International Civil Aviation Organization

Thirty-Second Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/32)

Video Teleconference, 1 – 3 December 2021

Schedule: 10:00 – 13:15 Bangkok Time [UTC+7]

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

3.3: **RASMAG**

RASMAG/26 OUTCOMES

(Presented by the RASMAG Chair)

SUMMARY

This paper provides a summary of the key outcomes from the Twenty-Sixth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/26), including the RASMAG/26 discussion of the outcomes of its contributory body, Future Air Navigation Services (FANS) Interoperability Team – Asia (FIT-Asia/1). One Draft Conclusion is presented for the consideration of the APANPIRG/32 meeting.

Strategic Objectives:

A: ***Safety*** *– Enhance global civil aviation safety*

B: ***Air Navigation Capacity and Efficiency*** *— Increase the capacity and improve the efficiency of the global aviation system*

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

1. INTRODUCTION

1.1 The Twenty-Sixth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/26) was held from 20 to 23 September 2021 2020 by Video Teleconference (VTC) from the ICAO Asia and Pacific Regional Office, Bangkok, Thailand.

1.2 A total of 119 participants were registered for RASMAG/26 from Australia, Bangladesh, Cambodia, China, Hong Kong China, Fiji, India, Indonesia, Japan, Malaysia, New Zealand, Pakistan, Philippines, Republic of Korea, Singapore, Somalia, Sri Lanka, Thailand, United States of America, Viet Nam, CANSO, IATA, IFALPA IFATCA and ICAO.

1.3 A total of 40 Working Papers (WPs), six Information Papers (IPs) and three flimsies were presented to the meeting.

1.4 The RASMAG/26 Report and all meeting documentation is available on the ICAO Asia/Pacific Regional Office meetings web-pages at https://www.icao.int/APAC/Meetings/Pages/default.aspx.

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

2. DISCUSSION

FIT-Asia/11 Meeting Outcomes

2.1 The Eleventh Meeting of the FANS Interoperability Team-Asia (FIT-Asia/11) was held by video teleconference from 23 to 26 August 2020.

2.2 The lower number of data link Problem Reports (PRs) submitted to the FIT-Asia Central Reporting Agency (CRA) in the 2020-2021 reporting period (27, compared with 66 in 2019-2020) reflected the decrease in air traffic due to the impact of the COVID-19 pandemic.

2.3 Regarding PRs relating to flights in areas of poor VHF coverage with subsequent reversion to SATCOM (PR 3178-MM), or flights on the edge of VHF coverage experiencing media transitions (3099-KS) the FIT-Asia/11 meeting was reminded of the guidance for data link performance improvement for aircraft operators approved by RASMAG for regional use under ***Conclusion RASMAG/24-1: Guidance for Data Link Performance Improvement for Aircraft Operators***. The guidance was available on the ICAO Asia/Pacific Regional Office eDocuments web-page: https://www.icao.int/APAC/Pages/eDocs.aspx.

2.4 The CRA provided information to the FIT-Asia/11 meeting on causes of poor Performance-Based Communications and Surveillance (PBCS) performance in the South China Sea area, and potential resolutions. Removal of a specific VHF ground station had led to frequent media transitions to SATCOM.

2.5 The FIT-Asia/11 meeting had discussed the need for adoption in the Asia/Pacific Region of a common Future Air Navigation Services 1/A (FANS1/A) Controller-Pilot Data Link Communications (CPDLC) Latency Timer value of 300 seconds, as was currently being successfully trialled in the North Atlantic (NAT) Region. The RASMAG/26 meeting agreed to the following technical Conclusion drafted by FIT-Asia/11:

Conclusion RASMAG/26-1: FANS1/A CPDLC Latency Timer 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. *a latency timer value of 300 seconds supports both RCP240 and RCP400 operations;*
3. *the need for a single, standardized global value; and*
4. *the trialling of a value of 300 seconds in the North Atlantic Region;*

States are urged to implement a latency timer value of 300 seconds on a trial basis and report outcomes to FIT-Asia.

2.6 The meeting was informed that over a period of four years a total of 19 APAC Administrations had responded to the annual regional survey of the status of current and planned implementation of performance-based horizontal separation minima, which was supported by several APANPIRG and RASMAG conclusions. Only Australia, Indonesia and Singapore had responded in 2021.

2.7 A Proposal for Amendment (PfA) to ICAO Doc 7030 *Regional Supplementary Procedures* (SUPPS) had been drafted to support the inclusion of relevant FIRs administered by Indonesia, Philippines, Singapore and Sri Lanka in sections supporting the application of performance-based separation that required PBCS. On receipt of formal communications from all States requesting the change, the PfA process would commence.

2.8 China had presented the Asia/Pacific Region Combined PBCS Monitoring Report to the FIT-Asia/11 meeting. The report highlighted consolidated performance data and issues associated with Automatic Dependent Surveillance - Contract (ADS-C) Actual Surveillance Performance (ASP) and CPDLC Actual Communications Performance (CPDLC) for the region.

2.9 Overall ASP for the region had met the 95% criterion of the Required Surveillance Performance 180 (RSP180) specification, but fell marginally below the 99.9% criterion[1]. While the volume of data counts had significantly reduced in 2020, the trend of regional performance in both the 95% and 99.9% criteria had generally improved.

2.10 Overall ACP for the region met the 95% criterion (**Table 1**). ACP for most FIRs fell marginally below the 99.9% criterion, but several FIRs failed to meet it[2]. In the first half of 2020 one FIR did not meet the 95% criterion for Actual Communications Technical Performance (ACTP) and two FIRs failed to meet the 99.9% criterion. In the second half of the year all reporting FIRs met the 95% criterion, but four did not meet the 99.9% criterion. Pilot Operator Response Time (PORT) performance requirements were not met by a number of aircraft operators.

ACTUAL COMMUNICATION PERFORMANCE - FIR AGGREGATE (ALL MEDIA TYPES)										
Region	Asia-Pacific Region									
Performance Criteria	RCP240									
Time Period	2020 January-June					2020 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	70739	99.12%	99.33%	99.21%	99.50%	68090	99.06%	99.32%	99.24%	99.48%
RJJJ	34547	99.57%	99.78%	99.65%	99.75%	31739	99.60%	99.76%	99.63%	99.73%
KZAK	192062	99.31%	99.53%	99.65%	99.77%	142934	99.46%	99.64%	99.72%	99.84%
NFFF	3764	99.62%	99.81%	99.81%	99.89%					
NTTT	2939	99.49%	99.78%	99.71%	99.78%	1002	99.40%	99.70%	100.00%	100.00%
NZZO	7999	99.58%	99.73%	99.72%	99.74%	2803	99.82%	99.71%	99.89%	99.89%
YBBB	24042	99.25%	99.29%	99.46%	99.48%	11475	99.29%	99.29%	99.48%	99.48%
YMMM	29335	99.55%	99.48%	99.67%	99.66%	12820	99.38%	99.38%	99.53%	99.53%
RPHI	4665	97.59%	97.84%	98.91%	99.24%	9044	98.24%	98.40%	98.58%	98.82%
VCCF	24214	98.45%	99.53%	99.28%	99.78%	16601	98.37%	99.39%	99.17%	99.76%
VOMF	31266	99.77%	99.86%	99.84%	99.86%	31445	99.77%	99.85%	99.84%	99.86%
VVTS	26896	95.80%	96.31%	99.40%	99.65%	31859	96.26%	96.64%	99.48%	99.72%
WAAF	21900	98.20%	98.45%	99.70%	99.78%	11451	97.80%	98.12%	99.68%	99.75%
WMFC	9261	98.14%	98.71%	98.54%	99.11%	30246	97.67%	98.45%	97.42%	98.40%
WSJC	19113	98.94%	99.29%	98.87%	99.22%	14758	98.93%	99.20%	99.05%	99.29%
ZLLL	2447	97.99%	98.32%	98.40%	98.81%	1140	97.10%	97.28%	98.42%	98.68%
ZWWW	464	95.90%	96.76%	93.31%	96.98%	111	97.29%	98.19%	96.39%	96.39%

Table 1: Asia/Pacific Region ACP (RCP240)

[1] ASP Criteria: 95% of transactions completed within 90 seconds, 99.9% completed within 180 seconds

[2] ACP Criteria: 95% of transactions completed within 180 seconds, 99.9% completed within 210 seconds.

