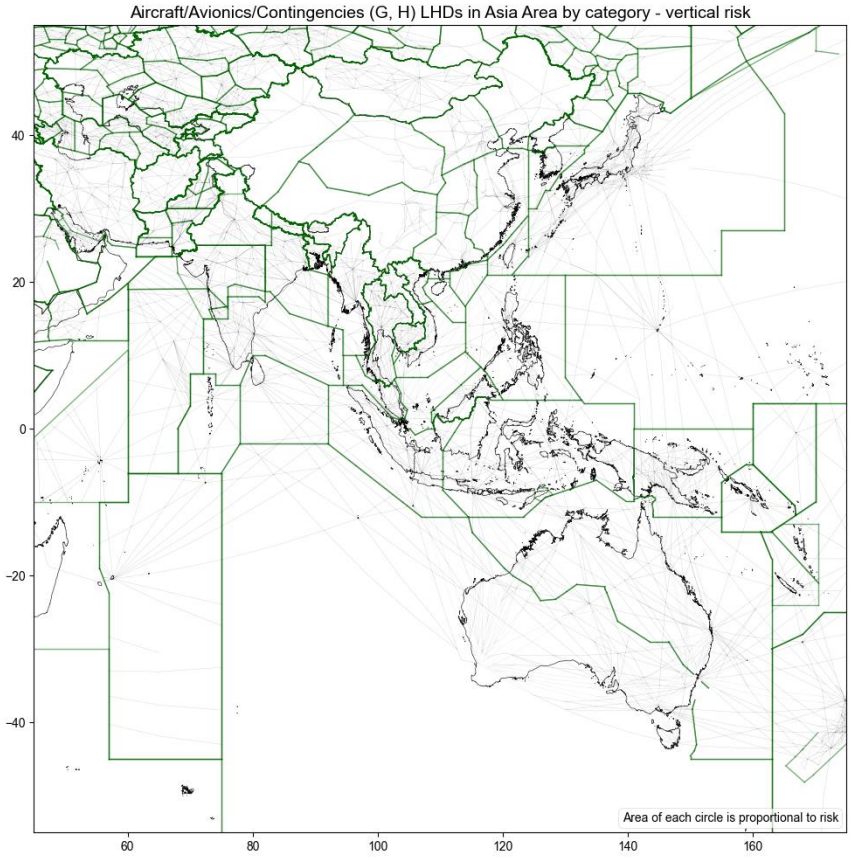


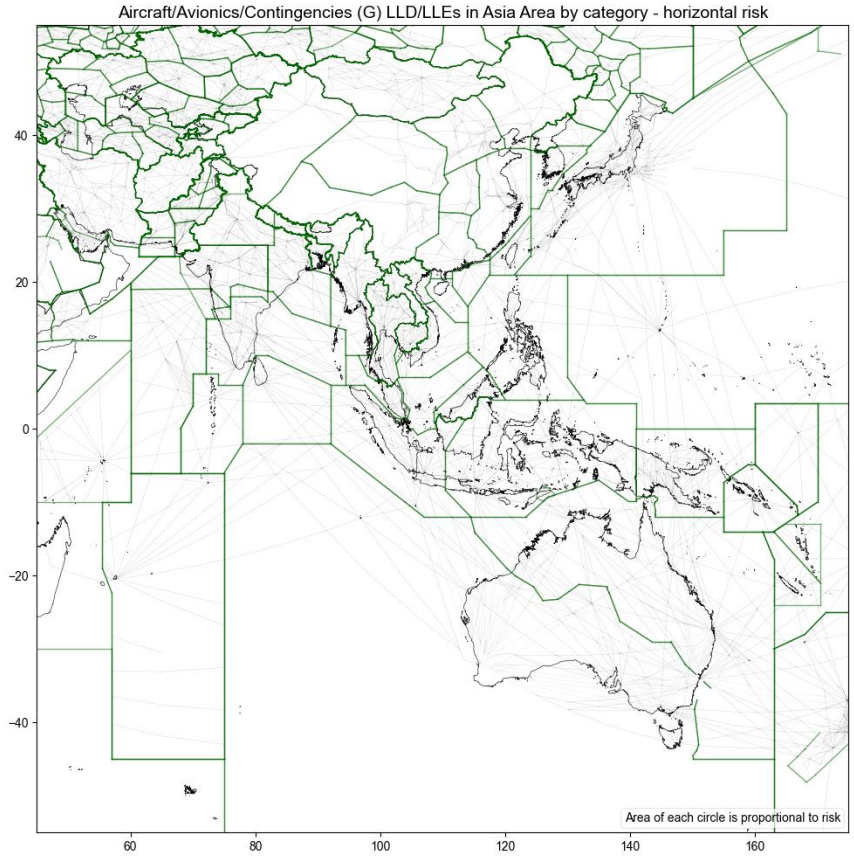
Asia : ATC (D, E, F)


