



ICAO

**Thirty First Meeting of the Asia/Pacific Air Navigation
Planning and Implementation Regional Group
(APANPIRG/31)**

Video Teleconference - Bangkok, Thailand, 14 to 16 December 2020

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

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

3.3: RASMAG

RASMAG/25 OUTCOMES

(Presented by the RASMAG Chair)

SUMMARY

This paper provides a summary of the key outcomes from the Twenty-Fifth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/25), and its contributory bodies. One Draft Conclusion is presented to APANPIRG/31's consideration from the meeting.

Strategic Objectives:

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

1. INTRODUCTION

1.1 The Twenty-Fifth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/25) was held from 27 to 30 October 2020 by Video Teleconference (VTC) from the ICAO Asia and Pacific Regional Office, Bangkok, Thailand.

1.2 A total of 117 participants attended RASMAG/25 from Australia, Bangladesh, Cambodia, China, Hong Kong China, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Zealand, Philippines, Republic of Korea (ROK), Singapore, Sri Lanka, Thailand, United States of America (USA), Viet Nam, IATA, IFALPA and ICAO.

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

1.4 The RASMAG/25 Report is available on the ICAO APAC Regional Office website at: <https://www.icao.int/APAC/Meetings/2020%20RASMAG25/Final%20Report%20RASMAG25.pdf>

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

2. DISCUSSION

FIT-Asia Meeting Outcomes

2.1 The Tenth Meeting of the FANS Interoperability Team-Asia (FIT-Asia/10) was held by Video Teleconference from 03 to 06 August 2020.

2.2 The improvement in the submission of Problem Reports (PRs) that was noted at FIT-Asia/9 continued at FIT-Asia/10, as 66 PRs had been raised from July 2019 and June 2020, compared with 45 in the previous 12-month period. However, only six States had provided their annual survey response to FIT-Asia/10 in 2020: Australia, China, Philippines, Singapore, Thailand and Viet Nam.

2.3 States that were believed to have currently implemented, or intended to implement, performance based separations in the high seas airspace within their FIRs but were not listed in the corresponding procedure in ICAO Doc 7030 – *Regional Supplementary Procedures* included India, Indonesia, Maldives, Myanmar, Philippines and Sri Lanka. States had been requested to notify the ICAO Regional Office so a Proposal for Amendment (PfA) to Doc 7030 can be coordinated. Following the receipt of information subsequent to the FIT-Asia/10 meeting, coordination had commenced on the inclusion of relevant provisions in SUPPS for Indonesia, Philippines and Sri Lanka.

2.4 Analysis of the Required Surveillance Performance (RSP) aggregated data for the APAC Region indicated that performance requirements for RSP180 had not been met for Automatic Dependent Surveillance – Contract (ADS-C) messages delivered via High Frequency (HF), or messages delivered via Iridium and some Inmarsat paths.

2.5 Analysis of the Required Communications Performance (RCP) data indicated that requirements for RCP240 had not been met for Controller Pilot Datalink Communications (CPDLC) transactions delivered via High Frequency (HF) and mixed media, for CPDLC transactions delivered via Iridium paths in a few Asia/Pacific FIRs, and also for some aircraft operators observed below the RCP240 95% requirements within multiple APAC Flight Information Regions (FIRs).

2.6 PBCS non-compliance report templates had been intended for ANSPs to inform the relevant Regional Monitoring Agency (RMA) of aircraft/aircraft operators where data link performance did not comply with specifications. A revised non-compliance report form template was proposed to FIT-Asia/10 in order to include additional information, to harmonize with the template adopted in the North Atlantic (NAT) Region, and to use MS Excel format to facilitate data handling by the RMA. RASMAG/25 agreed to the following Conclusion developed by the FIT-Asia/10:

Conclusion RASMAG/25-1: Revised PBCS Non-Compliance Report Form Template	
What: That, the PBCS Non-Compliance Report Form Template at Appendix C to the Report be uploaded to the Asia/Pacific Regional Office website, to replace the previous template.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: To include additional information, to harmonize with the template already adopted in the North Atlantic (NAT) Region, and to use MS Excel format to facilitate data handling by the RMA.	Follow-up: <input type="checkbox"/> Required from States
When: 30-Oct-20	Status: Adopted by Subgroup
Who: <input checked="" type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:	

2.7 FIT-Asia/10 recommended deletion of the APANPIRG Deficiency for Myanmar related to PRs not being provided to the Central Reporting Agency (CRA).

2.8 RASMAG/25 noted that the Regional Monitoring Agencies Coordination Group (RMACG, VTC, July – August 2020) had urged State CAAs to liaise with State Aircraft operators (such as military aircraft) regarding the verification process and status of RVSM approvals. Those aircraft with no RVSM approvals were strongly advised not to file ‘W’ in item 10 of the ICAO Flight Plan in order to prevent their flight plans from being rejected by EUROCONTROL.

2.9 RASMAG/25 endorsed the updated MMR in accordance with the following Conclusion:

Conclusion RASMAG/25-2: RVSM MMR Update	
What: That, the Reduced Vertical Separation Minimum (RVSM) Minimum Monitoring Requirement (MMR) update at Appendix D to the Report be utilized by Regional Monitoring Agencies (RMAs) and States as appropriate.	Expected impact: <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
Why: The Regional Monitoring Agencies Coordination Group (RMACG) had updated the MMR for RMAs/States to utilise.	Follow-up: <input type="checkbox"/> Required from States
When: 30-Oct-20	Status: Adopted by Subgroup
Who: <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:	

AAMA Vertical Safety Report

2.10 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, and Jakarta and Ujung Pandang FIRs for 2019.

2.11 The 2019 RVSM risk estimates for Brisbane, Honiara, Melbourne, Nauru and Port Moresby FIRs indicated that the Target Level of Safety (TLS) of 5×10^{-9} had been met at 1.37×10^{-9} .

2.12 The 2019 RVSM risk estimates for the Jakarta and Ujung Pandang FIRs indicated that the TLS had not been met at 10.2×10^{-9} (Figure 1).

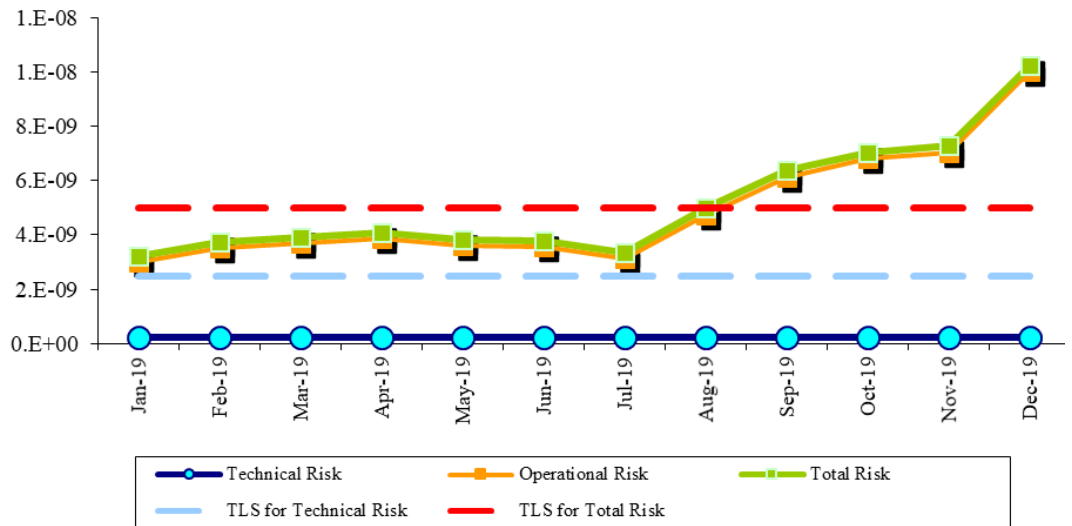


Figure 1: 2019 Vertical Risk Estimates for the Jakarta and Ujung Pandang FIRs

China RMA Vertical Safety Report

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

Chinese Airspace

2.14 The 2019 RVSM risk estimates for the Beijing, Guangzhou, Kunming, Lanzhou, Pyongyang, Sanya, Shanghai, Shenyang, Urumqi and Wuhan FIRs indicated that the TLS had been met at **1.367 x 10⁻⁹**.

Pyongyang FIR Airspace

2.15 The 2019 RVSM risk estimate for the Pyongyang FIR indicated that the TLS had been met at **3.02 x 10⁻⁹**, as no Large Height Deviation (LHD) had been reported during 2019. However, the technical risk exceeded the target level of technical risk of 2.5 x 10⁻⁹, which rarely occurred. China RMA indicated that they will further investigate this.

JASMA Vertical Safety Report

2.16 The vertical safety assessment for the Fukuoka FIR’s RVSM airspace by the Japan Airspace Safety Monitoring Agency (JASMA) during 2019. The 2019 RVSM risk estimate for the Fukuoka FIR indicated that the TLS had not been met at **11.57 x 10⁻⁹** (Figure 2).