MAWG and RMACG Reports

2.11 The Eighth Meeting of the Monitoring Agencies Working Group (MAWG/8, 01 – 04 February 2021) had discussed a number of key issues relevant to the APAC Region including Altimetry System Error (ASE) and height monitoring activities, En-route Monitoring Agency (EMA)/Regional Monitoring Agency (RMA) safety monitoring, PBCS oversight, monitoring of non-RVSM approved aircraft and consolidated safety reporting to RASMAG.

2.12 The Sixteenth Meeting of the Regional Monitoring Agencies (RMAs) Coordination Group (RMACG/16, 14 – 25 June and 28 June to 02 July 2021 had discussed a number of key issues including RVSM and PBCS approvals and monitoring, technical height monitoring systems and techniques, aircraft technical height keeping performance, and RMA coordination and data exchange.

2.13 RASMAG/26 endorsed the new Minimum Monitoring Requirements (***RASMAG/26 WP/04 Attachment***) for applicability in the Asia/Pacific Region, and agreed to the following technical Conclusion.

Conclusion RASMAG/26-2: RVSM MMR Update

That, the Reduced Vertical Separation Minimum (RVSM) Minimum Monitoring Requirement (MMR) update at ***Appendix C to the Report*** *be utilized by Regional Monitoring Agencies (RMAs) and States as appropriate.*

AKARA – FUKUE Corridor

2.14 On 25 March 2021 all Air Traffic Control (ATC) responsibility for ATS route A593 between ONIKU and SADLI had been handed over to Incheon Area Control Centre (ACC). Prior to that date ATS services for operations on ATS route A593 were provided Shanghai ACC for traffic west of SADLI, and east of SADLI by Fukuoka ACC for east/west traffic and Incheon ACC for north-south traffic, with a Flight Level Allocation Scheme (FLAS) in place.

2.15 The Japan Airspace Safety Monitoring Agency (JASMA) provided an update on 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**).

2.16 Due to the use of ATS Inter-Facility Data Communication (AIDC) there had been no Large Height Deviations (LHDs) at BEDAR and ONIKU reported to JASMA from 25 March to 31 August 2021.

2.17 As at August 2021 the transition from Phase 1 to Phase 2 of the improvement plan had been discussed between China and Republic of Korea, but the transition date had not yet been determined. **Figure 2** shows the ATS route structure of Phase 2.

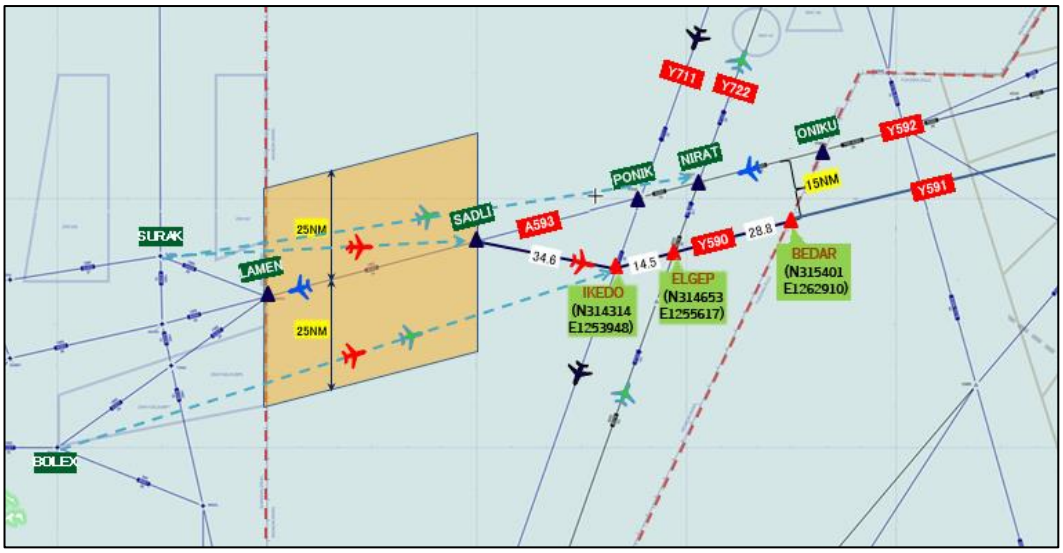

Figure 1: AKARA-FUKUE Corridor Safety Improvement Plan Phase 1

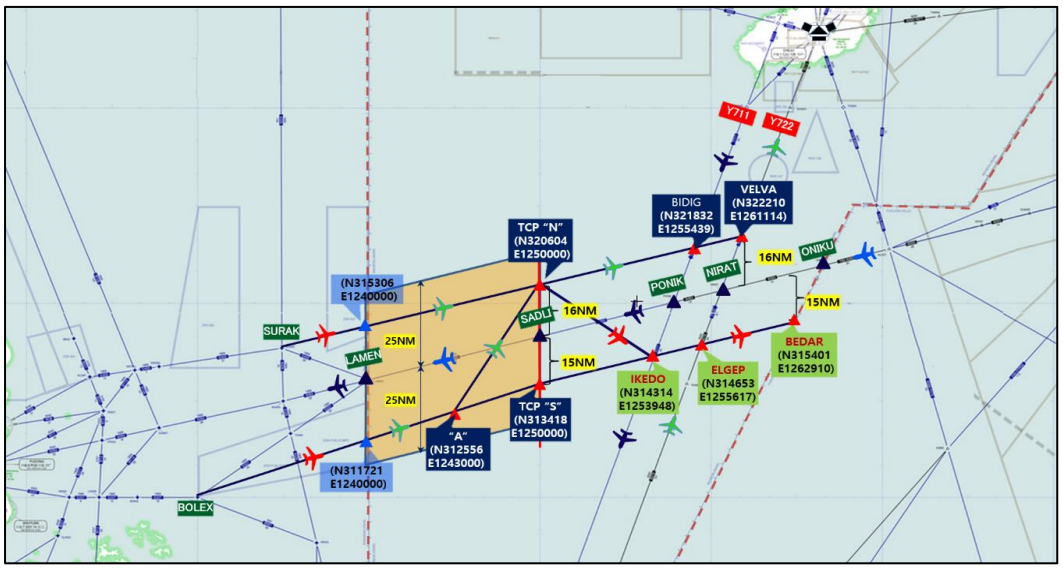

Figure 2: AKARA-FUKUE Corridor Safety Improvement Plan Phase 2.

2.18 JASMA provided the results of a safety assessment in the AKARA – FUKUE corridor airspace conducted by JASMA and the Electronic Navigation Research Institute (ENRI), using fast-time simulation of December 2019 Traffic Sample Data (TSD).

2.19 The technical risk estimate may have met the Target Level of Safety (TLS) following transition to Phase 1. Establishing new parallel routes of A593 as non-bidirectional routes in Phase 1 seemed to decrease the technical risk estimates for the same and opposite directions significantly. Therefore, establishing parallel routes in the entire AKARA corridor airspace under Phase 2 would further decrease the technical risk estimates.

2.20 JASMA had received a report of category D[3] LHD (ATC system loop error) that occurred more than 100NM East of the AKARA corridor airspace in May 2021. Pilots misunderstood a heading instruction by Fukuoka ACC as a descending clearance to the FLAS altitude. According to the investigation by Fukuoka ACC, pilots flying the AKARA corridor airspace expected flight level change before entering the corridor. JASMA considered the pilots' expectation for altitude change due to FLAS could not be overlooked as a potential risk of LHD.

2.21 The meeting is invited to note that the matter of the FLAS was also discussed at the Ninth Meeting of the ATM Sub-Group of APANPIRG (ATM/SG/9, 01 to 05 November 2019), as reported to this meeting under Agenda Item 3.2.