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

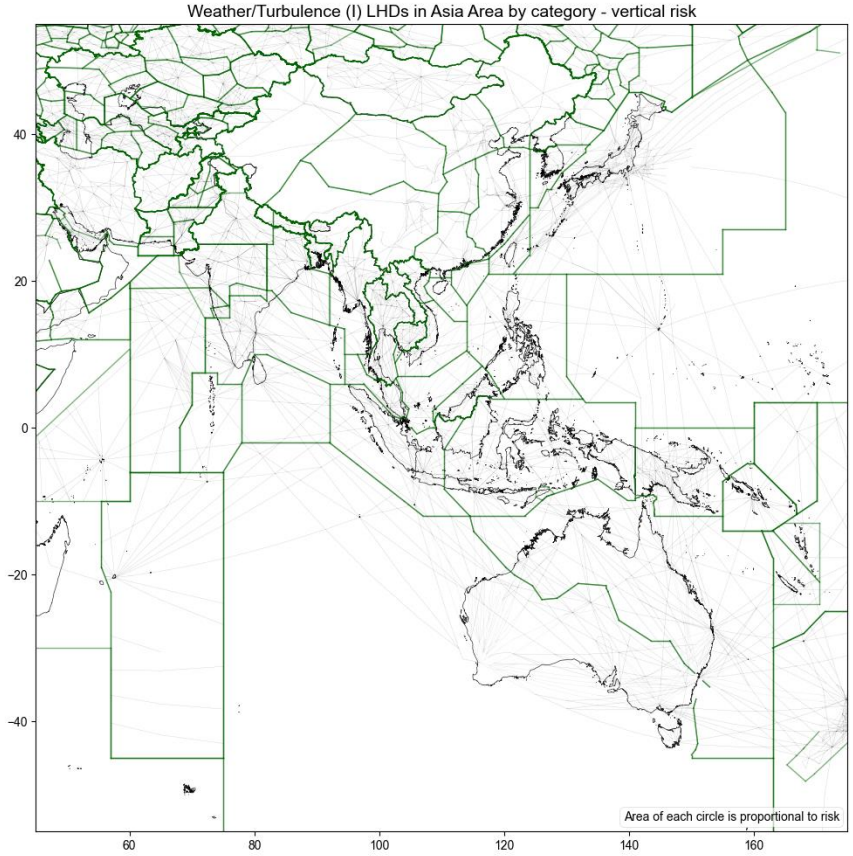

ATC (D, E, F) LLD/LLEs in Asia Area by category - horizontal risk
Area of each circle is proportional to risk
40
20
0
−20
−40
60
80
100
120
140
160

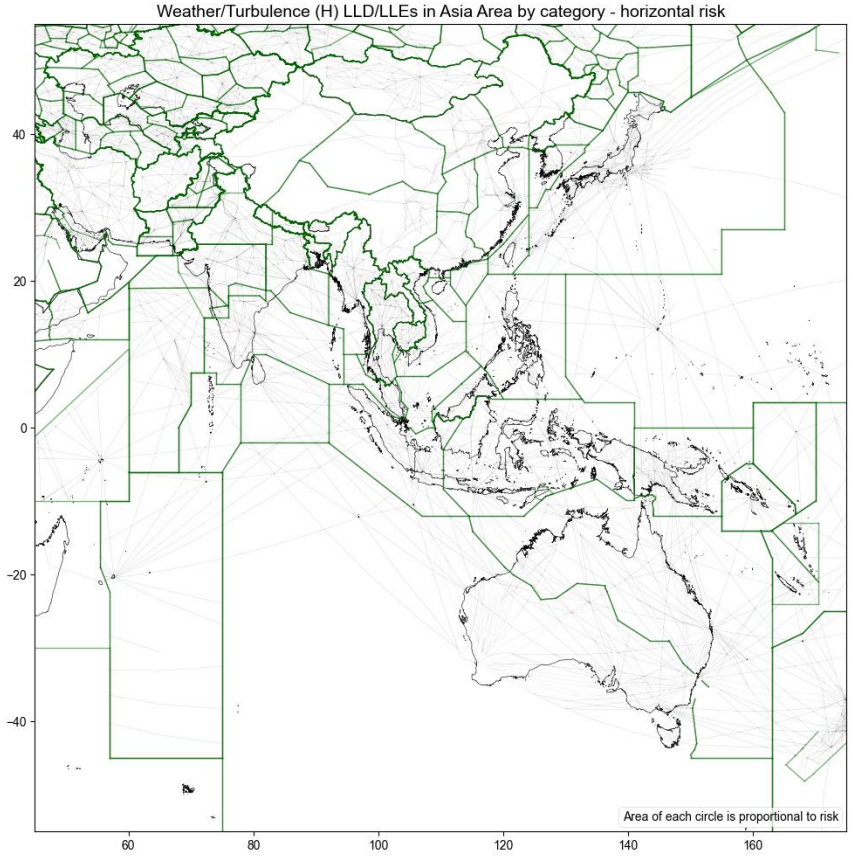
Asia : Aircraft Avionics/Contingencies (G, LHD:H)



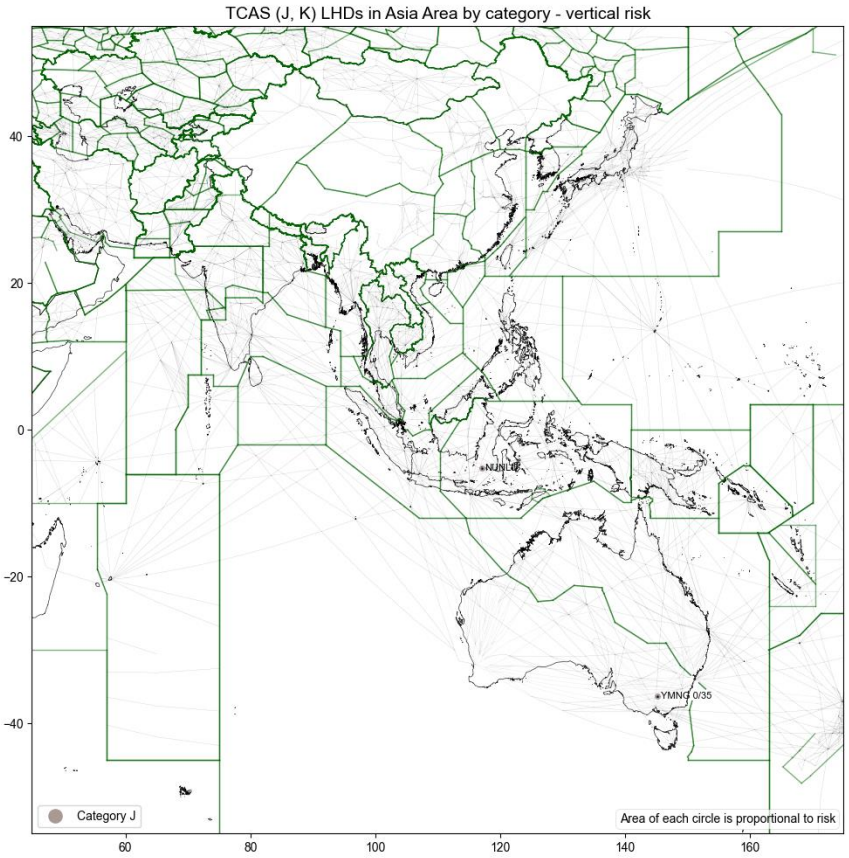


Asia : Weather/Turbulence (LHD:I, LLD/LLE:H)