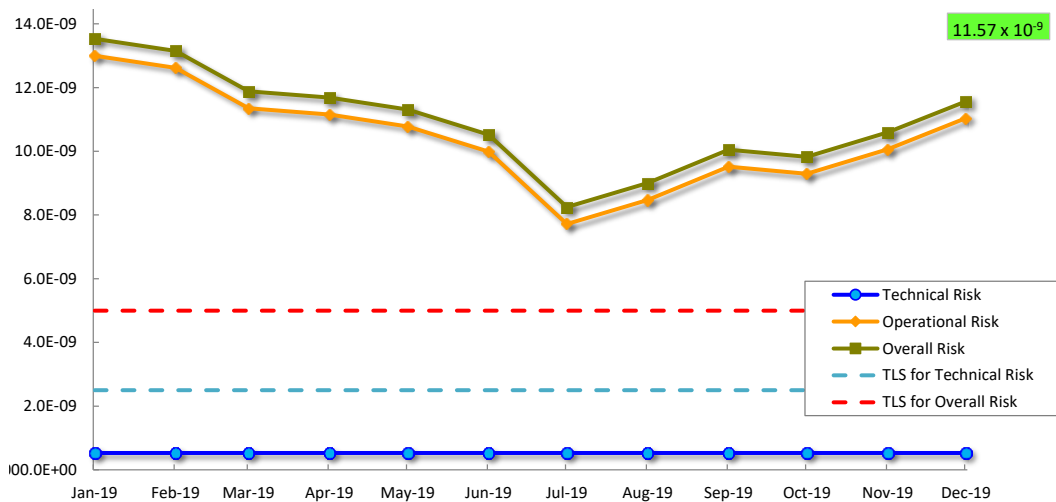


Figure 2: 2019 Vertical Risk Estimate for the Fukuoka FIR

2.17 With regard to Category D (*ATC system loop error*) events, JASMA provided more detailed analysis to the meeting after ICAO asked whether English Language Proficiency (ELP) might be an issue. While acknowledging the potential role of ELP, Japan noted that some of these incidents were due to similar call signs.

2.18 In response to a query from ICAO, IATA clarified that its successful similar call sign initiative that had been implemented in the Middle East (MID) Region had not been able to progress in the APAC Region. One of the reasons for this was the reluctance of aerodrome operators to implement change until an automated tool was available to accommodate alphanumeric call signs.

2.19 Noting the grave safety risks from such occurrences, the meeting agreed to the following Draft Conclusion (which were subsequently endorsed by the ATM/SG/8 and the AOP/SG/4).

Draft Conclusion RASMAG/25-3: Alphanumeric Call Sign Initiative	
<p>What: Noting: 1) the extreme safety risks associated with pilot-ATC miscommunication and the number of Category D (ATC Loop Error) Large Height Deviations (LHDs); 2) APANPIRG Conclusion 27/15. ATMSG Conclusions 5-5 and 5-6 regarding the Asia Pacific Alpha Numeric Call-Sign (ANCS) call sign project; and 3) alphanumeric call signs were a well-established call sign confusion mitigation, that: leading Air Navigation Service Providers (ANSPs) and aerodrome operators, in coordination with CANSO and ACI, were urged to consider a trial to identify and overcome any barriers for the implementation of alphanumeric call signs, with a view to developing a project for the Asia/Pacific (APAC) Region.</p>	<p>Expected impact: <input checked="" type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input checked="" type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical</p>
<p>Why: The Asia Pacific ANCS call-sign project had not been universally supported by aerodrome operators and ANSPs thus far.</p>	<p>Follow-up: <input type="checkbox"/> Required from States</p>
<p>When: 30-Oct-20</p>	<p>Status: Draft to be adopted by PIRG</p>
<p>Who: <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: RASG</p>	

MAAR Vertical Safety Report

2.20 The Monitoring Agency for the Asian Region (MAAR) provided the vertical safety assessment for the RVSM operation in South Asia/Indian Ocean Airspace (SAIO), Southeast Asia Airspace (SEA), and Mongolian Airspace during 2019.

South Asia Indian Ocean Airspace

2.21 The 2019 RVSM risk estimate for SAIO airspace indicated that the TLS had not been met at 36.78×10^{-9} (Figure 3).

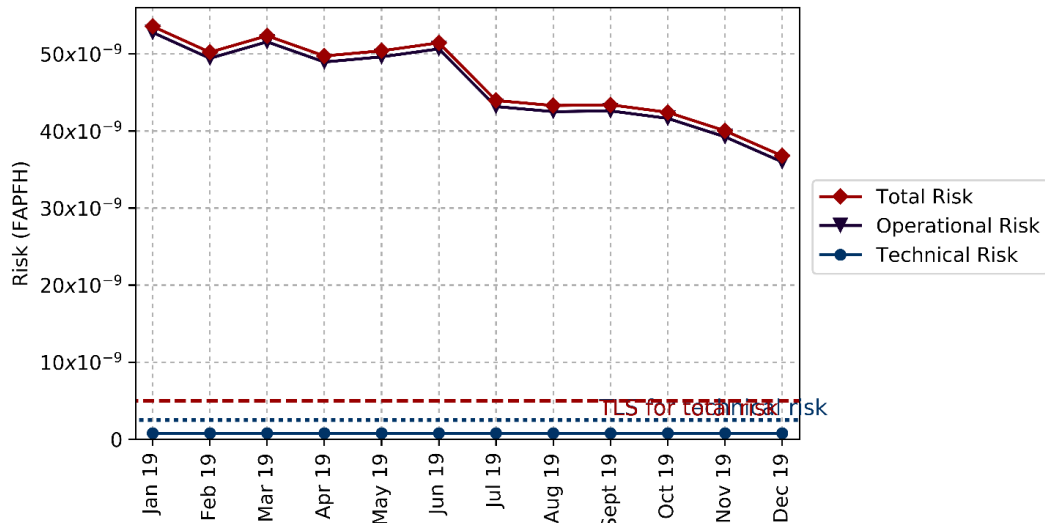


Figure 3: 2019 Vertical Risk Estimate for SAIO airspace

2.22 As had been the case in previous years, the vast majority of the 434 LHD cases that had been reported were Category E (ATC to ATC coordination errors due to human factors) events, with 411 (95%).

2.23 LHD **Hot Spot F** (Mogadishu – Mumbai) and **Hot Spot G** (Sanaa/Muscat – Mumbai) remained as LHD hot spots. In 2019, this hotspot’s operational risk had accounted for 25.65×10^{-9} , which was 71% of the SAIO area’s total risk. The 2019 operational risk in SAIO airspace was dominated by LHDs at Mumbai – Muscat interface. Out of 16 long duration LHDs in SAIO airspace, 12 LHDs occurred at this interface, accounting for 38% of the total operational risk in this sub-region.

2.24 The majority of LHDs between Muscat and Mumbai were Category E, with a sub-category of ‘No or Late FL Revision’ and ‘Negative Transfer’. The poor communication services and lack of surveillance coverage at this interface worsened the situation, due to the slower identification that led to long-duration occurrences.

2.25 In addition, the Pakistan airspace closure (27 February to 16 July 2019) had contributed to an increase in LHDs, particularly at waypoints RASKI, PARAR and TOTOX (**Figure 4**).

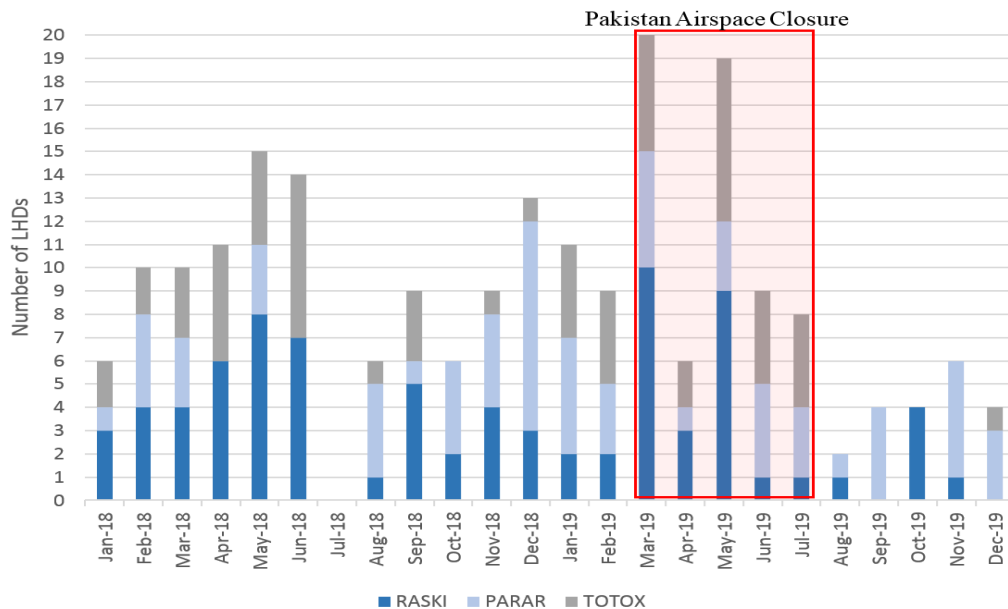


Figure 4: LHDs at RASKI, PARAR and TOTOX, January 2018 – December 2019

2.26 The operational risk at Kolkata/Dhaka –Yangon and Chennai – Kuala Lumpur interfaces (**Hot Spots A1 and A2**) had decreased from 2017 to 2019. The LHDs over waypoint APAGO and CHILA involved Dhaka, Kolkata and Yangon FIR. The ambiguity on handling of eastbound traffic between Dhaka FIR and Kolkata FIR (as well as coordination with Yangon FIR) was resolved by the implementation of a new procedure, which was developed by Bangladesh, India and Myanmar at the BIMT/4 ATM Coordination meeting in August 2016. This procedure was incorporated into a new ATS Letter of Agreement (LOA) signed between Bangladesh and India, effective March 2018.

2.27 ADS-B data sharing between Kolkata ACC and Yangon ACC had also been implemented in June 2018, allowing controllers to detect and resolve any issues before an aircraft passed the Transfer of Control (TOC) points. This had successfully mitigated the risk at the interface between Kolkata and Yangon FIRs, with the operational risk decreasing from 2.04×10^{-9} in 2017, to 0.6×10^{-9} in 2018, and to 0.31×10^{-9} in 2019.

2.28 Conversely, the operational risk in 2019 had increased at Chennai-Yangon and Chennai-Kuala Lumpur interfaces (LULDA, MEPAK, IGOGU, NOPEK and MEMAK). At these interfaces, ADS-B data sharing had not yet been implemented.

2.29 For **Hot Spot I** (Karachi – Kabul), since the establishment of a new ATS route Z627 between the Tehran and Kabul FIRs in July 2019, there had been no reported LHD.