2.22 The meeting was reminded of the identification of the Corridor as one of the five LHD hot spot areas in the APAC Region (**Hot Spot B**) at RASMAG/20 (Bangkok, Thailand, 26-29 May 2015). Republic of Korea informed the meeting that the Pacific Approvals Registry and Monitoring Organization (PARMO) RMA had conducted safety assessments for the Corridor every year since 2015 (**Table 2**).

Year	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Overall vertical collision risk	46.2×10^{-9}	2.08×10^{-9}	1.75×10^{-9}	55.1×10^{-9}	247.0×10^{-9}	45.1×10^{-9}

Table 2: Vertical safety assessment of the AKARA - FUKUE Corridor

2.23 The 62% fall in traffic volume in the Corridor due to the coronavirus outbreak had led to the number of LHD reports falling from 29 in 2019 to 5 in 2020. However, the overall vertical collision risk continued to exceed the TLS due to the Corridor being highly susceptible to even a single deviation resulting in the airspace not meeting TLS.

2.24 Regarding a proposal that the AKARA – FUKUE Corridor be removed from the list of LHD Hot Spots, the meeting was reminded that usual RASMAG practice was to retain the identification of hot spots for 2 years following the achievement of overall collision risk below the TLS. ICAO proposed that any consideration of removal of hot spots should take into account the current major reduction in traffic and its effect on safety risk calculations. It would not be appropriate to remove hot spots under the prevailing circumstances only to find they had to be re-imposed after traffic volumes returned to more normal levels.

2.25 The meeting was informed that China and Republic of Korea were currently negotiating on Phase 2 implementation, and more time was needed to reach agreement. The three States, together with observers from other States and International Organizations, held a breakout session to discuss progress. A summary of discussion was provided in **RASMAG/26 Report of the Meeting - Appendix D**.

AAMA Vertical Safety Report

2.26 The Australia Airspace Monitoring Agency (AAMA) provided an airspace safety review of RVSM airspace risk within the Brisbane, Honiara, Melbourne, Nauru and Port Moresby FIRs. The TLS of 5 x 10^{-9} had been met, at **0.0017 x 10^{-9}.**

[3] The Large Height Deviation (LHD), Large Longitudinal Error (LLE) and Large Lateral Deviation (LLD) taxonomy is provided in **Attachment A**.

2.27 The total risk estimate for the Jakarta and Ujung Pandang FIRs at **0.181 x 10^{-9},** reflecting the significant decrease in flying hours and occupancy parameters (2019 vertical risk estimate 10.2 x 10^{-9}.

China RMA Vertical Safety Report

2.28 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).

2.29 The 2020 RVSM risk estimates for the Beijing, Guangzhou, Kunming, Lanzhou, Pyongyang, Sanya, Shanghai, Shenyang, Urumqi and Wuhan FIRs indicated that the TLS had not been met, at **7.107 x 10^{-9}**.

2.30 The risk estimate had resulted from 85 reported LHDs, including 34 Category I (*Turbulence or other weather related cause*. 40%), nine Category A (*Flight crew failing to climb/descend the aircraft as cleared*, 11%) and 10 Category E (*Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues*, 12%). Four Category E events had been reported in 2019.

2.31 The 2020 RVSM risk estimate for the Pyongyang FIR indicated that the TLS had been met at **1.04 x 10^{-9}**, as no LHD had been reported during 2020.

JASMA Vertical Safety Report

2.32 The vertical safety assessment for the RVSM airspace in the Fukuoka FIR's RVSM airspace for the period from January to December 2020, provided by JASMA, indicated that the TLS had not been met at **11.57 x 10^{-9}** (**Figure 3**).

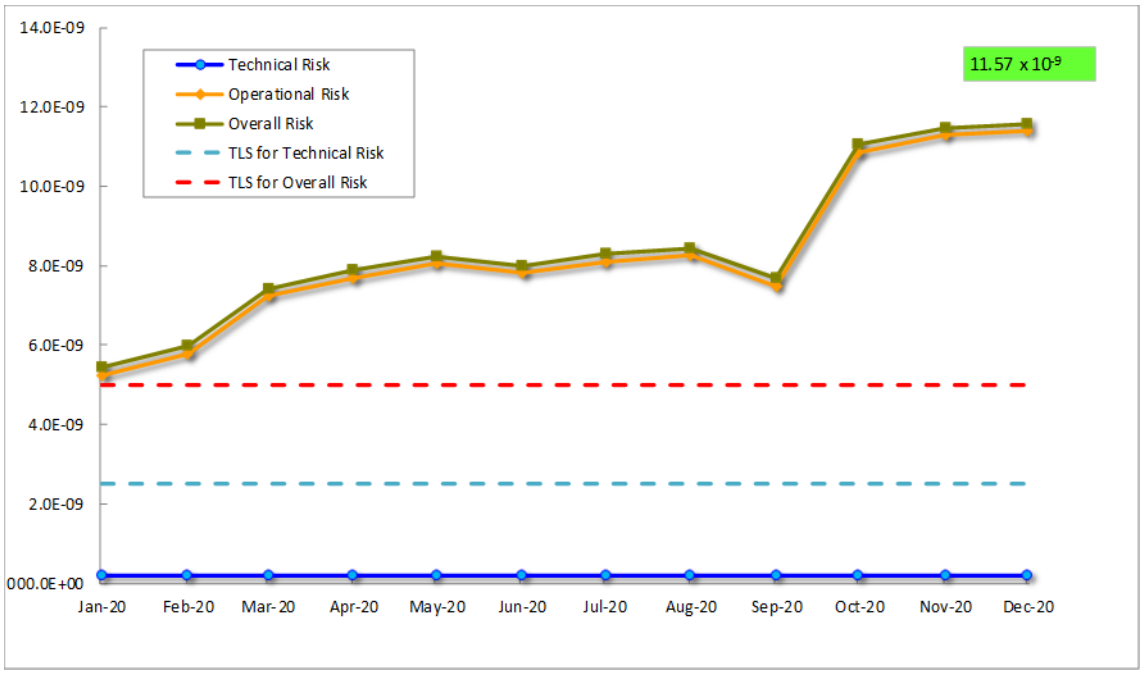

Figure 3: Japanese Airspace RVSM Risk Estimate Trends

2.33 Of the 42 LHDs reported during 2020 within the Fukuoka FIR:

- 10 were Category E (24%); and
- 11 were Category I (26%);

2.34 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.

MAAR Vertical Safety Report

2.35 The Monitoring Agency for the Asian Region (MAAR) provided the results of the airspace safety oversight for RVSM operations in South Asia/Indian Ocean Airspace (SAIO), Southeast Asia Airspace (SEA), and Mongolian Airspace during 2020.

South Asia Indian Ocean Airspace

2.36 The 2020 RVSM risk estimate for SAIO airspace indicated that the TLS had not been met at **15.67 x 10^{-9}** (**Figure 4**).