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

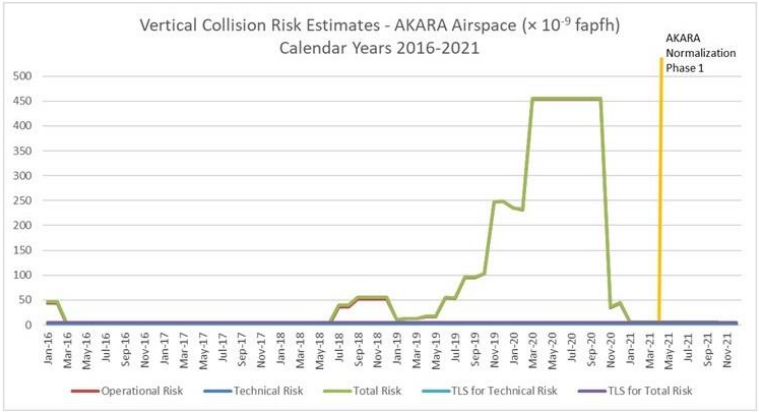
Asia : LHD Hot Spot B (AKARA Airspace)

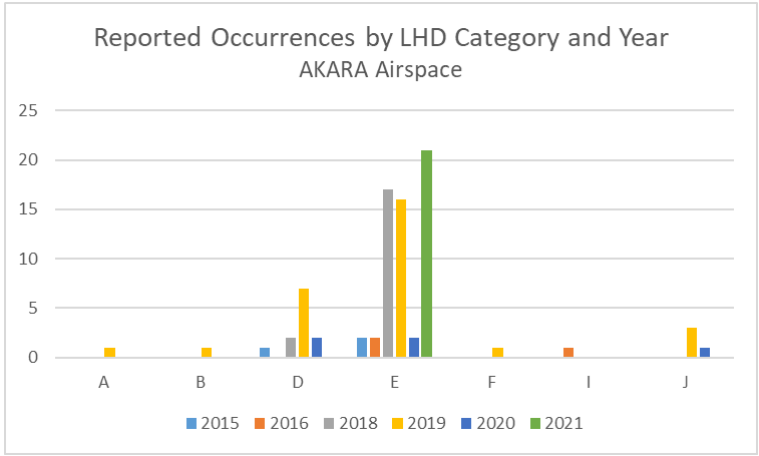
Nature of Occurrences :
Reported occurrences classified as category E are most common.

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)

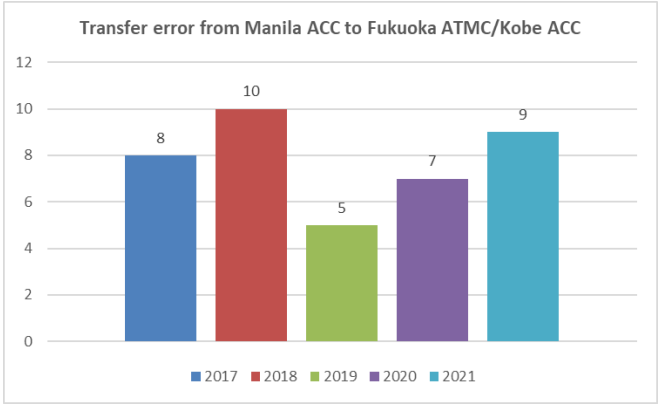
Nature of Occurrences : Transfer error due to human factors (Category E LHD)

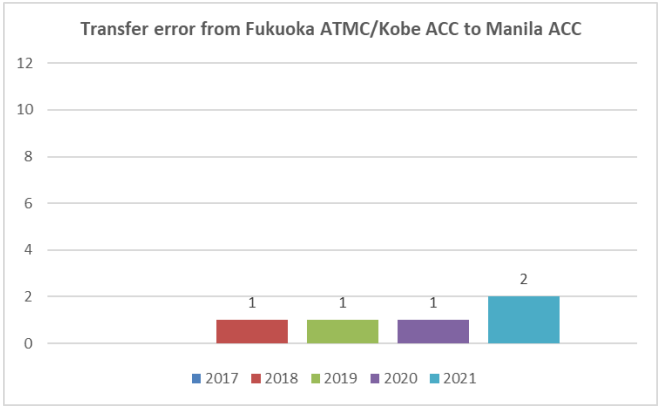
Contributing Factors : Total 11 LHDs occurred in 2021.
9 LHDs occurred on transfer from Manila ACC to Fukuoka ATMC/Kobe ACC.
2 LHDs occurred on transfer from Fukuoka ATMC/Kobe ACC to Manila ACC.

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.

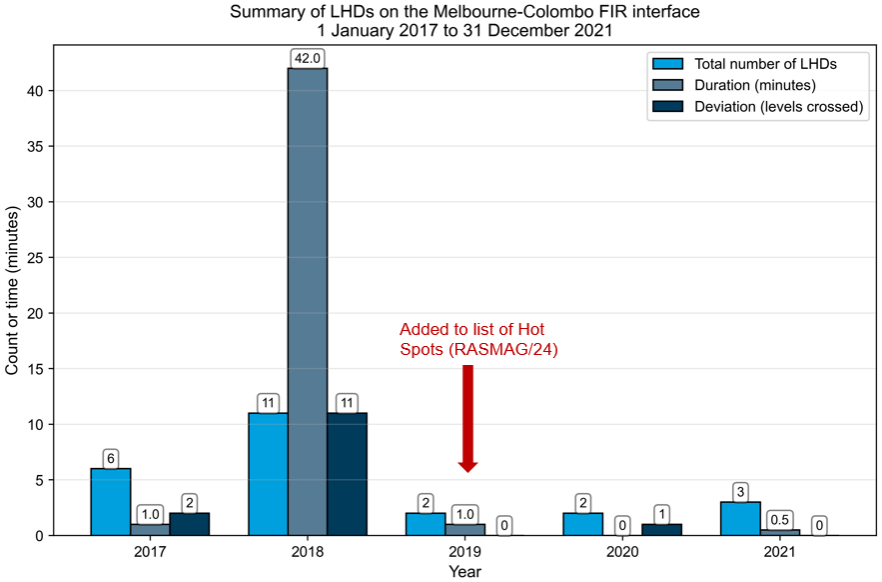
Contributing Factors : A large number were pilot errors involving the Indian Navy.