2.30 **Figure 5** provides an overview of the geographical locations of SAIO LHDs, 2019.

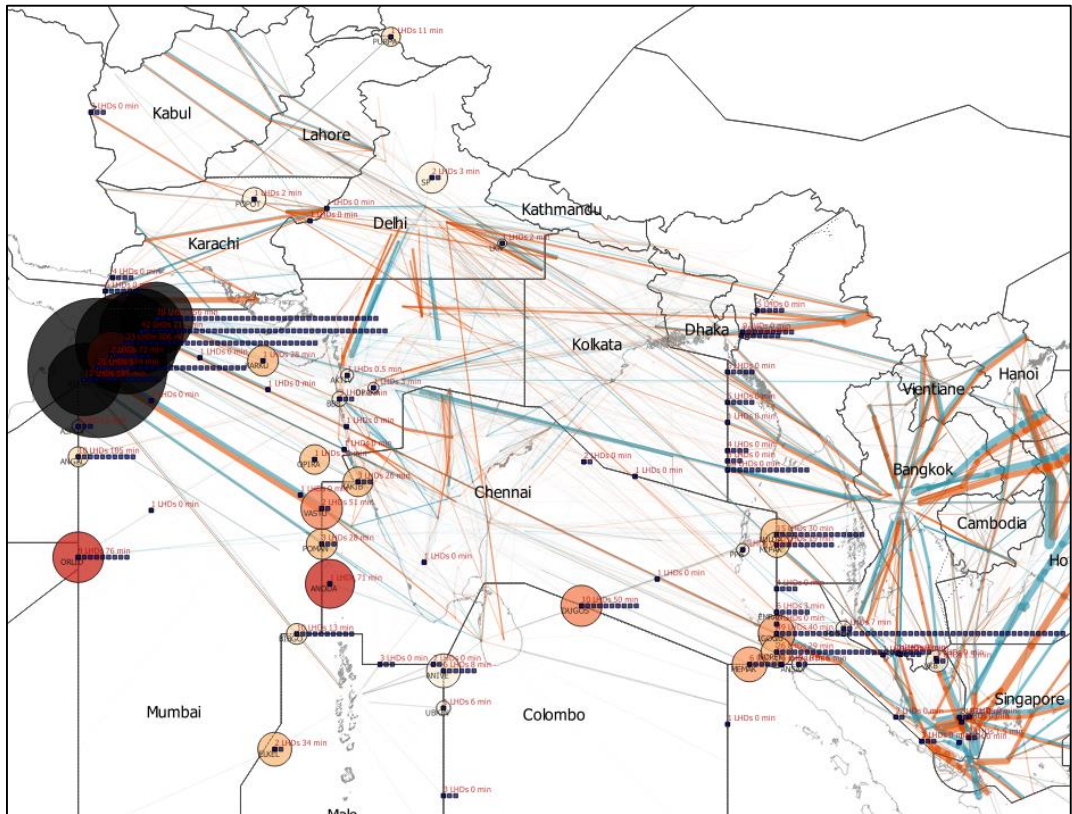


Figure 5: 2019 Geographical Locations of SAIO LHDs

Southeast Asian Airspace

2.31 The 2019 RVSM risk estimate for SEA airspace indicated that the TLS had been met at 3.59×10^{-9} . However, there was an upward trend towards the TLS at the end of 2019 (**Figure 6**).

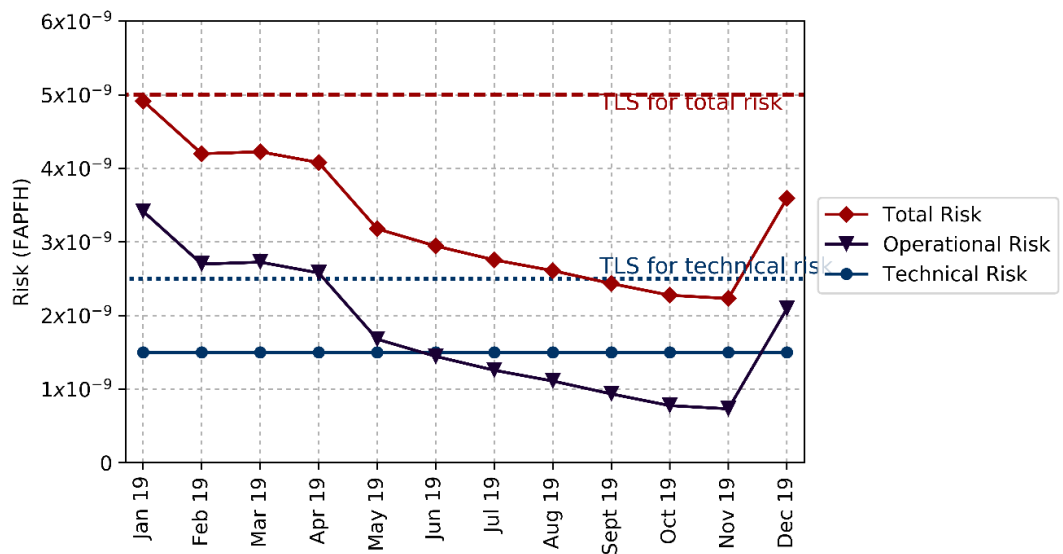


Figure 6: 2019 Vertical Risk Estimate for SEA airspace

2.32 Category E events once again formed the vast majority of occurrences, with 120 out of 145 attributed to this cause (83%).

2.33 Most of the LHDs and operational risk within SEA airspace was associated with **Hot Spot D** (Manila and all adjacent FIRs). From late 2018, the number of LHDs and operational risk in SEA airspace began reducing as the capabilities of the new ATM system were implemented, including enhanced VHF radio, radar and ADS-B coverage, and new ATC sectors. Furthermore, the ADS-C/CPDLC implementation in oceanic airspace, AIDC implementation with Hong Kong FIR, Singapore FIR and Taipei FIR commenced as indicated in **Figure 7**.

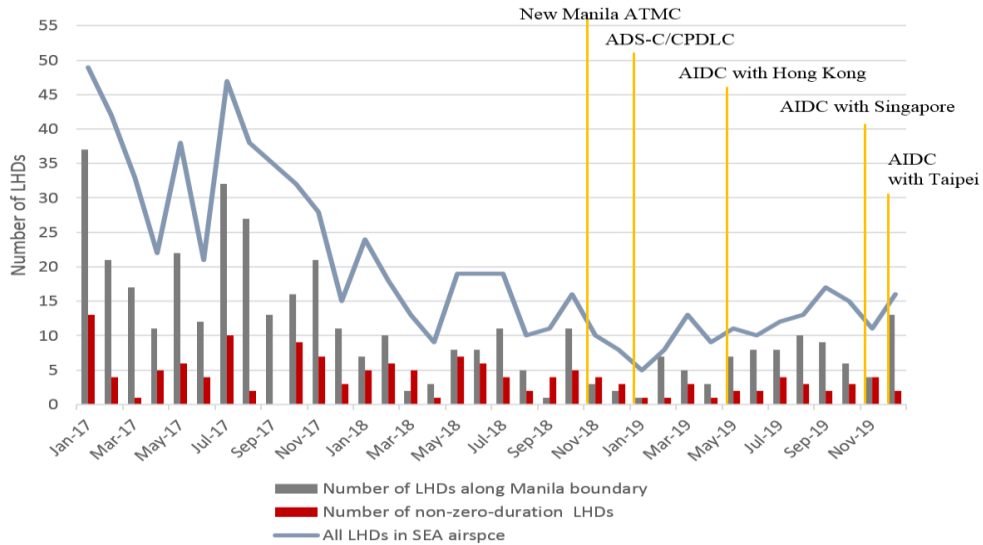


Figure 7: LHDs, Manila FIR Boundary, 2017 – 2019

Mongolian Airspace

2.34 The 2019 RVSM risk estimate for Mongolian airspace indicated that the TLS had been met at 1.07×10^{-9} .

PARMO Vertical Safety Report

2.35 The Pacific Approvals Registry and Monitoring Organization (PARMO) had provided a vertical safety assessment for the RVSM airspace of Pacific airspace and a portion of the Incheon FIR during 2019.

Pacific Airspace

2.36 The 2019 RVSM risk estimate for Pacific airspace indicated that the TLS had not been met at 31.41×10^{-9} (**Figure 8**).

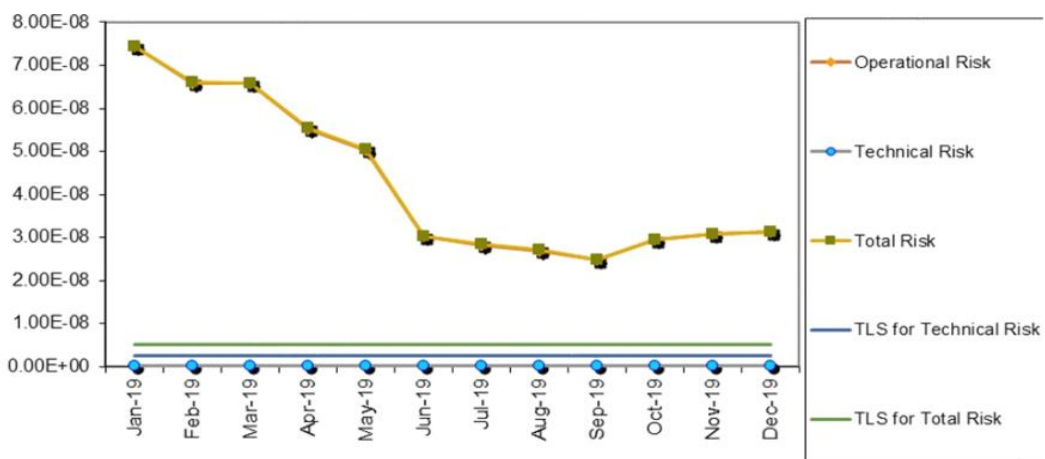


Figure 8: 2019 Vertical Risk Estimate for Pacific airspace

2.37 Of the 83 LHDs, 67 were classified as Category E (81%). There were also five Category A events and four Category B (*Flight crew climbing /descending without ATC clearance errors* LHDs) – 11% A/B. In 2018, the area of Pacific airspace with the largest reported LHD duration was the Central East Pacific (CEP) traffic flow, and this area was designated as Hot Spot N.