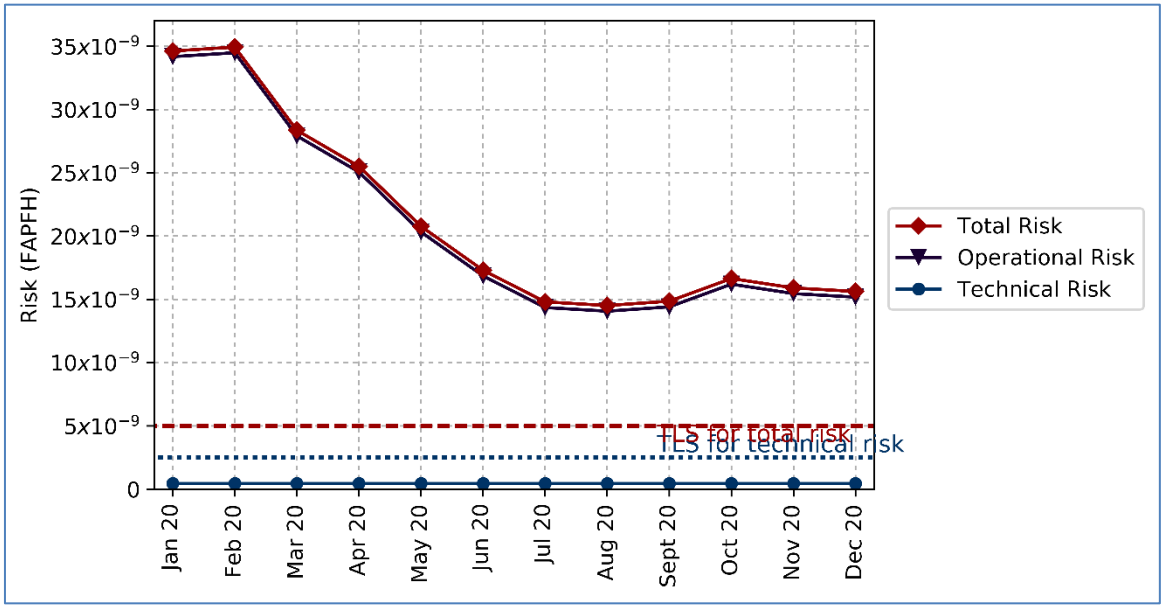

Figure 4: Trends of Risk Estimates for SA/IO Airspace.

2.37 As had been the case in previous years, the vast majority of the 152 LHD cases that had been reported were Category E events, with 138 (91%). The 65% reduction in numbers of LHDs from 434 in 2019 to 152 in 2020 reflected the 66% decrease in estimated annual flight hours.

2.38 LHD **Hot Spot F** (Mogadishu – Mumbai) and LHD **Hot Spot G** (Sanaa/Muscat – Mumbai) at the western boundary of Mumbai FIR remain as LHD hot spots since 2015. In 2020 the number of non-zero duration LHDs of these hot spots accounted for 62% of all non-zero-duration LHDs of the SAIO airspace and the resultant operational risk of **11.17 x 10^{-9} FAPFH** accounted for 74% of the total operational risk of the SA/IO airspace.

2.39 The majority of LHDs at the western boundary of the Mumbai FIR were Category E, with sub-category being 'no or late FL revision' and 'negative transfer'. The poor communication services and lack of surveillance coverage at these interfaces worsened the situation. It was strongly recommended that an engineering solution such as AIDC (hard barrier) be implemented with the Mumbai FIR to mitigate the risk. The meeting was informed that Mumbai ACC had conducted AIDC trials with Muscat ACC and Mogadishu ACC in March 2021. Some minor systematic issues were found and remained to be resolved before the AIDC implementation could proceed to the next phase. Space-based ADS-B had been implemented to enhance surveillance capability, particularly in oceanic airspace.

2.40 The number of LHDs at **LHD Hot Spot A1 (Kolkata/Dhaka - Yangon) and LHD Hot Spot A2 (Chennai - Kuala Lumpur)**, first identified as hot spots in 2015, had been decreasing from 275 in 2018 to 24 in 2020. All reported LHDs in 2020 had 0-min duration, resulting in the operational risk of 0 FAPFH. The reduction of operational risk to 0 FAPFH was related to safety enhancement initiatives including ADS-B data sharing between Kolkata and Yangon, and AIDC between Chennai and Kuala Lumpur, as well as the reduction in traffic volume.

2.41 **LHD Hot Spot I (Karachi – Kabul)** was de-identified from being an LHD hot spot by RASMAG/25. In 2020, Kabul ACC identified and reported more of their operational risk from LHD occurrences within their own airspace and at the boundaries with Lahore FIR and Karachi FIR, as depicted in **Figure 5**.

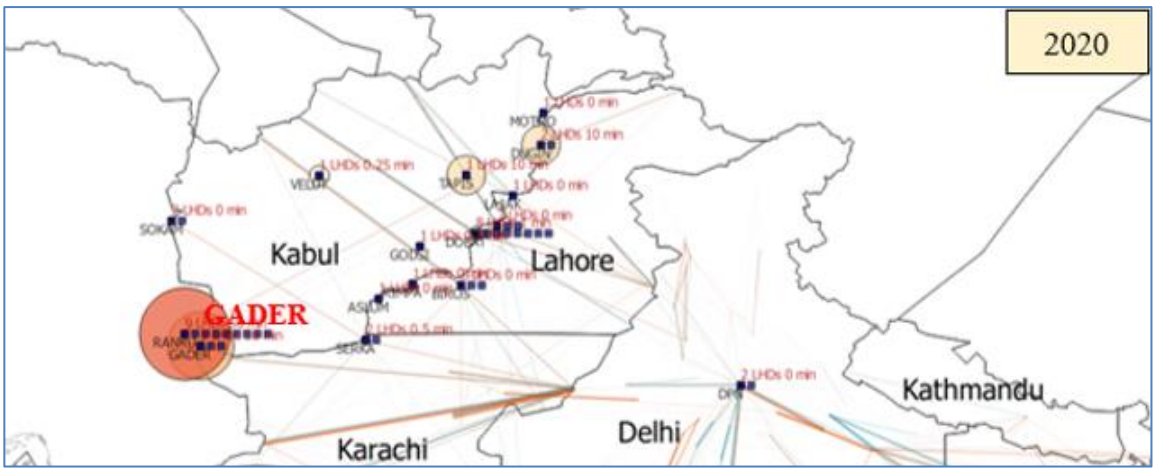

Figure 5: Kabul FIR LHDs

2.42 The number of LHDs and operational risk at GADER and RANRU, most of which were Category E, increased in 2020. Poor communication and surveillance coverage did not allow Kabul ACC to detect and resolve the issues before an aircraft passed the transfer-of-control point. This issue was to be closely monitored together with the dynamic situation over the Kabul airspace in 2021, but such monitoring (and its reporting) are likely to be heavily impacted by the ongoing Kabul FIR ATM contingency situation, continuing since 16 August 2021.

Southeast Asian Airspace

2.43 The 2020 RVSM risk estimate for SEA airspace indicated that the TLS for total risk had been met at **1.82×10^{-9}** FAPFH.

2.44 27 of the 39 reported LHDs in SEA airspace (69%) were classified as Category E, which contributed to most of the operational risk (1.35×10^{-9} FAPFH).

2.45 Even though the situation of **LHD Hot Spot D (Manila and all adjacent FIRs)** seemed to be improving, the majority of the reported LHDs and the operational risk of the SEA airspace still remained along the boundaries of Manila FIR. A total of 24 LHDs at Manila FIR boundaries accounted for 62% of the number of LHDs in the SEA airspace. The resultant operational risk of 1.05 x 10^{-9} FAPFH accounted for 74% of the operational risk of the SEA airspace. Two out of three long duration LHDs occurred at Manila FIR boundaries.

2.46 **Figure 6** illustrates the trend of LHDs being reported along Manila FIR boundaries together with the timeline of major safety improvement implementation by Manila ACC and the adjacent units. Since the transition to the new ATM centre in 2018, Manila ACC aimed to continually improve their communication and surveillance capabilities with ADS-C/CPDLC, AIDC and ADS-B technology.