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

APANPIRG Asia/Pacific Airspace Safety Monitoring

RASMAG LIST OF COMPETENT AIRSPACE SAFETY MONITORING ORGANISATIONS

The Regional Airspace Safety Monitoring Advisory Group of APANPIRG (RASMAG) is required by its terms of reference to recommend and facilitate the implementation of airspace safety monitoring and performance assessment services and to review and recommend on the competency and compatibility of airspace monitoring organisations. In order to assist in addressing these requirements, RASMAG updates and distributes the following list of competent airspace safety monitoring organizations for use by States requiring airspace safety monitoring services. In the context of the list, abbreviations have meanings as follows:

- RMA – Regional Monitoring Agency – safety assessment and monitoring in the vertical plane (i.e. RVSM);
- EMA – En-route Monitoring Agency – safety assessment and monitoring in the horizontal plane (i.e. RSP, RCP, RNP for performance-based horizontal separations);
- CRA – Central Reporting Agency – technical performance of data link systems (i.e. ADS/CPDLC); and
- FIT – FANS 1/A Interoperability/Implementation Team – parent body to a CRA.

(Last updated 25 July 2022)

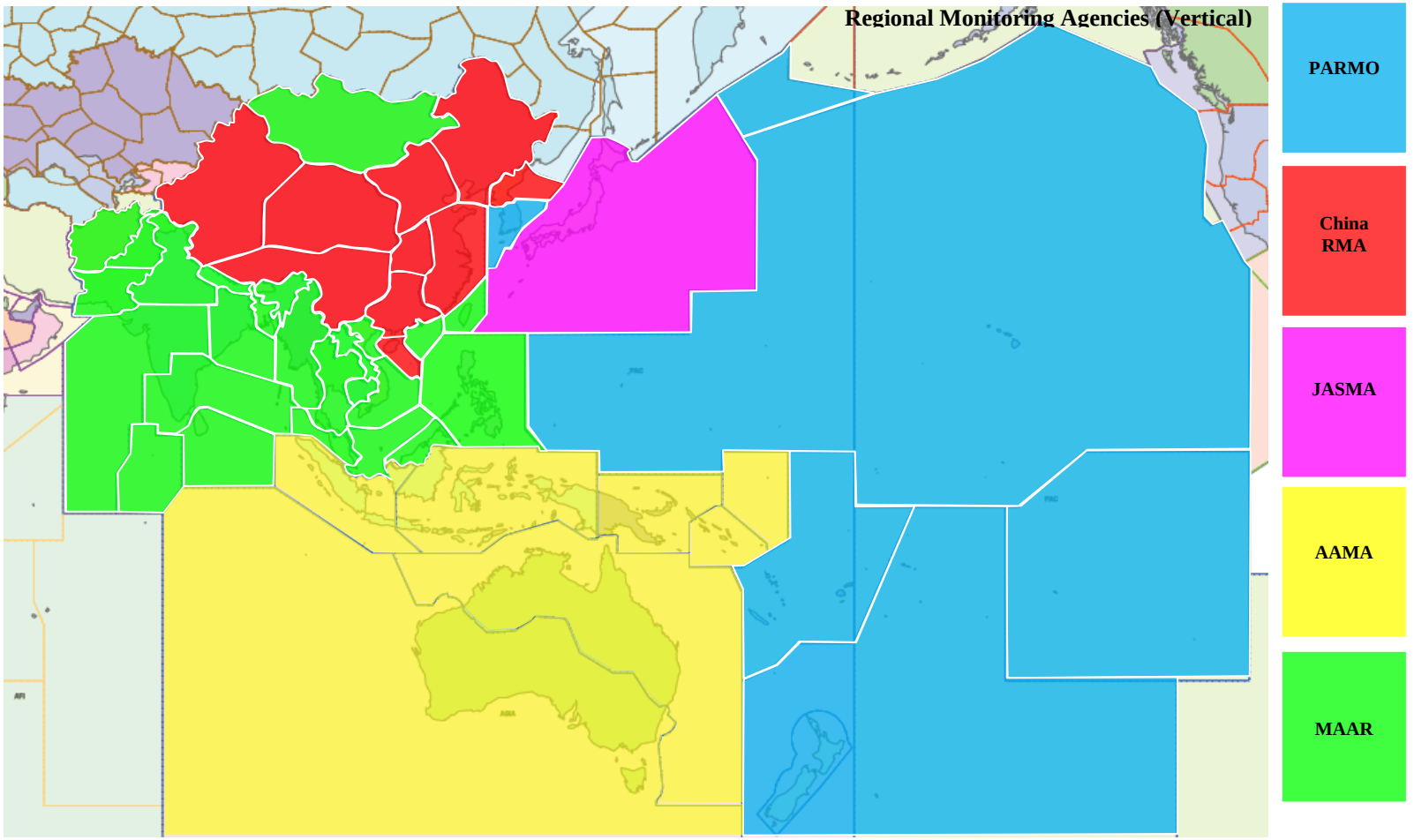
Organisation *(including contact officer)*	**State**	**Competency**	**Status**	**Airspace assessed (FIRs)**
Australian Airspace Monitoring Agency (AAMA) - Airservices https://www.airservicesaustralia.com/about-us/our-services/aama/ Dr Amelia Gontar, Risk Intelligence Specialist Safety and Risk Airservices Australia Email: amelia.gontar@airservicesaustralia.com; or aama@airservicesaustralia.com;	Australia	RMA	Current	Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby and Ujung Pandang (including Timor-Leste) FIRs
		EMA	Current	Brisbane, Melbourne, Honiara,-Nauru, and Port Moresby FIRs