2.38 There had been an increase of 61 Category E LHDs from transfer errors between Honolulu Control Facility (HCF) and the Oakland Oceanic FIR. Extra resources had been provided to the ATC units concerned to investigate the underlying causes and a task force had been established that included personnel from both facilities.

Incheon FIR

2.39 The 2019 RVSM risk estimate for the Incheon FIR (not including the AKARA - FUKUE Corridor) airspace indicated that the TLS had been met at 1.07×10^{-9} .

2.40 PARMO had provided an RVSM safety report for the AKARA-FUKUE Corridor airspace containing ATS route A593 with crossing routes Y711 and Y722/B576 within the Incheon FIR. The AKARA corridor airspace involved four FIRs (Fukuoka, Incheon, Taipei and Shanghai) and four RMAs and had a unique, Annex 11 non-compliant arrangement, whereby two ATC units provided services within the same airspace.

2.41 There had been twelve reported LHDs during 2019 that contributed towards the estimate of operational vertical risk, with a total of 35.9 minutes of duration at an incorrect flight level and 10 flight levels crossed without an ATC clearance. This had resulted in a 57% increase in estimated vertical risk to 247.0×10^{-9} (Figure 9).

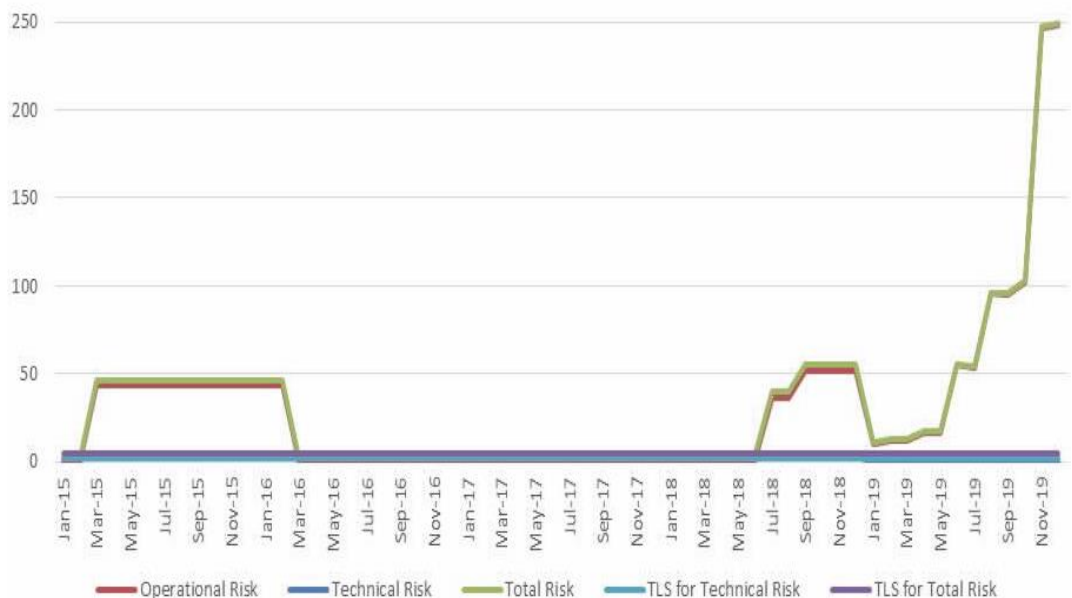


Figure 9: AKARA Twelve-month Rolling Vertical Collision Risk Estimates, 2015–2019

2.42 The numbers of reported LHDs within this airspace had been increasing rapidly, with only three in 2015 and 2016, and none in 2017. After discussions at RASMAG on the need for improved safety reporting, a major increase of 19 for 2018 was recorded, and again in 2019 29 LHDs were recorded, 16 of which were Category E (55%), seven were Category D (24%) and one each for Category A and Category B (7% together).

2.43 Locations of the LHD events are indicated in **Figure 10**.

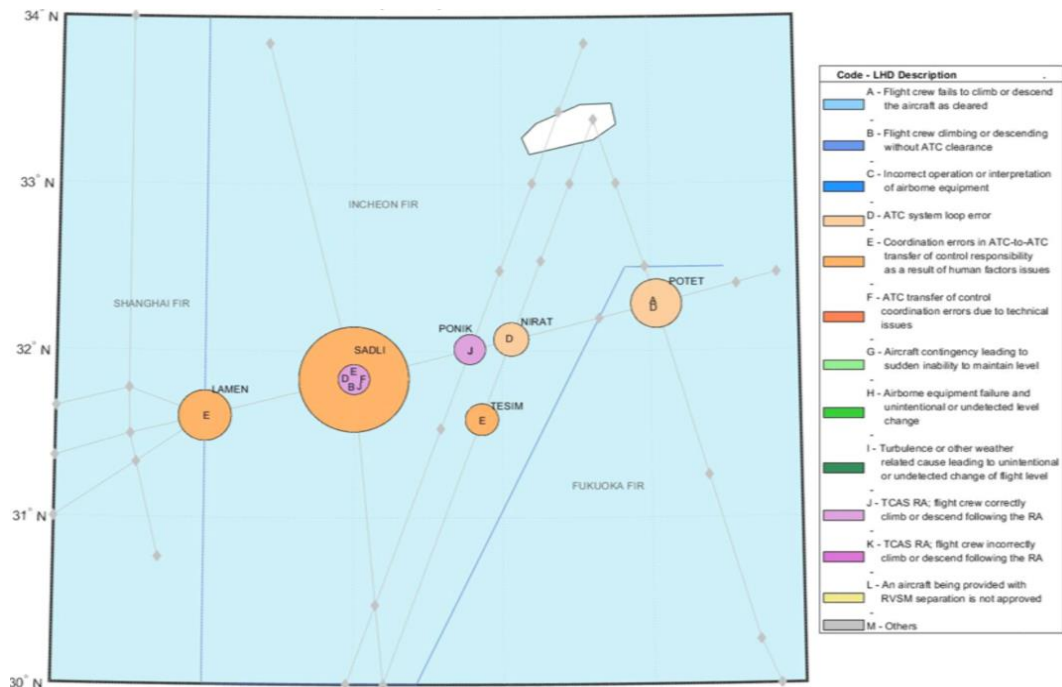


Figure 10: Locations of 2019 Reported AKARA Corridor LHDs

2.44 ICAO thanked PARMO for its work to consolidate the safety data from four RMAs, noting that as a result of greater scrutiny and more reporting, the vertical risk estimate result exceeded the TLS by a factor of nearly 50 times, significantly more than an order of magnitude.

2.45 The ROK had provided comprehensive information on its analysis process of the proposed changes to the AKARA – FUKUE Corridor arrangement, and its capability to provide ATS within the airspace concerned. The ROK noted that after a period of slow progress due to the COVID-19 pandemic, the States concerned had resumed negotiations.

2.46 The ROK stressed that while the pandemic had temporarily reduced the air traffic volume, safety concerns may resurge at any time with the expected increase of traffic in the future. As such, ROK stated that they were convinced that the timely transition to the new ATS structure should occur now.

Regional Airspace Safety Assessment

2.47 ICAO provided a regional safety monitoring assessment summary. **Figure 11** is an Asia/Pacific RVSM TLS compliance overview, as at RASMAG/25:

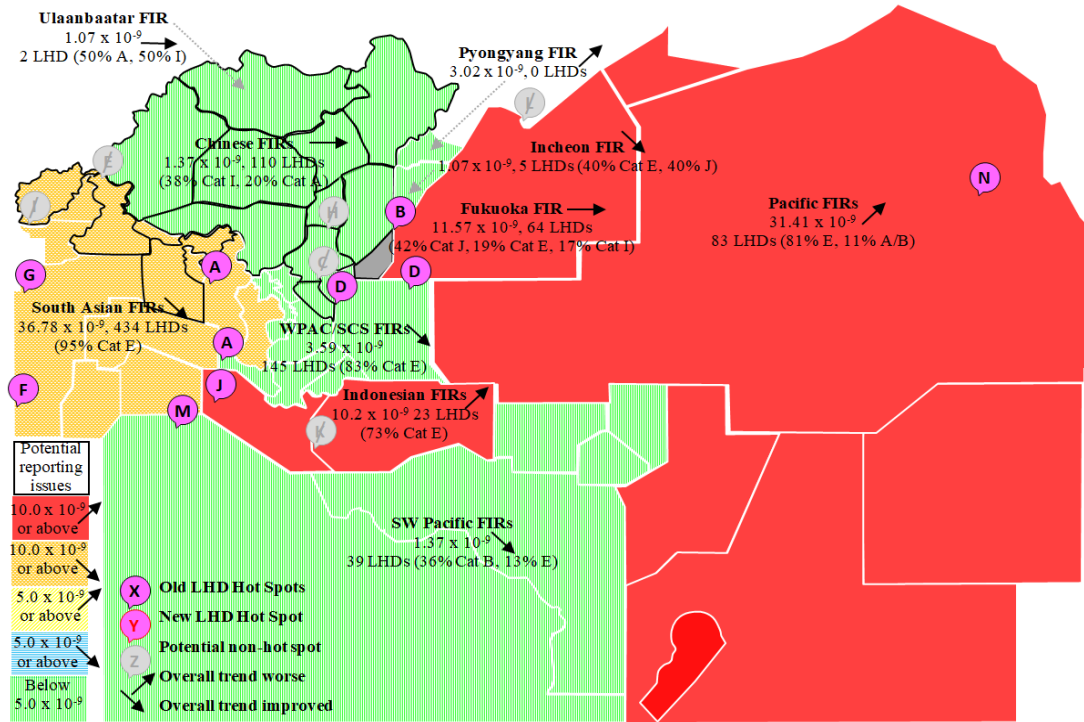


Figure 11: Asia/Pacific RVSM TLS subregion compliance reported to RASMAG/25

2.48

Table 1 highlights the following RMA airspace subdivision aspects:

RMA Airspace Subdivision	Safety trend	Notes
Chinese FIRs	No change	Potential ATC reporting issues
Incheon FIR(excl. AKARA)	Improving	AKARA would dramatically worsen
Indonesia FIRs	Worsening	Improving reporting
Fukuoka FIR	No change	Still affected by the Manila FIR
Pacific FIRs	Worsening	Dramatic increase in CAT E LHDs
Pyongyang FIR	Worsening	Insufficient traffic to judge compliance
South Asia Indian Ocean FIRs	Improving	Still has the second worst hot spots
Southwest Pacific FIRs	Improving	Best performing APAC airspace
Ulaanbaatar FIR	No change	Potential ATC reporting issues
W Pacific/Southeast Asia FIRs	Improving	Second best performing APAC airspace

Table 1: Airspace Vertical Safety Performance Overview

2.49

Table 2 provides a comparison of the APAC RVSM risk as a measure against the TLS by grouped FIRs, according to the RMA responsibilities for airspace. Over the past six years, APAC’s TLS compliance for RVSM had been poor overall, averaging 40% when measured by the grouped FIRs. However, of the 29 FIRs that achieved TLS, 10 FIRs had potential reporting issues (discussed later in this paper). Therefore, the compliance rate may be significantly worse than reported. In conclusion, measures taken to improve adherence to the TLS in the past six years have yielded localised improvements, but overall had failed to produce a positive result for the APAC Region as a whole.

	2014	2015	2016	2017	2018	2019
FIRs	53%	32%	51%	16% (8 FIRs)	37% (18 FIRs)	53% (26 FIRs)

Table 2: Comparison of Regional RVSM TLS Achievement

Hot Spot Summary

2.50 **Table 3** provides a summary of the Hot Spots.

ID	Involved FIRs	Identified	Remarks
A1	Kolkata/Chennai/Dhaka – Yangon	2015	Potential non-hot spot
A2	Chennai – Kuala Lumpur	2015	LHDs increased
B	Incheon	2015	AKARA Corridor
D	Manila – all adjacent FIRs	2015	LHDs reduction
F	Mogadishu – Mumbai	2015	LHDs reducing
G	Sana'a/Muscat – Mumbai	2015	Cat. E LHDs (Sana'a improved)
J	Jakarta – Singapore/Kota Kinabalu	2018	Minor, Cat. E LHDs
M	Colombo - Melbourne	2019	Potential non-hot spot
N	Oakland USA – Hawaii CEP	2019	Cat. E LHDs

Table 3: Comparison Summary of LHD Hot Spots

Non-RVSM Approved Aircraft

2.51 **Table 4** compared the non-RVSM airframes reported by each RMA annually:

Report	AAMA	China RMA	JASMA	MAAR	PARMO	Total
RASMAG/23	5	20	9	43	38	115
RASMAG/24	5	4	17	34	1	61
RASMAG/25	2	24	6	26	9	67

Table 4: Trend of Non-RVSM Airframes Observed by Asia/Pacific RMAs

Regional Horizontal TLS Compliance

2.52 The following Asia/Pacific En-Route Monitoring Agency (EMAs) reported performance-based horizontal risk assessments as follows, which all met the TLS of 5.0×10^{-9} (**Table 5**):

ATC Separation	EMA	2018 Estimated Risk	2019 Estimated Risk
50NM Lateral	BOBASMA	2.05×10^{-9}	1.59×10^{-9}
	JASMA	0.05×10^{-9}	1.45×10^{-9}
	PARMO	-	-
	SEASMA	0.52×10^{-9}	0.012×10^{-9}
30NM Lateral	PARMO	0.16×10^{-9}	3.35×10^{-9}
50NM Longitudinal	BOBASMA	4.21×10^{-9}	4.97×10^{-9}
	PARMO	2.22×10^{-9}	-
	SEASMA	0.38×10^{-9}	0.38×10^{-9}
30NM Longitudinal	BOBASMA	-	-
	JASMA	0.001×10^{-9}	0.015×10^{-9}
	PARMO	4.08×10^{-9}	4.08×10^{-9}

Table 5: Comparison of Horizontal Risk Assessments

APAC Consolidated LTHM Burden Estimate Update

2.53 Thailand presented an overview of Long Term Height Monitoring (LTHM) compliance status in the Asia/Pacific Region, including assessments of Asia Pacific RMAs: AAMA, CHINA RMA, JASMA, MAAR and PARMO. The assessment, which was based on RVSM approval data as at 30 October 2020, yielded a remaining monitoring burden of 379, a 20% increase from 2018.

2.54 China RMA (22%), JASMA (2%), and PARMO (3%) States had reduced their remaining their monitoring burden, with China having the biggest improvement.

2.55 MAAR (54%) and AAMA (19%) States had an increased remaining monitoring burden, mainly due to aircraft being unable to be monitored using EGMU. MAAR had a total of 206 aircraft remaining to be monitored. The total number of aircraft remaining to be monitored in APAC had risen by 20% to 379. Afghanistan had the highest monitoring burden of 85%.

2.56 As Malaysia's remaining monitoring burden had significantly dropped to below 30%, MAAR proposed to remove their APANPIRG Deficiency for LTHM compliance.

2.57 During 2019 – 2020, seven States – Afghanistan, Bhutan, India, Indonesia, Nepal, Pakistan and the Philippines had a remaining monitoring burden over 30% (**Table 6**). However, with the unavailability of EGMU services due to travel restrictions during the COVID-19 pandemic, MAAR proposed to delay proposing new Deficiencies for States until RASMAG/26's review.

State	2017%	2018%	MMR	Burden	2019%
Afghanistan (MAAR)	38%	36%	13	11	85%
Pakistan (MAAR)	69%	56%	28	13	46%
India (MAAR)	30%	25%	245	106	46%
Nepal (MAAR)	0%	0%	11	5	45%
Philippines (MAAR)	30%	26%	70	30	43%
Indonesia (AAMA)	42%	21%	57	24	42%
Bhutan (MAAR)	0%	0%	5	2	40%
Malaysia (MAAR)	38%	40%	72	19	26%
Myanmar (MAAR)	36%	0%	6	1	17%
Bangladesh (MAAR)	44%	14%	14	2	14%

Table 6: State Monitoring Burden Comparison (red = liable for APANPIRG Deficiency)

Consolidated Asia/Pacific Safety Report

2.58 Thailand provided a consolidated safety review and a comprehensive presentation of Asia/Pacific airspace safety performance (**Attachment A**).

Safety Reporting

2.59 MAAR noted that measuring how well an organization reports hazards and incidents had been a challenge and the use of reported incident numbers as an indicator of reporting culture had limitations, due to many factors apart from the maturity of reporting cultures. Low number of reported incidents could be a result of the improvement in safety level or a result of poor reporting cultures.

2.60 MAAR had also noted: In most cases, ATCO report LHDs only when they are affected by mistakes made by ATCO in their neighbouring FIRs. However, in 2018, the MAAR started to receive LHD reports which occurred inside an FIR.

2.61 Notwithstanding this, MAAR advised that there were some signs of reporting culture improvement, including positive trends in India. ACCs that had always submitted NIL report were:

Phnom Penh, Hong Kong, Vientiane, Taipei, Hanoi, Ho Chi Minh, Dhaka, Karachi and Ulaanbaatar.

2.62 MAAR clarified that controllers tend to report LHDs only when affected by mistakes made by their neighbouring FIRs. In 2019, only 15% of all LHDs were reported by the ACC that had made the error. ACCs with good reporting culture that submitted this type of LHD report were:

Singapore, Manila, Kota Kinabalu and Kuala Lumpur.

- 2.63 RASMAG/25 had noted that the following States had potential reporting issues:
- a) Afghanistan, which did not report any LHDs during 2020;
 - b) China, which had reported an implausibly low percentage of Category E events (7.3% during 2018 and 7% in 2019);
 - c) India – Delhi and Kolkata FIRs (although Mumbai and Chennai had made distinct improvements); and
 - d) Mongolia had a rate of reported LHDs per hour that was very low, many factors less than that expected.

2.64 Significant improvements in safety reporting had been noted in within the AKARA – FUKUE Corridor. Previously, some States had insisted that there were no safety issues within the Corridor, and it had been very rare to receive safety incident reports. RASMAG/25/WP14 illustrated the level of data that showed the Corridor was a Hot Spot with very high latent safety risks.

2.65 AAMA had also noted that Indonesia had probably improved its safety reporting culture.

2.66 It was appropriate to remind States, even those which had taken significant positive steps to improve reporting, to continually monitor their reporting culture and systems to optimise reporting. Experience from developed nations had shown that educating operational personnel was not enough to achieve the open reporting objective of the ‘aviation culture’, as described in the *Asia/Pacific Seamless ATM Plan*.

2.67 In order to be more proactive, ICAO recommended that RMAs and EMAs better analyse safety data to identify potential under-reporting and undertake safety culture surveys and audits to monitor safety reporting culture. RASMAG/25 agreed to the following Decision on safety reporting as part of RMA/EMA safety reports.