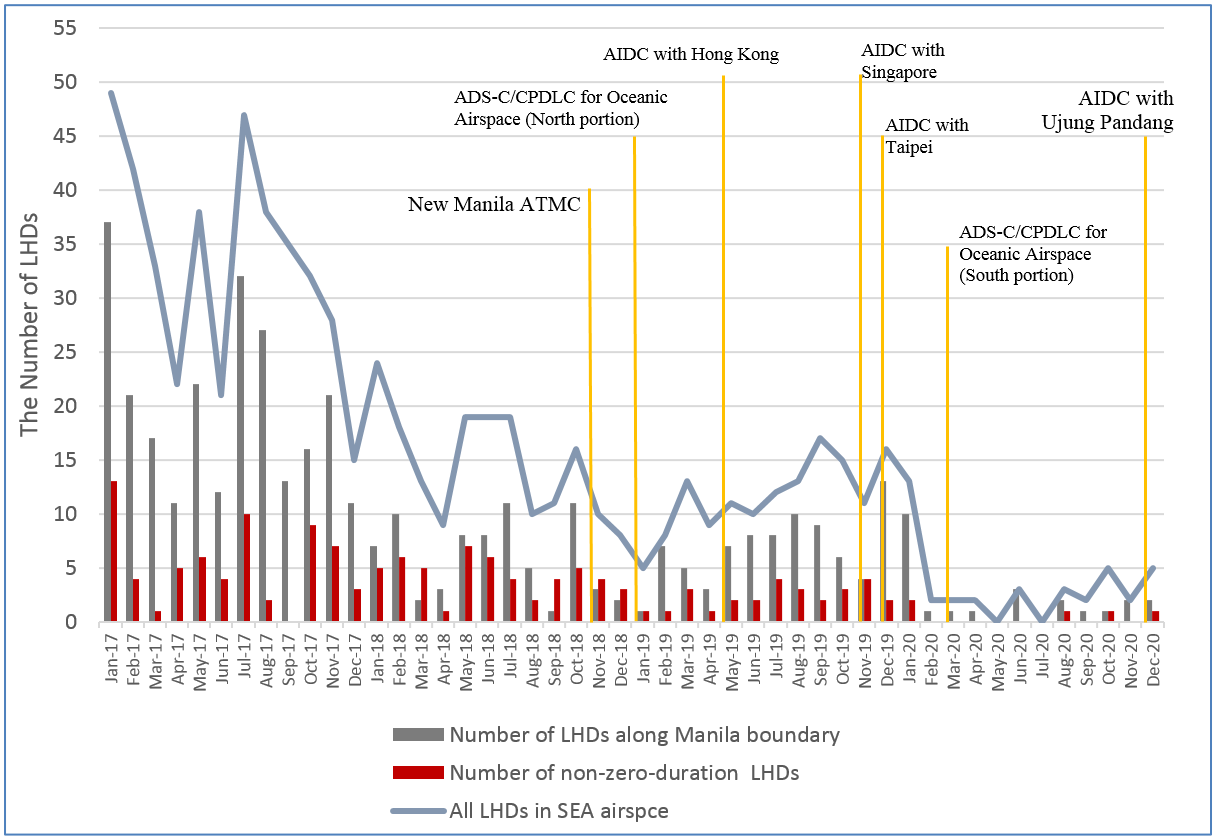

Figure 6: LHDs along Manila FIR Boundary 2017 to 2020

2.47 The number of Category F LHDs slightly decreased from 9 (2019) to 6 LHDs, caused by AIDC system failures and the unsuccessful transfer via AIDC. ICAO noted that system alerts to ATC and robust procedures requiring voice coordination in the event of failure of AIDC message exchange were necessary for all AIDC implementations.

Mongolian Airspace

2.48 The 2019 RVSM risk estimate for Mongolian airspace indicated that the TLS had been met at **0.87 x 10^{-9}**. No LHD was reported in 2020 within or at the boundary of Mongolian airspace.

PARMO Vertical Safety Monitoring Report

2.49 PARMO provided a vertical safety assessment for the Pacific RVSM airspace and a portion of the Incheon FIR during 2020.

Pacific Airspace

2.50 The 2020 RVSM risk estimate for Pacific airspace indicated that the TLS had not been met at **22.04×10^{-9}** (**Figure 7**).

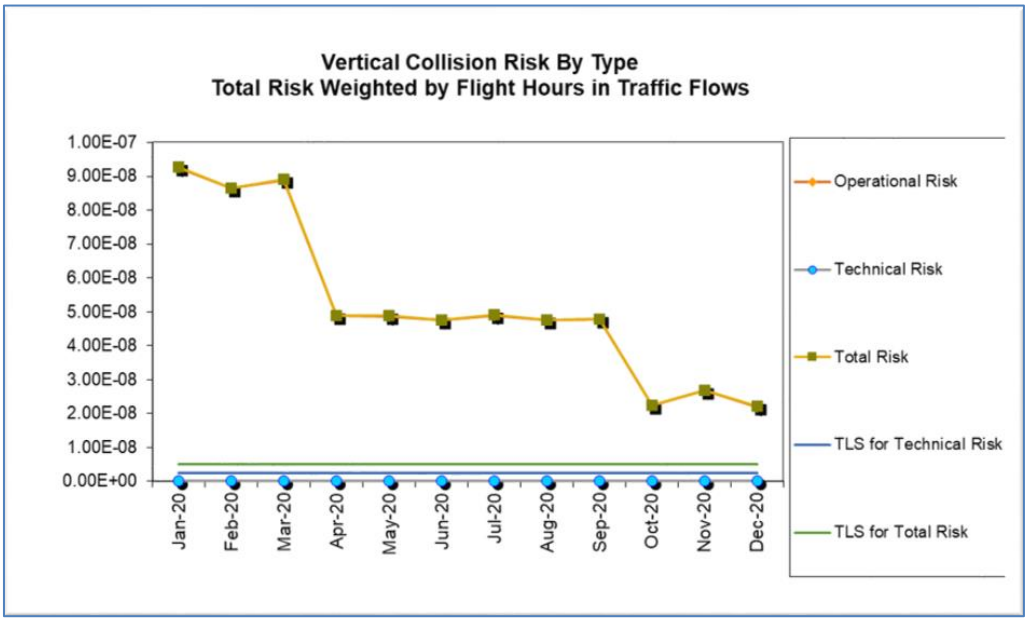

Figure 7: Pacific Airspace RVSM Risk Estimate Trends

2.51 Of the 51 LHDs, 27 were classified as Category E (53%, compared to 81% in 2019). There were also nine Category B *Flight crew climbing /descending without ATC clearance* LHDs (18%). The geographical location of reported Pacific LHDs is depicted in **Figure 8**.

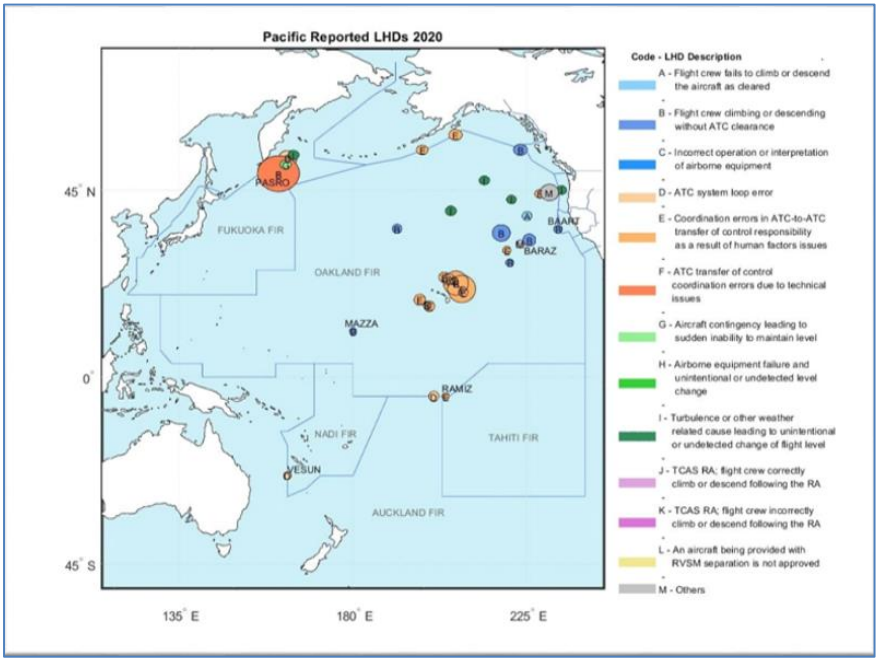

Figure 8: Location of Pacific LHDs, 2020

2.52 The longest reported LHD duration was 33 minutes, which was approximately 20 percent of the total LHD duration for 2020 in Pacific airspace.