China RMA - **Air Traffic Management Bureau, (ATMB) of Civil Aviation Administration of China (CAAC)** http://www.chinarma.cn Mr.Yongyue Chen (Monsoon), Coordinator of China RMA, ADCC, ATMB of CAAC Email: rmachina@rmachina.cn	China	RMA & EMA	Current	RMA for: Beijing, Guangzhou, Kunming, Lanzhou, Pyongyang, Sanya, Shanghai, Shenyang, Urumqi, and Wuhan FIRs. EMA for: Lanzhou and Urumqi FIRs
India Bay of Bengal Arabian Sea Indian Ocean Safety Monitoring Agency (BOBASMA) http://www.aai.aero/public_notices/aaisite_test/bobasma_index.jsp Mr. A. P. Udayanarayanan Joint General Manager (ATM) Phone No:+ 91 44 22561253 Fax No: +91 44 22561740 Email: bobasmachennai@gmail.com : bobasma@aai.aero	India	EMA	Current	Chennai, Colombo, Delhi, Dhaka, Kabul, Karachi, Kolkata, Lahore, Male, Mumbai, Yangon,
Japan Airspace Safety Monitoring Agency (JASMA) - Japan Civil Aviation Bureau (JCAB) https://www.jasma.jp Mr. Yasuhiro MARUTSUKA, Special Assistant to the Director, Flight Procedures and Airspace Program Office, Japan Civil Aviation Bureau, Email : marutsuka-y0799@mlit.go.jp : hqt-JASMA@gxb.mlit.go.jp : jasma-hq@jasma.jp Central Reporting Agency Japan (CRA Japan) ~~Mr. Hiroyuki WADA~~ Mr. Yukio IMADA, Special Assistant to the Director, Air Navigation Services Planning Division, Civil Aviation Bureau, MLIT Email: ~~wada-h22t5@mlit.go.jp~~ imada-y037c@mlit.go.jp	Japan	RMA and EMA CRA	Current Current	Fukuoka FIR

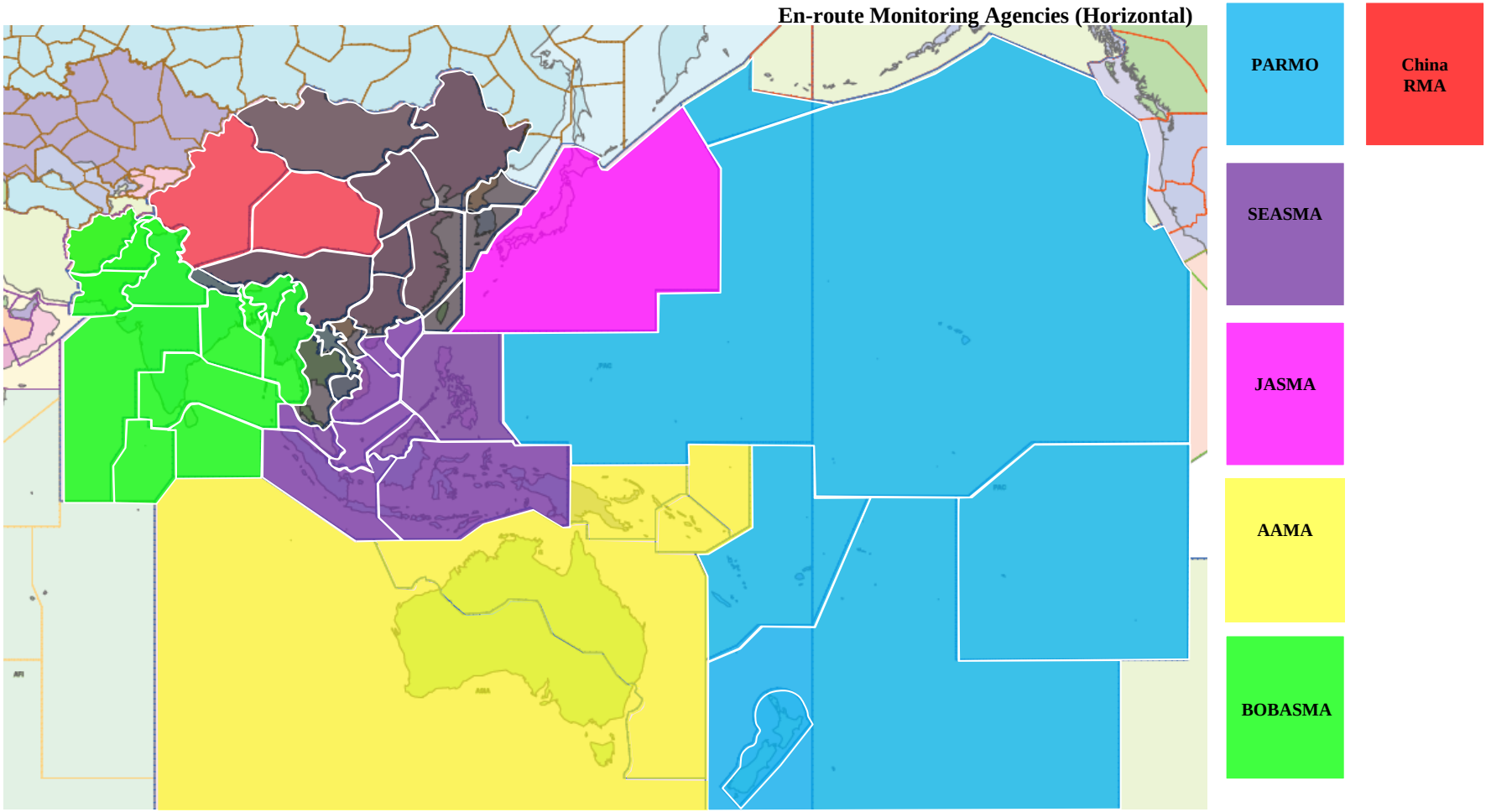
Monitoring Agency for the Asia Region (MAAR) **Aeronautical Radio of Thailand LTD** (AEROTHAI) http://www.aerothai.co.th/maar Mr. Theeravut Sungseemek Director, Safety Management Department & MAAR AEROTHAI Email: maar@aerothai.co.th	Thailand	RMA	Current	Bangkok, Kolkata, Chennai, Colombo, Delhi, Dhaka, Hanoi, Ho Chi Minh, Hong Kong, Kabul, Karachi, Kathmandu, Kota Kinabalu, Kuala Lumpur, Lahore, Male, Manila, Mumbai, Phnom Penh, Singapore, Taibei, Ulaan Bataar, Vientiane, Yangon FIRs
Pacific Approvals Registry and Monitoring Organization (PARMO) – Federal Aviation Administration (US FAA) http://www.faa.gov/air_traffic/separation_standards/parmo/ Christine Falk Federal Aviation Administration Separation Standards Analysis Branch Safety Analysis Subject Matter Expert Email: parmo@faa.gov	USA	RMA and EMA	Current	RMA for Anchorage Oceanic, Auckland Oceanic, Incheon, Nadi, Oakland Oceanic, Tahiti FIRs EMA for Anchorage Oceanic, Auckland Oceanic, Nadi, Oakland Oceanic, Tahiti FIRs
South East Asia Safety Monitoring Agency (SEASMA) - Civil Aviation Authority of Singapore (CAAS) ~~Mr. Ying Weng Kit~~ ~~Principal Air Traffic Control Manager (ANS Safety & Security), Air Navigation Services Group~~ ~~Email: ying_weng_kit@caas.gov.sg;~~ Mr. Chew Han Jun ~~Principal Air Traffic Control Manager~~ Senior Air Traffic Control Manager (ANS Safety & Security), Air Navigation Services Group Email: chew_han_jun@caas.gov.sg; https://www.caas.gov.sg/operations-safety/airspace/south-east-asia-safety-monitoring-agency	Singapore	EMA and CRA	Current	EMA for Hong Kong, Ho Chi Minh, Kota Kinabalu, Kuala Lumpur, Manila, Jakarta, Sanya, Singapore and Ujung Pandang FIRs CRA for Singapore, Viet Nam and Philippines