Decision RASMAG/25-4: Safety Reporting Assessments	
<p>What: That, RMAs and EMAs will include within their vertical and horizontal safety reports to RASMAG an assessment of the safety reporting culture of the States concerned (including ‘Just Culture’), and specifically, whether safety reports for events such as LHDs were consistently being made by pilots and ATC.</p>	<p>Expected impact:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
<p>Why: Very few RMA and EMA safety reports include an analysis of reporting culture; yet this is demonstrably important to verify the validity of the data being used.</p>	<p>Follow-up: <input type="checkbox"/> Required from States</p>
<p>When: 30-Oct-20</p>	<p>Status: Draft to be adopted by Subgroup</p>
<p>Who: <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:</p>	

Summary Report of Identified Airspace Risk Occurrences

2.68 Singapore presented an analysis of LHDs and Gross Navigation Errors, the impact of COVID-19 on ATC operations, and associated mitigations. Examples of lessons learnt were the:

- a) use of available aide memoirs as reminders to controllers of any outstanding task such as checking for AIDC transfer failures at boundary points; and
- b) minimisation of last minute flight levels revisions near transfer boundaries.

2.69 Due to the reduction in air traffic as a result of the COVID-19 pandemic, key safety hazards were identified. Their corresponding mitigations for ATC were as follows:

- a) mental fatigue, reduced alertness and distractions were mitigated by merging ATC positions to increase the sector area and maintain a healthy level of stimuli;
- b) limited On-Job-Training (OJT) opportunities and challenges making realistic and accurate assessments of trainees' competency were addressed through OJT revision and a validation assessment framework to allow the use of ATC simulators; and
- c) skill fade of controllers related to the handling of pre-COVID traffic volume and scenarios was managed with a revised programme for proficiency checks and continuous training (comprised of various exercises using pre-COVID traffic volume and complexity which are made available at all simulators).

ATM and Airspace Safety Deficiencies List

2.70 The meeting reviewed the APANPIRG ATM and Airspace Safety Deficiency List and agreed to make the following recommendations to APANPIRG/31:

- a) deletion of the Deficiency for Myanmar related to PRs not being provided to the Central Reporting Agency (CRA);
- b) deletion of the Deficiency for Bhutan and Lao People's Democratic Republic (PDR) related to non-provision of the annual RVSM approval snapshot;
- c) deletion of the Deficiency for Bangladesh, Pakistan and French Polynesia related to non-provision of the TSD and LHD;
- d) deletion of the LTHM Deficiency for Malaysia; and
- e) amendment of the LTHM Deficiency for Pakistan to reflect the remaining monitoring burden of 46% and for Afghanistan for failing to submit the annual RVSM approval snapshot for 2018 and 2019.

Production of the Asia/Pacific Region Combined PBCS Monitoring Report

2.71 USA presented a recommended process for the production of the Asia/Pacific Region Combined PBCS Monitoring Report, proposing the retention of a PBCS Report format harmonized with other ICAO regions, and the biennial rotation of the report generation responsibilities amongst States and Monitoring Agencies.

2.72 It was noted that the consolidated performance report format currently used by FIT-Asia was also used in the North Atlantic (NAT) Region, and was also used by FIT-IPACG and FIT-ISPACG. Rotating responsibility for the production of the report would assure that, over time, multiple States and organizations would gain the knowledge and develop the skillset to improve system performance. Ideally, the proposed biennial rotation would allow for the outgoing State/Agency to assist the incoming organization in the first year, followed by independent production in the second year.

2.73 The meeting agreed to the following Decision:

Decision RASMAG/25-5: Rotational Responsibility for the Production of the Combined PBCS Monitoring Report	
<p>What: That, FIT-Asia will produce an annual Combined PBCS Monitoring Report, as follows:</p> <ol style="list-style-type: none"> 1. responsibility for the report production will rotate biennially amongst volunteer States, 2. Reporting Agencies, or other relevant stakeholders; the State, Reporting Agency or other stakeholder releasing responsibility for production of the report will assist the new report producer in the first year of their responsibility; and 3. until a report format is codified in ICAO documentation, producing organizations must assure the report content, format, and quality are consistent with similar reports in other ICAO regions. 	<p>Expected impact:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Political / Global <input type="checkbox"/> Inter-regional <input type="checkbox"/> Economic <input type="checkbox"/> Environmental <input checked="" type="checkbox"/> Ops/Technical
<p>Why: To improve PBCS system performance within APAC and other ICAO Regions</p>	<p>Follow-up: <input type="checkbox"/> Required from States</p>
<p>When: 30-Oct-20</p>	<p>Status: Adopted by Subgroup</p>
<p>Who: <input type="checkbox"/> Sub groups <input type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input checked="" type="checkbox"/> Other: FIT-Asia</p>	

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note –
 - i. **Conclusion RASMAG/25-1: Revised PBCS Non-Compliance Report Form Template;**
 - ii. **Conclusion RASMAG/25-2: RVSM MMR Update;**
 - iii. **Decision RASMAG/25-4: Safety Reporting Assessments;**
 - iv. **Decision RASMAG/25-5: Rotational Responsibility for the Production of the Combined PBCS Monitoring Report;** and
- b) discuss and agree to **Draft Conclusion RASMAG/25-3: Alphanumeric Call Sign Initiative;**
- c) note the continuing LHD Hot Spot concerns associated with Indian, Indonesian, Japanese, Korean and Pacific airspace;
- d) note that non-RVSM aircraft observed within the RVSM stratum had plateaued at about 60 per annum, although this number was expected to reduce when the European restrictions came into effect;
- e) note that Afghanistan, Bhutan, India, Indonesia, Nepal, Pakistan and the Philippines had a remaining monitoring burden over 30%, but that new APANPIRG Deficiencies would not be proposed until 2021;
- f) urge Afghanistan, China, India (Delhi and Kolkata FIRs) and Mongolia to review their safety reporting culture; and
- g) review the proposed airspace safety Deficiency changes (under Agenda Item 4).

RASMAG/25 Consolidated Report

For APANPIRG/31

Outline

- **Airspace Risk Assessment & Hot Spots**
 - PAC
 - Vertical & Horizontal Risk Estimates and Summary of LHDs, LLDs and LLEs
 - Geolocations of LHDs/LLDs/LLEs
 - Hot Spots
 - Asia
 - Vertical & Horizontal Risk Estimates and Summary of LHDs, LLDs and LLEs
 - Geolocations of LHDs/LLDs/LLEs
 - Hot Spots
 - Reporting Rate of LHDs/LLDs/LLEs
 - Conclusion
- **Long-Term Height Monitoring (LTHM) Compliance**
 - Summary
 - Highlights from each RMA

Airspace Risk Assessment

Background

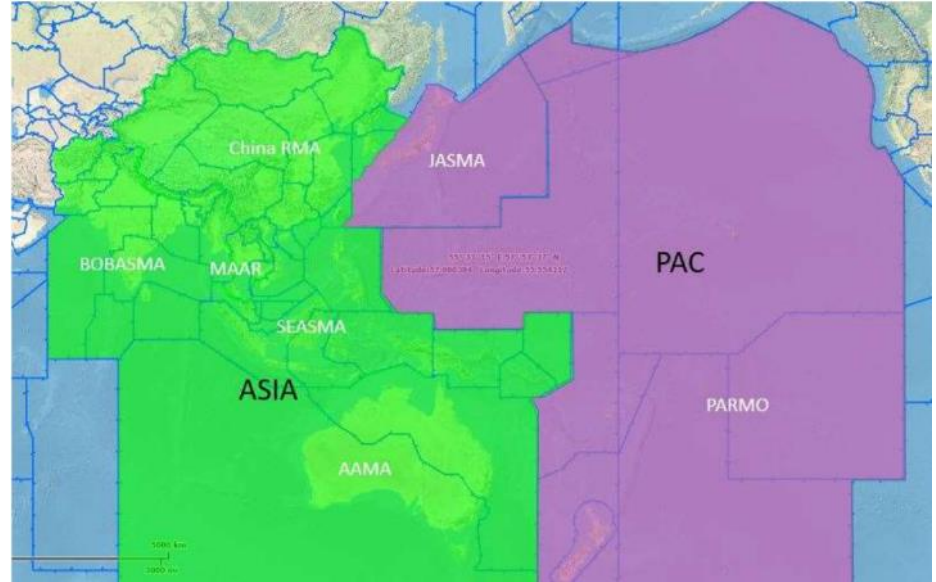
In MAWG/5, APAC monitoring agencies agreed to consolidate key elements from their safety risk analysis into one report to give an overall picture of airspace safety risk in Asia Pacific.

The report is divided into the following sub-areas:

- Pacific (PAC)
- Asia

In each sub-region, there will be a summary of:

- vertical collision risk estimates, LHD summary, and their hot spots;
- horizontal collision risk estimates, LLD & LLE summary, and their hot spots (if any); and
- reporting rates in 3 groups : Pilot/aircrew related, ATC related, Aircraft Avionics/Contingencies, Weather/Turbulence, and TCAS related.