2.53 A task force had been established to develop mitigations for the high number of reported Category E occurrences between Honolulu Control Facility (HCF) and Oakland Center.

North East Asia Airspace

2.54 The 2020 RVSM risk estimate for the Incheon FIR (not including the AKARA – FUKUE Corridor) indicated that the TLS had been met at **0.23×10^{-9}**

2.55 There were two LHDs reported in North East Asia airspace in 2020. Both were Category E (**Figure 9**).

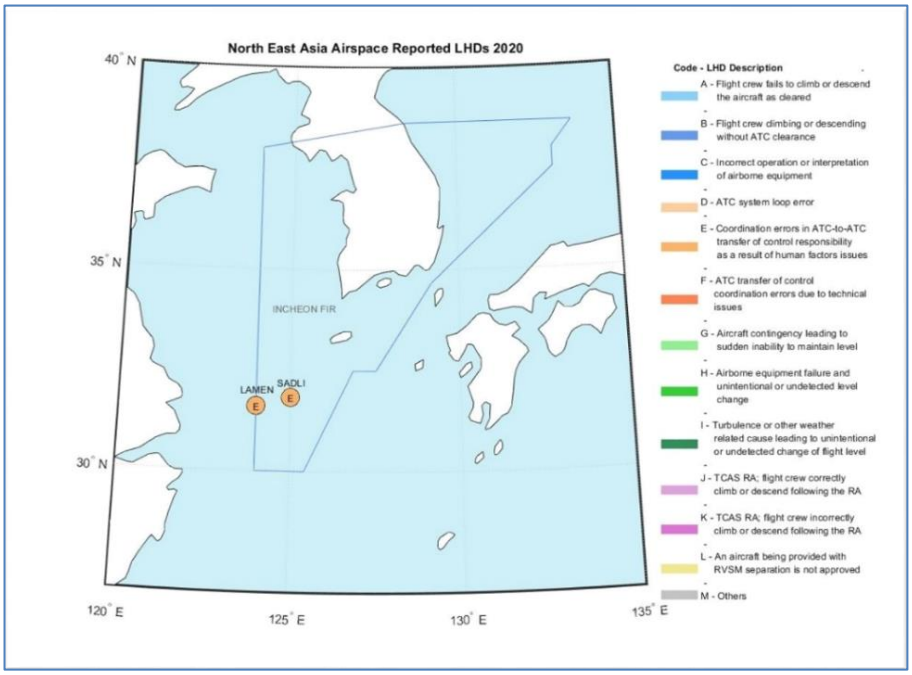

Figure 9: Location of North East Asia LHDs, 2020

Hot Spots

2.56 **Table 3** summarizes current LHD Hot Spots, the FIRs involved, the year of identification, and status remarks.

Hot Spot	Involved FIRs	Identified	Remarks
A1	Kolkata/Chennai/Dhaka-Yangon	2015	Cat. E LHDs reducing
A2	Chennai – Kuala Lumpur	2015	Cat. E LHDs reducing
B	Incheon (AKARA Airspace)	2015	Cat. E LHDs
D	Manila – all adjacent FIRs	2015	Cat. E LHDs reducing Cat F LHDs emerging
F	Mogadishu – Mumbai	2015	Cat. E LHDs
G	Sanaa/Muscat – Mumbai	2015	Cat. E LHDs (Sanaa improved)
J	Jakarta – Singapore/Kota Kinabalu	2018	Cat. E LHDs, minor and reducing
M	Colombo – Melbourne	2019	Proposed to re-classify as non-hot spot, subject to further data
N	Oakland USA – Hawaii CEP	2019	Cat. E LHDs increasing

Table 3: LHD Hot Spots in the Asia/Pacific Region

Horizontal Safety Assessments

2.57 Horizontal safety assessments provided by APAC monitoring agencies indicated that the TLS of 5.0 x 10^{-9} had been met in all FIRs. The contribution of the significantly reduced traffic levels to an overall reduction in the estimated horizontal safety risk across the region was acknowledged. **Table 4** summarizes regional performance-based horizontal risk assessments.

ATC Separation	EMA	2019 Estimated Risk	2020 Estimated Risk
50NM Lateral	BOBASMA	1.59 x 10^{-9}	0.64 x 10^{-9}
	JASMA	1.45 x 10^{-9}	0.65 x 10^{-9}
	PARMO	-	-
	SEASMA	0.012 x 10^{-9}	0.012 x 10^{-9}
30NM Lateral	PARMO	3.35 × 10^{-9}	0.09 × 10^{-9}
50NM Longitudinal	BOBASMA	4.97 x 10^{-9}	0.87 x 10^{-9}
	PARMO	-	2.22 × 10^{-9}
	SEASMA	0.38 x 10^{-9}	0.38 x 10^{-9}
30NM Longitudinal	BOBASMA	-	-
	JASMA	0.015 x 10^{-9}	0.015 x 10^{-9}
	PARMO	4.08 × 10^{-9}	4.08 × 10^{-9}

Table 4: Comparison of Horizontal Risk Assessments

APAC Consolidated Safety Report

2.58 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 report was divided into the Pacific (PAC) area, and Asia area.

Pacific Area Vertical Collision Risk

2.59 The estimated vertical collision risk for 2020 for the PAC area did not meet TLS. (**Table 5**). The overall risk vertical risk had been increasing from 2016 to 2020 due to improvements in reporting culture.

Pacific Area – annual flying hours = 1,749,178 hours			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Vertical Technical Risk	0.14 × 10^{-9}	2.5 × 10^{-9}	Below Technical TLS
Vertical Operational Risk	16.57 × 10^{-9}	-	-
2020 Vertical Overall Risk	**16.71 × 10^{-9}**	5.0 × 10^{-9}	**Above TLS**

Table 5: Pacific Area Vertical Collision Risk 2020

2.60 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 **(Table 6**)

Year	Vertical Overall Risk Estimate (x 10^{-9} FAPFH)	Remark
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 6: Pacific Area Vertical Collision Risk Estimates 2016 - 2020

2.61 There was a total of 91 LHDs in the Pacific area in 2020, with total duration 312.90 minutes and 82 levels crossed. 17 of the occurrences were Category A, B or C (19%), 48 were Category D, E or F (53%), and 16 were Category I (18%).

Pacific Area Horizontal Collision Risk

2.62 The estimated horizontal collision risk for 2020 for the PAC area met TLS in all longitudinal and lateral risk categories.

2.63 There was a total of 109 LLDs and LLEs in the Pacific area in 2020, with a total duration of 781 minutes and total horizontal deviation of 544NM. 70 of the occurrences were Category E (64%), 13 were Category A or B (12%), 10 were Category G (9%) and 14 were Category H (13%).

Asia Area Vertical Collision Risk

2.64 The estimated vertical collision risk for 2020 for the Asia area did not meet TLS (**Table 7**). The overall risk continued to decline since 2017 due to various safety improvement initiatives, but remained above TLS.

Asia Area – annual flying hours = 5,404,154 hours			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Vertical Technical Risk	0.33×10^{-9}	2.5×10^{-9}	Below Technical TLS
Vertical Operational Risk	7.09×10^{-9}	-	-
2020 Vertical Overall Risk	**7.42×10^{-9}**	5.0×10^{-9}	**Above TLS**

Table 7: Asia Area Vertical Collision Risk 2020

2.65 The Asia vertical collision risk estimates had been above TLS each year from 2016 to 2019, and trending downwards since 2017. In 2020 there was a significant fall in the risk estimate, while still remaining above TLS, reflecting the reduction in traffic volumes caused by the COVID-19 pandemic **(Table 8**)

Year	**Vertical Overall Risk Estimate (x 10^{-9} FAPFH)**	**Remark**
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 8: Asia Area Vertical Collision Risk Estimates 2016 - 2020

Asia Area Horizontal Collision Risk

2.66 The estimated horizontal collision risk for 2020 for the Asia area met TLS in all longitudinal and lateral risk categories.