FIT-ASIA ICAO Asia and Pacific Regional Office Email: apac@icao.int; ~~ssumner@icao.int~~; htakata@icao.int Mr. Kwek Chin Lin Chair, FIT-Asia Email: kwek_chin_lin@caas.gov.sg Mr. Michael Matyas, Boeing Engineering Email: michael.matyas@boeing.com	FIT-Asia States Boeing USA	FIT CRA	Current Current	FIRs in the Asian Region not covered by IPACG/FIT and ISPACG/FIT FIRs in the Asian Region not covered by IPACG/FIT, ISPACG/FIT, JASMA or SEASMA
IPACG/FIT ~~Mr. Hiroyuki WADA~~ Mr. Yukio IMADA IPACG/FIT Co-Chair (JCAB) Email : ~~wada-h22t5@mlit.go.jp~~ imada-y037c@mlit.go.jp Mr. John Roman FAA IPACG/FIT Co-Chair (FAA) Email: john.roman@faa.gov	Japan and USA	FIT & CRA	Current	North & Central Pacific (Oceanic airspace within Fukuoka FIR, and Anchorage & Oakland FIRs)
ISPACG/FIT ~~Mr. Mat Fraser~~ Mr. Todd Kendall Airways New Zealand ISPACG Co-Chair Email: ~~mathew.fraser@airways.co.nz~~ Todd.Kendall@airways.co.nz Mr. Ahmad Usmani	ISPACG States	FIT&CRA	Current	South Pacific FIRs and members of the Informal South Pacific ATS Coordination Group (ISPACG)

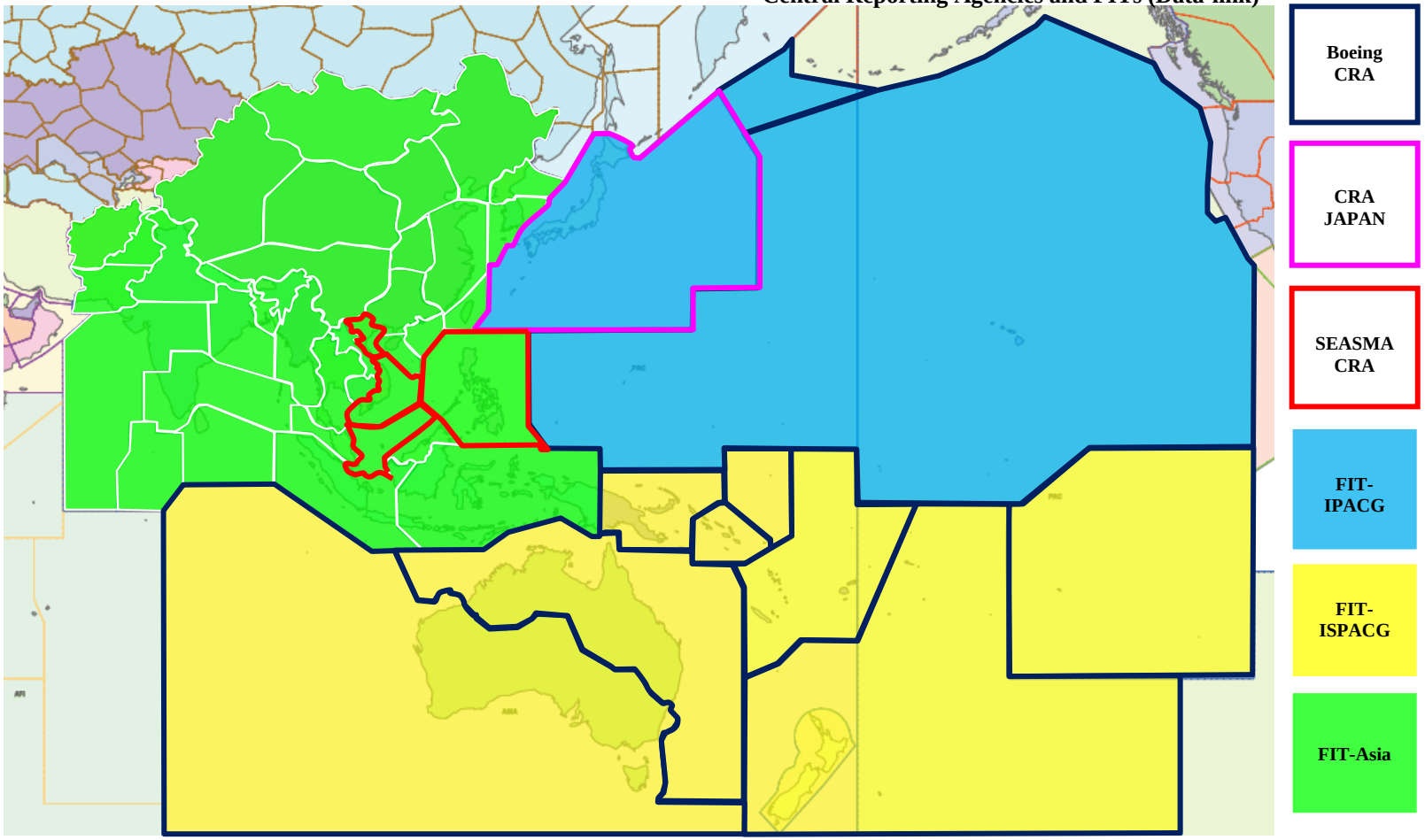
FAA ISPACG Co-Chair Email: ahmad.usmani@faa.gov				
~~Mr. Bradley Cornell, Boeing Engineering~~ ~~ISPACG/FIT Chair~~ ~~email: Bradley.D.Cornell@Boeing.Com~~	~~Boeing USA~~	~~FIT~~		
Ms. Lisa Bee, Inmarsat Aviation ISPACG/FIT Chair Email: Lisa.Bee@inmarsat.com	Inmarsat	FIT		
Mr. Michael Matyas, Boeing Engineering ISPACG lead Email: michael.matyas@boeing.com	Boeing USA	CRA		