Pacific (PAC)

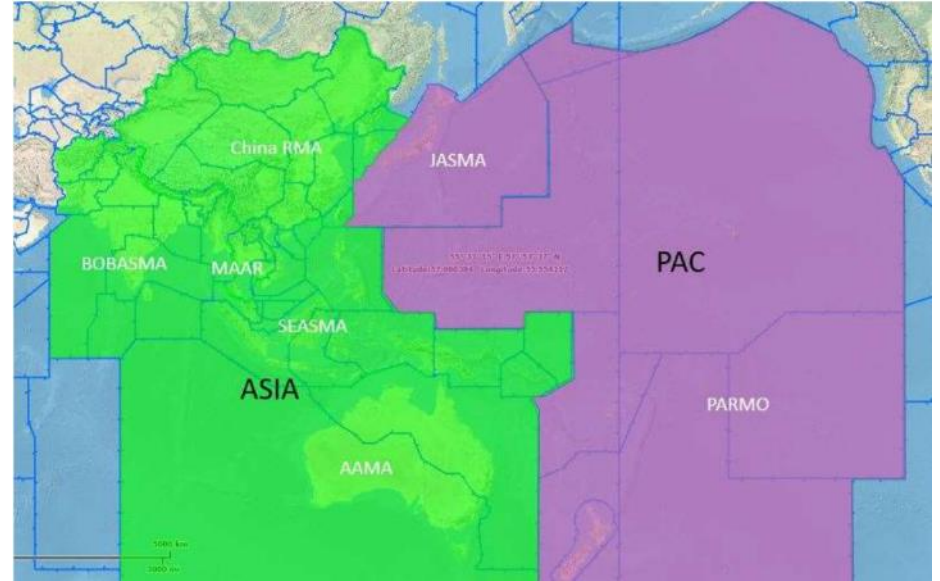
Traffic between North America and Asia,
or North America and South Pacific States

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

Monitoring Agencies :

RMA : JASMA, PARMO

EMAs : JASMA, PARMO



Asia (Asia)

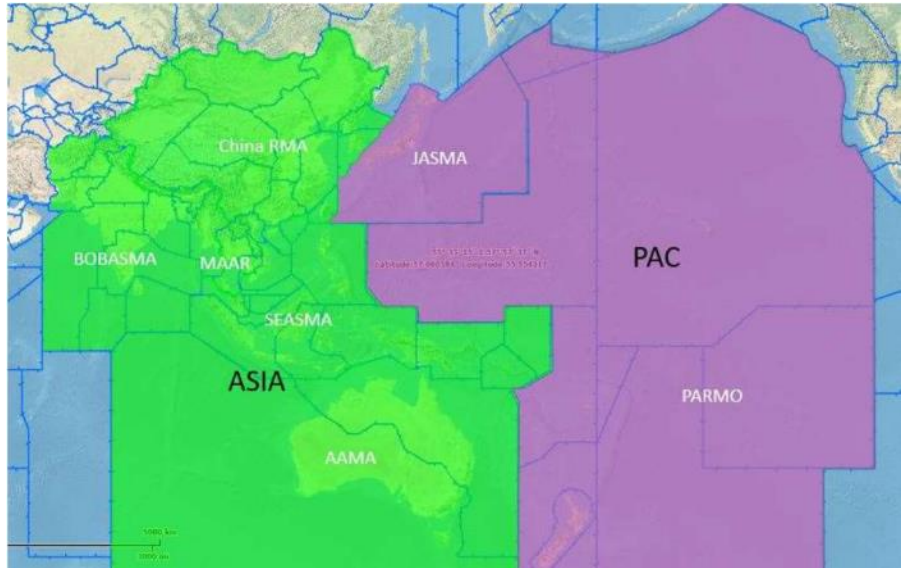
Traffic flows between between Asia and Middle East, Europe and South Pacific States.

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, Taipei, Ujung Pandang, Ulaanbaatar, Urumqi, Vientiane, Wuhan, and Yangon

Monitoring Agencies :

RMA's : AAMA, China RMA, MAAR, PARMO

EMA's : AAMA, BOBASMA, PARMO, SEASMA



Pacific (PAC)

PAC : Vertical Collision Risk

PAC : Vertical Collision Risk Estimates

Number of annual flying hours: 3,352,872 hours/year

2019 PAC Sub-Region	Vertical Risk Estimate	Remark
Vertical Technical Risk	0.20 x 10 ⁻⁹ FAPFH	Below Technical TLS
Vertical Operational Risk	30.01 x 10 ⁻⁹ FAPFH	
2019 Vertical Overall Risk	30.21 x 10⁻⁹ FAPFH	Above TLS
2018 Vertical Overall Risk	19.40 x 10⁻⁹ FAPFH	Above TLS
2017 Vertical Overall Risk	7.30 x 10⁻⁹ FAPFH	Above TLS
2016 Vertical Overall Risk	5.01 x 10⁻⁹ FAPFH	Above TLS

PAC : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minute)	Number of Levels Crossed
Aircrew/ Pilot	A	Flight crew failing to climb/descend the aircraft as cleared	6	18	4
	B	Flight crew climbing/descending without ATC Clearance	4	15	3
	C	Incorrect operation or interpretation of airborne equipment	2	18	0
ATC	D	ATC system loop error	10	14.5	7
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	79	362.5	3
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	3	130	0
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	3	2	7
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	0	0	0

PAC : Summary of LHDs

Attribution s	Category Code	Description	Number of Occurrences	Duration (minute)	Number of Levels Crossed
Weather/ Turbulence	I	Turbulence or other weather related causes leading to unintentional or undetected change of flight level	13	10.5	15
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	27	2.9	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	0	0	0
Total			147	573.4	41

PAC : Horizontal Collision Risk

PAC : Horizontal Collision Risk Estimates

Number of annual flying hours: 3,352,872 hours/year

2019 PAC Sub-Region	Horizontal Risk Estimate	Airspace	Remark
Lateral Risk (All operation)	3.35 x 10 ⁻⁹ FAPFH	Pacific	Below TLS
50NM Lateral Risk	1.45 x 10 ⁻⁹ FAPFH	Japan	Below TLS
30NM Longitudinal Risk	4.10 x 10 ⁻⁹ FAPFH	Pacific and Japan	Below TLS
50NM Longitudinal Risk	2.02 x 10 ⁻⁹ FAPFH	Pacific	Below TLS
10MIN Longitudinal Risk	20.1 x 10 ⁻⁹ FAPFH	Japan	Above TLS
2018 PAC Sub-Region	Horizontal Risk Estimate	Airspace	Remark
30NM Lateral Risk	0.15 x 10 ⁻⁹ FAPFH	Pacific and Japan	Below TLS
30NM Longitudinal Risk	3.9 x 10 ⁻⁹ FAPFH	Pacific and Japan	Below TLS
50NM Longitudinal Risk	2.1 x 10 ⁻⁹ FAPFH	Pacific and Japan	Below TLS

In 2019, PARMO applied new methodology for risk estimation, presented in a paper in RASMAG/25. JASMA also estimates as 50NM lateral risk and 10MIN longitudinal risk, which are different to last year and PARMO's methodology

PAC : Summary of LLDs and LLEs

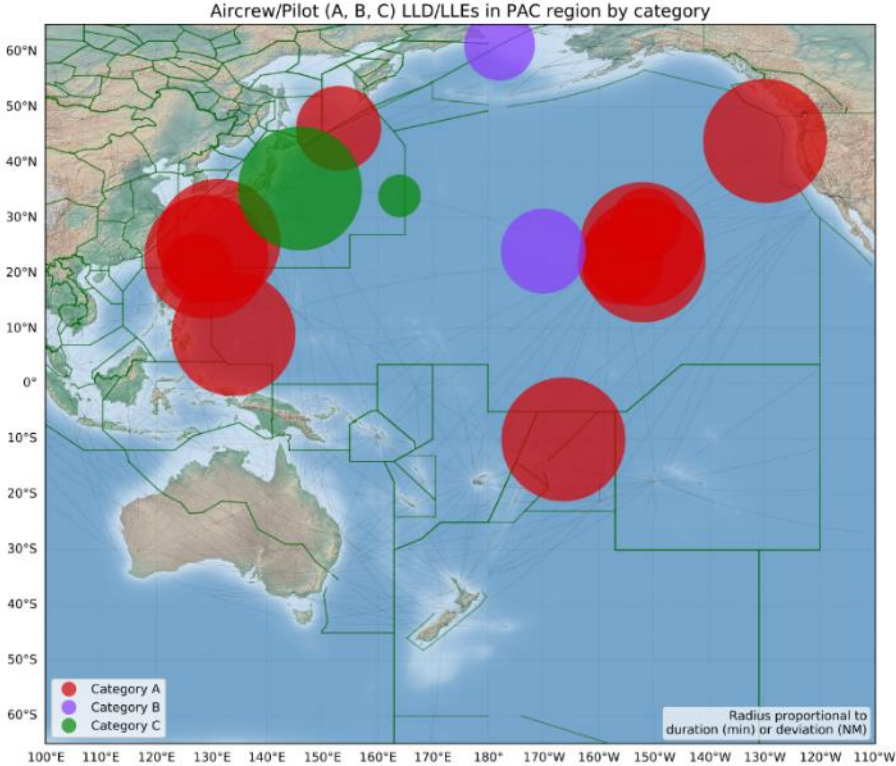
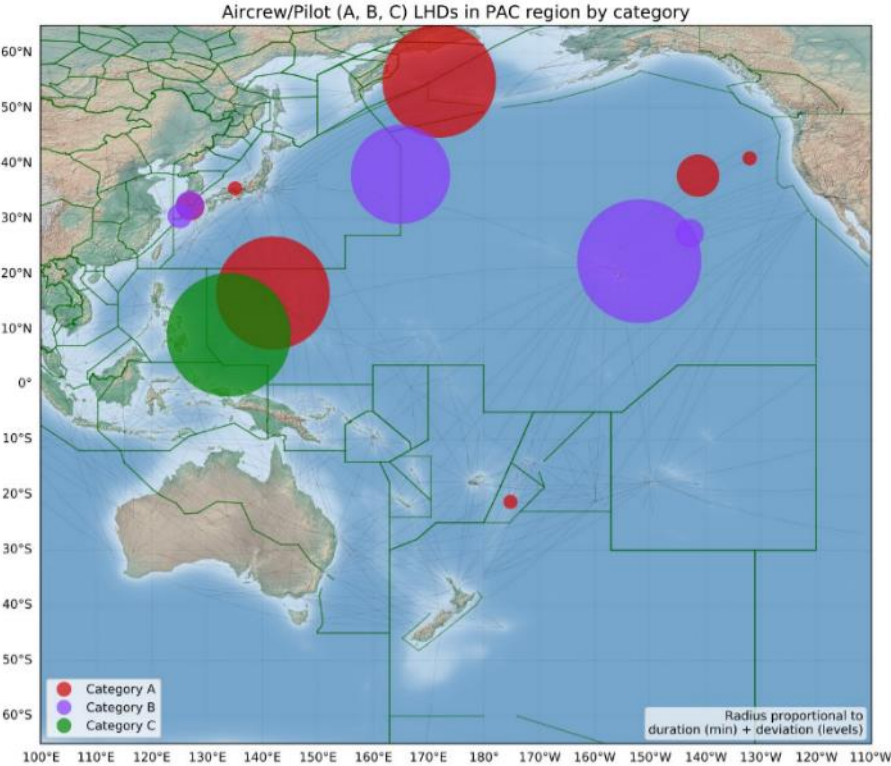
Attributions	Category Code	Description	Number of Occurrences	Duration (minute)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	14	91	2	175
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	3	0	0	11
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	2	18	0	110
ATC	D	ATC system loop error	5	25	0	219
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	75	319	0	108
	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