Safety Reporting

2.67 **Table 9** shows the number of LHD, LLD and LLE reports for 2016 to 2020, and the number of reports per flying hours. Total estimated flying hours 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%. The total number of reports approximately halved, from 1094 in 2019 down to 548 in 2020.

2.68 The number of reports per flying hours in 2020 increased from 2019 in China, Indonesia, Japan, South Asia/Indian Ocean (marginally), South West Pacific and Pacific, leading to an overall reporting rate that was slightly improved from the 2019 reporting rate.

2.69 The number of reports per flying hours decreased in Republic of Korea and South East Asia. China, Republic of Korea and South East Asia were among the lowest recorded reporting rates for the region. Data was not available for DPR Korea or Mongolia.

Airspace	# Reports					1 Report : Flying Hrs				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
DPRK	0	0	0	0	0	-	-	-	-	-
Mongolia	0	4	1	2	0	-	1: 37,771	1: 158,891	1: 82,138	-
China	117	134	110	79	85	1: 20,413	1: 18,248	1: 22,229	1: 31,119	1: 26,867
ROK	6	5	12	34	5	1: 93,291	1: 117,090	1: 28,365	1: 18,959	1: 25,965
SEA	426	474	205	152	42	1: 5,884	1: 6,548	1: 17,757	1: 22,275	1: 25,106
Indonesia	32	34	23	37	18	1: 11,520	1: 10,842	1: 53,603	1: 33,321	1: 17,346
Japan	43	71	76	77	66	1: 33,834	1: 21,510	1: 20,632	1: 20,762	1: 14,737
SA/IO	778	935	681	439	152	1: 3,689	1: 3,166	1: 3,783	1: 7,955	1: 7,907
SW Pacific	52	51	53	101	46	1: 16,639	1: 17,572	1: 17,817	1: 9,335	1: 6,954
Pacific	33	42	43	173	134	1: 63,500	1: 54,191	1: 45,064	1: 10,139	1: 6,404
Total	**1,487**	**1,750**	**1,204**	**1,094**	**548**	**1: 8,905**	**1: 8,180**	**1: 12,332**	**1: 14,330**	**1: 11,712**

Table 9: Total LHD, LLD and LLE Reports, and Reports per Flying Hours, 2016 - 2020

RASMAG Safety Bulletin Issue 02

2.70 MAAR informed the meeting of the publication of RASMAG Safety Bulletin Issue 02. The Bulletin, designed to capture some guidance and recommendations provided in the second edition of ICAO Doc 10037 *Global Operational Data Link (GOLD) Manual*, was published on the ICAO Asia/Pacific Regional Office eDocuments web-page at https://www.icao.int/apac/pages/edocs.aspx (ATM section, Safety Monitoring Sub-Section).

Identification of Non-Approved Airframes Operating in RVSM Airspace

2.71 AAMA informed the meeting of non-RVSM approved airframes indicating RVSM approval status over a period of three months or more. 10 airframes were identified, including six from Australia, and one each from Greece, India, Papua New Guinea and United States. The airframe from India (IN320, Indian Navy, i.e. a State aircraft) and the airframe from Papua New Guinea (M2ZMY) had been operating in RVSM airspace without RVSM approval for 12 months or more.

2.72 Similarly, JASMA reported a total of 21 airframes operating in the RVSM airspace of Fukuoka FIR with no registration of RVSM in the approval databases as of June 2021, including one each from Canada, China, Indonesia and the Solomon Islands, two from Malaysia and 14 from USA. Almost all of the listed aircraft were identified only once in the period from January to June 2021.

2.73 MAAR presented the result of an annual audit that detected 19 aircraft that operated in RVSM airspace without valid RVSM approvals in the RMA's database. The reduction from 26 in the previous year's audit was likely to be due to the reduction of flights during the COVID-19 pandemic. India had the highest number of aircraft on the list (12, all domestic flights and increased from eight reported to RASMAG/25). Others were from Indonesia (four), Australia (one) and Malaysia (two)

2.74 Brunei Darussalam, Myanmar and Pakistan did not submit annual RVSM data snapshots. Myanmar and Viet Nam had not adopted the new F2 form, which included PBCS approvals information.

2.75 Non-approved aircraft detected by China RMA were from Australia (three), Hong Kong China (one), Indonesia (nine), Philippines (three), Republic of Korea (one) and USA (two).

2.76 The PARMO assessment identified three aircraft; one each from Greece, Netherlands (Aruba) and Solomon Islands, which would be further investigated and appropriate parties queried if no additional information was obtained.

JASMA Assessment of Non-PBCS Approved Aircraft

2.77 JASMA presented a list of operator-aircraft combinations operating within the Pacific Ocean airspace of the Fukuoka FIR with no registration of PBCS approval from April 2020 to June 2021. While the percentage of all flights in the Pacific Ocean airspace of the Fukuoka FIR that had filed PBCS indicators in flight plans increased to over 87% over the period, the percentage that were recorded in the database as PBCS-approved remained below 80%. Details were provided of the 203 airframes that had filed PBCS indicators but were not included in the PBCS approvals database.

RMAs' 'W' Verification of State Aircraft

2.78 The RASMAG Chair presented a paper addressing an action item from the RMACG/14 meeting, which asked all RMAs to request clarification from their respective PIRGs on responsibilities of the RMA regarding verification of the approval status of State aircraft (military and other government aircraft performing non-commercial, sovereign functions) and their relation to civil authorities.

2.79 APAC RMAs currently conducted monthly or annual audits of the use of the 'W' designator in flight plans, including the flight plans of State aircraft, against the global snapshot of all RMAs' approval records. Aircraft that included 'W' in flight plans but did not have matching RVSM approval were generally called 'rogue' aircraft. The rogue aircraft that persistently remained on the list were mostly State aircraft. In order for the rogue State aircraft to be removed from the list either the State aircraft's approval data had to be provided to the designated RMA, or the State aircraft operator had to stop using 'W' in item 10 of the ICAO flight plan.

2.80 **Table 10** summarized the effects on stakeholders if the RMAs discontinued the audit process with respect to State aircraft:

Stakeholder	Pros	Cons
State CAA	No requirement to try to liaise with its State aircraft operators regarding their RVSM approval status, which can be viewed as going beyond their scope of responsibilities.	Increased risk in the oversight airspace if any rogue State aircraft enter the airspace.
ATSP	Simpler procedure as there is no need to re-confirm RVSM approval status of rogue State aircraft.	Increased risk in its airspace if any rogue State aircraft enter the airspace.
Civil aircraft operators	-	Increased risk of mid-air collision from being provided with 1,000 ft separation near rogue State aircraft that do not satisfy all RVSM safety requirements.
State aircraft operators	Less likely to be penalized by being treated as non-RVSM approved while they might genuinely satisfy all RVSM safety requirements	Increased risk of mid-air collision from being provided with 1,000 ft separation if they actually do not satisfy all RVSM safety requirements
RMA	Less workload associated with handling rogue State aircraft	-

Table 10: Effect of RMA discontinuance of auditing State aircraft RVSM compliance.

2.81 In discussion the meeting noted that some States or their RMAs were not permitted to share RVSM approval data for State aircraft.

2.82 Noting that there was a 'political' dimension that warranted the matter be discussed by APANPIRG, the meeting agreed to a Draft Conclusion for consideration by APANPIRG/32:

2.83 As also reported under Agenda Item 3.2, the Draft Conclusion was presented to ATM/SG/9 for endorsement. ATM/SG/9 did not endorse the Draft Conclusion.

2.84 While noting the need for RVSM approval for all aircraft that included the RVSM indicator in flight plans, for the safety of operations in the airspace, the ATM/SG/9 meeting considered that there would be considerable difficulty in sharing data on State aircraft outside the State. Items 1a. and 1b. of the Draft Conclusion (see next page) were not supported by ATM/SG, but the remainder was acceptable.

Note: The States that did not support the Draft Conclusion at ATM/SG/9 were present at the RASMAG/26 meeting and had supported the Draft Conclusion at that time.