Regional Monitoring Agencies (Vertical)
PARMO
China RMA
JASMA
AAMA
MAAR

En-route Monitoring Agencies (Horizontal)



Central Reporting Agencies and FITs (Data-link)



Airspace Safety Deficiencies

(Extracted from the APANPIRG ATM and Airspace Safety Deficiencies List, updated 16 November 2021)

	Deficiencies			**Corrective Action**		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
	<u>Non Provision of Safety-related Data</u> Requirement of Paragraph 3.3.5.1 of Annex 11 (provision of data for monitoring the height-keeping performance of aircraft) and APANPIRG Conclusion 16/6 – Non Provision of safety related data by States					
Afghanistan	Non-provision of safety related data	12/07/2019	Failure to submit Kabul LHD data for January-December 2018 and 2020. Afghanistan ~~had~~ submitted data for the period January to July 2021, but no further LHD reports were received ~~after August 2021~~.	Afghanistan	RASMAG/27	U
Brunei Darussalam	Non-provision of safety-related data	25/08/2022	Failure to submit RVSM approval status validation data for two consecutive years (2020, 2021)	Brunei Darussalam	RASMAG/28	U
	State Responsibility to comply with the Annex 6 Height-Keeping Monitoring Requirement Annex 6 Part I Section 7.2.9 (10th Ed.) and Part II Section 2.5.2.10 (9th Ed.)					

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
Afghanistan	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/ 23	Remaining monitoring burden of 42% (RASMAG/26) Information received by MAAR and reported at RASMAG/27 indicated the monitoring burden may have fallen below 30%. However, the deficiency is retained as the source of the information is not known to be authorized by the aeronautical authority in Afghanistan.	Afghanistan	RASMAG24	A
Pakistan	Non-compliance with LTHM requirement (remaining monitoring burden more than 30%)	RASMAG/ 22	Remaining monitoring burden of 61% (RASMAG/26)	Pakistan	RASMAG24	A

	Deficiencies			Corrective Action		
States/facilities	**Description**	**Date first reported**	**Remarks**	**Executing body**	**Target date**	**Priority ****
	Data Link Performance Monitoring and Analysis Requirements of Paragraph 2.28 and/or 3.3.5.2 of Annex 11 not met					
India	Post-implementation monitoring not implemented	13/07/2017	Performance monitoring and analysis was reported for the Chennai and Kolkata FIRs, but was not reported for the Mumbai FIR~~s~~.	India	TBD	A
Maldives	Post-implementation monitoring not implemented	29/5/2015	Problem Reports not provided to CRA. Performance monitoring and analysis not reported to FIT.	Maldives	TBD	A

** Note: In accordance with the *APANPIRG Handbook - Asia/Pacific Supplement to the Uniform Methodology for the Identification, Assessment and Reporting of Air Navigation Deficiencies*, priority for Air Navigation Deficiencies is guided by the principle that a deficiency with respect to an ICAO Standard is accorded a "U" status, while a non-compliance with a Recommended Practice or a PANS is considered as "A" or "B" subject to additional expert evaluation. The final prioritization of deficiencies is the prerogative of APANPIRG.

RASMAG — TASK LIST

(last updated 25 August 2022)

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
22/8	MAWG to discuss the measure used to determine overall Asia/Pacific TLS compliance and make recommendations to RASMAG/23 (*APANPIRG Conclusion 20/4 − Asia/Pacific Performance Metrics* refers) related to Hot Spots	APANPIRG/32	MAWG	~~Open~~ Completed	RASMAG/26 update Ref Secretariat review of Regional Safety Assessment RASMAG/27 update: Action Item 26/5 refers.
24/5	Organise a meeting on implementation of AIDC between India and Oman	RASMAG26	India, Oman, ICAO	Closed	Coordination between India and Oman is occurring, and AIDC testing is under way.
25/1	RMAs to check that all States to adopt the new F2 Form and States to explicitly check YES or NO in field 15 (RSP180 Approval) and 18 (RCP240 Approval).	RASMAG/27	All RMAs to check Myanmar Viet Nam	~~Open~~ Completed	RASMAG/26 update para 5.7 *Myanmar and Viet Nam had not adopted the new F2 form, which included PBCS approvals information.* RASMAG/27 update para 5.18
25/2	The meeting suggested that the question be raised to the ATM/SG/8 on how to detect/handle State aircraft operators that incorrectly file 'W' in their flight plans (RASMAG/25/WP04).	~~ATM/SG/9~~ RASMAG/28	ICAO	Open	RASMAG/26 update ATM/SG/8 was informed of RASMAG/25 advice. Draft Conclusion RASMAG/26-3 to also be discussed and endorsed at ATM/SG/9 RASMAG/27 Update para 5.27 ref paper to Assembly.

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25/3	The meeting discussed the identification of Category J events as LHDs, given that these were not taken into account in risk modelling or ATC separations as an independent safety net action using the command authority of a pilot to conduct a safe trajectory, bearing in mind the Aircraft Collision Avoidance System (ACAS) Resolution Advisory (RA) and ATC essential traffic information. The issue of 'nuisance' RAs was also discussed, as these were the majority of Category J LHDs. The meeting agreed that the RASMAG Chair would further discuss this at the MAWG. RASMAG/25/WP08	MAWG/9	RASMAG Chair	~~Open~~ Completed	RASMAG/27 update: Report para 2.22. MAWG/9 provided common guidance for APAC RMAs on how to treat TCAS RA-related reports.
25/4	The meeting discussed the need for more systematic and efficient incident sharing mechanisms, as RMAs were not always able to source data in time. The RASMAG Chair agreed to discuss this at the next RASMSAG-MAWG. RASMAG/25/WP14	RASMAG-MAWG	RASMAG Chair	Closed	RASMAG/26 WP/4
25/5	The 2019 RVSM risk estimate for the Pyongyang FIR indicated that the TLS had been met at **3.02 x 10^{-9}**, as no LHD had been reported during 2019. However, the technical risk exceeds the target level of technical risk of 2.5 x 10-9, which rarely occurs. China RMA indicated that they will further investigate this. RASMAG/25/WP06	RASMAG/26	China RMA	Closed	RASMAG/26 WP/6 Technical Risk 1.04 x 10^{-9}
26/1	Noting that there were cases where some States were using a process other than direct operational approvals to enable aircraft operators to file PBCS indicators in flight plans, ICAO undertook to study how information on such State regulatory processes could be obtained	~~RASMAG/27~~ RASMAG/28	ICAO, States?	Open	RASMAG/26 Report para. 2.8

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26/2	JASMA noted that five LHDs at SADLI did not appear to have been included in the PARMO report. China RMA informed the meeting that the data would be shared with JASMA and PARMO. Republic of Korea also requested the data be shared with them (China RMA also agreed that information on this area should be shared), and advised that they would share relevant data with China RMA, JASMA and PARMO.	RASMAG/27	China RMA JASMA Republic of Korea PARMO	~~Open~~ Completed	RASMAG/26 Report para. 3.40 RASMAG/27 WP/20 LHD information is being shared between China RMA, JASMA and PARMO.
26/3	In response to JASMA's invitation to the meeting, particularly IATA and IFALPA, to provide feedback on the increasing number of Category A LHDs, IFALPA agreed that decreasing opportunities for pilots to operate aircraft may have contributed. JASMA was also asked whether these events could be categorized by time of day, as fatigue may be a contributing factor due to some operators requiring pilots to fly longer than usual flight hours. JASMA agreed to provide IFALPA with further information, but noted it would take some time to prepare	MAWG/9	JASMA	~~Open~~ Completed	RASMAG/26 Report para. 3.46 JASMA will provide information on Cat. A LHDs to IATA and IFALPA, and will also provide information to MAWG/9. RASMAG/27 WP/26
26/4	It was also noted that a significant number of the occurrences at this hot spot (*Hot Spot M*) were the result of Indian Navy flights not complying with ATC instructions, and that an identified mitigation strategy was to establish contact with the Indian Navy to resolve the matter. This mitigation had not yet been achieved. India informed the meeting that contact details for the Indian Navy could be provided if AAMA could provide the details of the occurrences. A formal letter on the subject should also be addressed to the Director General of Civil	MAWG/9 ?	BOBASMA AAMA	~~Open~~ Completed	RASMAG/26 Report para 3.114 AAMA to write to DGCA India to obtain contact details for Indian Navy AAMA to provide details of occurrences RASMAG/27 update WP/9 Refer Action Item 27/5

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	Aviation of India, with copy to BOBASMA.				
26/5	The Chair informed the meeting that the process of identification and monitoring of LHD hot spots had been developed informally over several years to facilitate the focus of RASMAG on areas requiring specific attention. The MAWG was invited to consider drafting a formalized process for this purpose, for consideration by RASMAG	~~RASMAG/27~~ RASMAG/28	MAAR	Open	RASMAG/26 Report para 3.116 RASMAG/27 WP/7 RASMAG/27 Update: Hot Spot methodology trial to be validated at RASMAG/28
26/6	APAC RMAs to administer a short questionnaire to States' POCs on the matter of RMA responsibility in this regard (sharing of RVSM approval data for State aircraft)	31 March 2022	All APAC RMAs	~~Open~~ Completed	RASMAG/26 Report para 5.21 Subject to APANPIRG/32 adoption of Draft Conclusion RASMAG/26-3 MAAR to prepare draft questionnaire for review at MAWG/9 RASMAG/27 WP/31
27/1	Draw the attention of ATM/SG and APANPIRG to issues related to PBCS non-compliance reporting (lack of reports, gaps in data, delayed reporting, lack of POCs, poor participation in RMA measures on PBCS, reporting processes and tracking of non-compliant aircraft	ATM/SG/10 APANPIRG/33	Secretariat	Open	RASMAG/27 report para 2.26
27/2	Explore the development of Regional Guidance for PBCS non-compliance reporting (including Nil Occurrence reports) and handling processes	FIT-Asia/13	Secretariat Others?	Open	RASMAG/27 report para 2.28
27/3	Provide update on AKARA airspace improvement project planning, if any.	ATM/SG/10	China Japan Republic of Korea	Open	RASMAG/27 report para 3.6
27/4	ICAO APAC Office to coordinate with ICAO HQ on AKARA airspace improvement project Phase 2	30 September 2022	Secretariat	Open	RASMAG/27 report para 3.9

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27/5	ICAO APAC Regional Office to write to DGCA India seeking contact details for Indian Navy (Hot Spot M mitigations)	30 September 2022	Secretariat	Open	RASMAG/27 report para 3.33 Action items and 25/2 and 26/4 refer.
27/6	2022 APAC Consolidated Safety Report to be provided to APANPIRG/33 and ANC	APANPIRG/33	Secretariat	Open	RASMAG/27 report para 3.128
27/7	Provide feedback to MAAR on the LHD Material Package, including LHD points of contact, for all APAC Administrations.	30 September 2022	All Administrations and Monitoring Agencies	Open	RASMAG/27 WP/24 and report para 4.3
27/8	Inform Brunei Darussalam of RASMAG/27 recommended ATM and Airspace Deficiency	30 September 2022	Secretariat	Open	RASMAG/27 WP/29 and report para 5.19
27/9	Inform Lao PDR and Mongolia of ATM and Airspace Deficiency to be proposed at RASMAG/28	30 September 2022	Secretariat	Open	RASMAG/27 WP/29 and report para 5.19
27/10	Present survey findings on removal of 1,000 flight hour portion of Annex 6 RVSM monitoring requirement to RMACG	RMACG/17 (Part II)	MAAR	Open	RASMAG/27 WP/33 and report para 5.38
27/11	Present survey findings on continuance of ‘W’ check of State aircraft	RMACG/17 (Part II)	MAAR	Open	RASMAG/27 WP/31 and report para 5.26

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