2.85 The Draft Conclusion as originally proposed by RASMAG/26 is presented for consideration by the meeting:

<table>
<tr><td colspan="3">Draft Conclusion RASMAG/26-3: RVSM Approvals Data and Filing of RVSM Indicator in Flight Plans of State Aircraft</td></tr>
<tr><td colspan="2">What: That, States are urged to:
1. liaise with their State aircraft operators to:
a. share State aircraft RVSM approval data with the designated RMA where State aircraft RVSM approval processes are implemented;
b. confirm the RVSM approval status of State aircraft when queried by the RMA; and
c. 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.</td><td>Expected impact:
☒ Political / Global
☒ Inter-regional
☐ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To improve airspace safety by ensuring that only RVSM-approved State aircraft file the RVSM ‘W’ indicator in filed flight plans, and facilitating the monitoring of RVSM approvals and performance of State aircraft by Regional Monitoring Agencies</td><td colspan="2">Follow-up: ☒Required from States</td></tr>
<tr><td>When: 3-Dec-21</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☒ICAO HQ ☒Other: RASG</td></tr>
</table>

APAC Consolidated LTHM Burden Estimate

2.86 MAAR presented the overview of Long Term Height Monitoring (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 2021, yielded a remaining monitoring burden of 422 aircraft, which was a 5% increase since 2019.

2.87 MAAR had a total of 294 aircraft remaining to be monitored, which accounted for 70% of all aircraft remaining to be monitored in the APAC Region. Pakistan had the highest percentage of remaining monitoring burden at 61%.

2.88 70 aircraft remained to be monitored by AAMA, accounting for 17% of the APAC remaining monitoring burden. Australia’s remaining monitoring burden had decreased 13%. Indonesia had a 41% remaining monitoring burden.

2.89 46 aircraft remained to be monitored by China RMA, accounting for 11% of all remaining aircraft to be monitored in APAC – a 44% decrease since RASMAG/25.

2.90 11 aircraft remained to be monitored by JASMA, accounting for only 3% of all aircraft remaining to be monitored in the APAC Region. There was only 1 aircraft remaining to be monitored by PARMO, accounting for only 0.2% of the remaining regional monitoring burden.

2.91 **Table 11** 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	2019%	2020%
Pakistan (MAAR)	46%	61%
India (MAAR)	46%	51%
Solomon Islands (AAMA)	0%	50%
Philippines (MAAR)	43%	48%
Nepal (MAAR)	45%	46%
Afghanistan (MAAR)	85%	42%
Indonesia (AAMA)	42%	41%
Bhutan (MAAR)	40%	40%
Bangladesh (MAAR)	14%	36%
Malaysia (MAAR)	26%	33%
Papua New Guinea (AAMA)	8%	31%
Mongolia	14%	30%

Table 11: Remaining LTHM Monitoring Burden ≥30% or more

2.92 While noting that RASMAG/23 had agreed that States with a remaining burden 30% or more would be proposed to be added to the APANPIRG Deficiencies List, MAAR observed that operators had been trying to fulfil their height monitoring requirements but could not do so due to the unavailability of Enhanced GPS-based Monitoring Unit services during the pandemic. It was therefore proposed that consideration of new deficiencies be delayed until an alternative means of height monitoring became available.

2.93 However, the RASMAG Chair noted that if the pandemic effects continued the monitoring burden may continue to become more serious. There were other ways to obtain height monitoring data, particularly from ANSPs, that may help to relieve the burden. RMAs were strongly encouraged to investigate available means to obtain data. MAAR was prepared to assist in this matter. The meeting further noted that the risks of not taking action to record Deficiencies could result in increased safety risks if and when some normal level of traffic resumed. It was therefore proposed that the meeting report include the statement that new Deficiencies would be recorded by RASMAG/27.

ATM and Airspace Safety Deficiencies List

2.94 The meeting reviewed the APANPIRG ATM and Airspace Safety Deficiency List and agreed to make the following recommendations to APANPIRG/32:

a) deletion of the Deficiency for Fiji related to PRs not being provided to the Central Reporting Agency (CRA);

b) deletion (provisional) of the Deficiency for Afghanistan related to non-provision of safety related data; and

c) amendment of the Deficiency for India related to non-reporting of data link performance monitoring and analysis, to remove reference to Kolkata FIR.

2.95 Regarding the deletion of the Deficiency recorded against Afghanistan, ICAO informed the meeting there had been major disruption of Air Navigation Services (ANS) in Afghanistan, and the continued provision of the safety data that had been received in 2020 and each month up to August in 2021 was not assured. The meeting agreed that if the provision of safety-related data did not continue in the next few months before APANPIRG/32 the Deficiency should be retained. The deficiency remains recorded in the ATM and Airspace Safety Deficiencies List presented under APANPIRG/32 Agenda Item 4.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note –

i. **Conclusion RASMAG/26-1: FANS1/A CPDLC Latency Timer Value;**

ii. **Conclusion RASMAG/26-2: RVSM MMR Update**;

b) note the overall data link ASP and ACP for the Asia/Pacific Region;

c) note the progress of airspace normalization in the AKARA – FUKUE Corridor;

d) note the overall vertical and horizontal safety risk estimates for the Asia/Pacific Region, and particularly the APAC Consolidated Safety Report;

e) note the overall improvement in LHD, LLD and LLE safety reports per flight hours in the APAC Region, which however included low and/or significantly decreased reporting rates among some States/sub-regional areas;

f) note the safety impacts of 'rogue' non-approved State aircraft filing the RVSM indicator in flight plans, and discuss and agree to **Draft Conclusion RASMAG/26-3: RVSM Approvals Data and Filing of RVSM Indicator in Flight Plans of State Aircraft**;

g) note the increased regional LTHM burden, pandemic-related constraints affecting the addressing of LTHM burden, and the planned identification of new ATM and Airspace Deficiencies in this regard, deferred by one year until 2022 (RASMAG/27);

h) review the proposed ATM and Airspace Safety Deficiency changes (under Agenda Item 4); and

i) discuss any other relevant matters as appropriate.

— END —

ATTACHMENT A – LHD/LLE/LLD TAXONOMY

Source: Guidance Material for the Continued Safety Monitoring of the Asia/Pacific RVSM Airspace Version 1.0

LHD TAXONOMY

LHD Code	LHD Category Description
A	Flight crew failing to climb/descend the aircraft as cleared
B	Flight crew climbing /descending without ATC clearance
C	Incorrect flight level provided due to incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance in FMS, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance, etc.)
D	ATC system loop error; (e.g. ATC issues incorrect flight level clearance or flight crew misunderstands the flight level clearance message)
E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues (e.g. late or non-existent coordination of flight level)
F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues (e.g. late or non-existent coordination of flight level)
G	Aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure);
H	Airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors)
I	Turbulence or other weather related causes leading to unintentional or undetected change of flight level
J	TCAS resolution advisory; flight crew correctly climb or descend following the resolution advisory
K	TCAS resolution advisory; flight crew incorrectly climb or descend following the resolution advisory
L	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RVSM approval but aircraft not approved, ATC misinterpretation of flight plan)
M	Others

Table A1: LHD Taxonomy

LLE/LLD TAXONOMY

LLE/ LLD Code	LLE and LLD Category Description
A	Flight crew deviate without ATC Clearance in the horizontal dimension
B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance, original clearance followed instead of re-clearance in FMS, incorrect time estimate sourced from flight deck, etc.)
C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position
D	ATC system loop error (e.g. ATC issues incorrect route clearance, Flight crew misunderstands route clearance message, etc.)
E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues (e.g. late or non-existent coordination, incorrect time estimate/actual, ATS route, etc. not in accordance with agreed parameters)
F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues (e.g. non-existent coordination, incorrect time estimate, or ATS route attributed to technical causes)
G	Navigation errors due to airborne equipment failure leading to a deviation in the horizontal dimension of which notification was not received by ATC or notified too late for action
H	Turbulence or other weather related causes (other than approved) leading to a deviation in the horizontal dimension
I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;
J	Others

Table A2: LLE/LLD Taxonomy