PAC : Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minute)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	3	0	0	15
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 specifications	0	0	0	0
	J	Other	1	13	0	0
Total			103	466	2	638

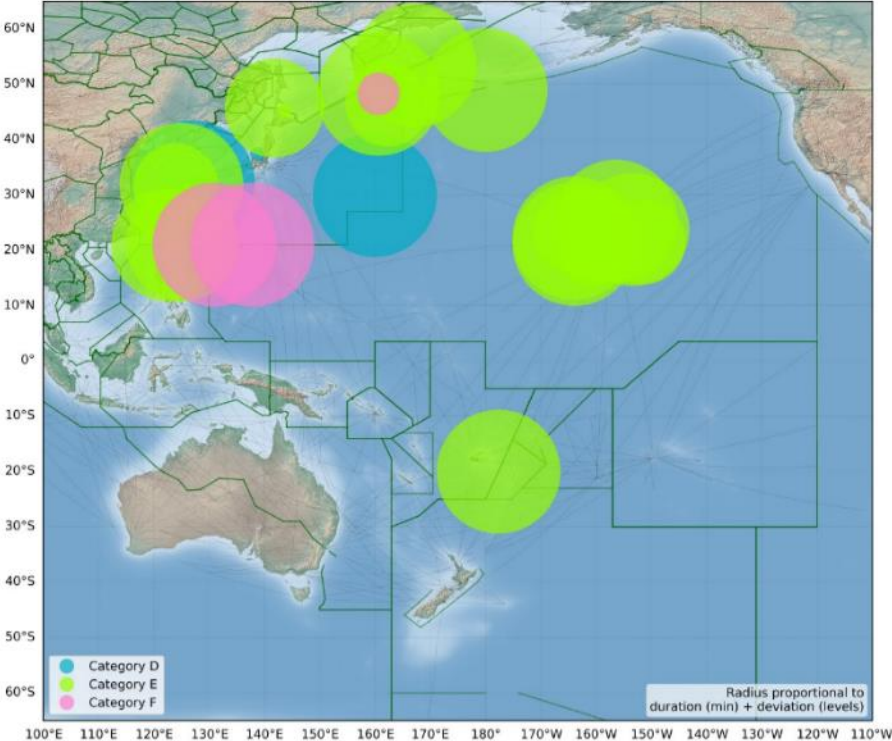
PAC : Geolocation of LHDs/LLDs/LLEs

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

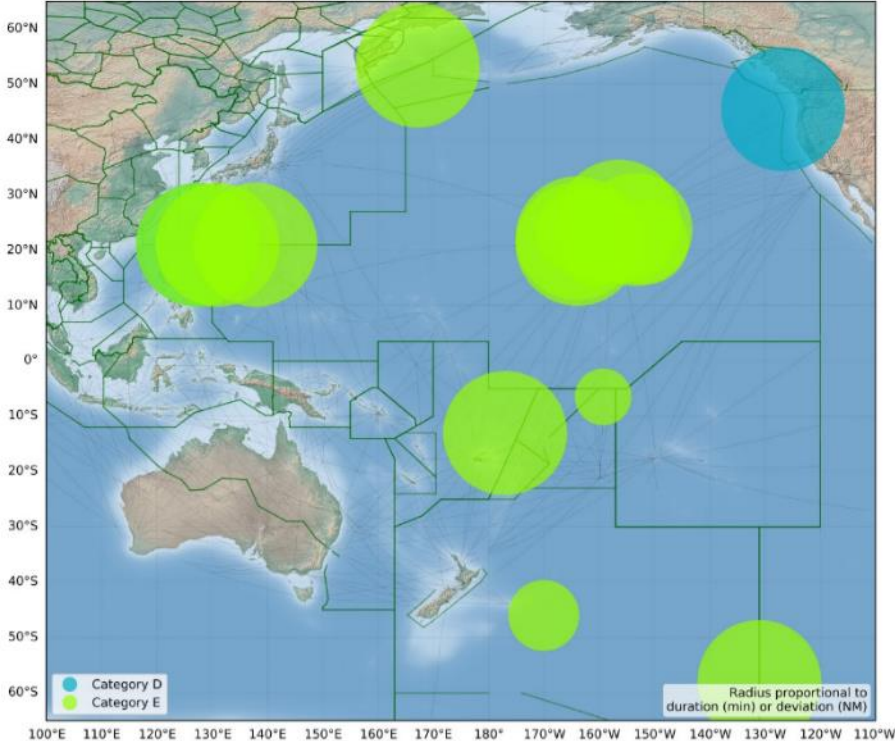


PAC : ATC Related (D, E, F)

ATC (D, E, F) LHDs in PAC region by category

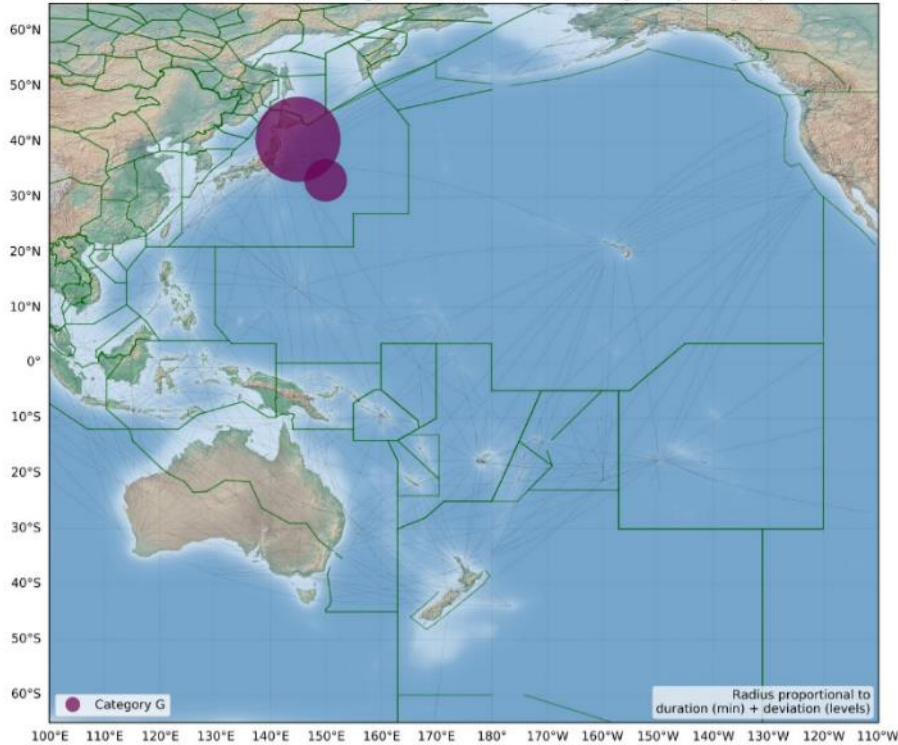


ATC (D, E, F) LLD/LLEs in PAC region by category

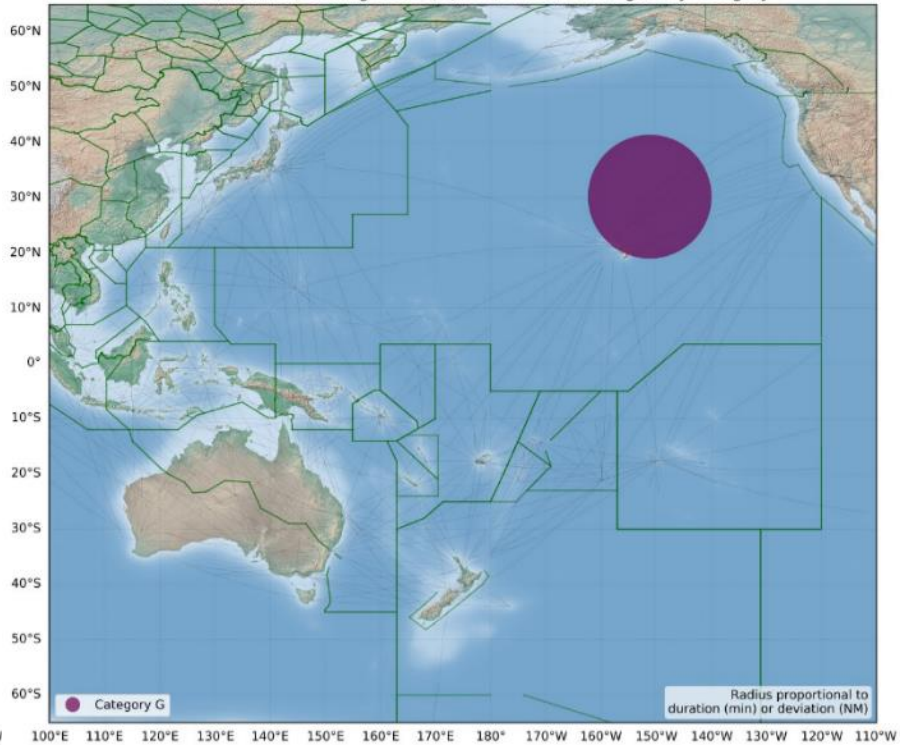


PAC : Aircraft Avionics/Contingencies (G, LHD:H)

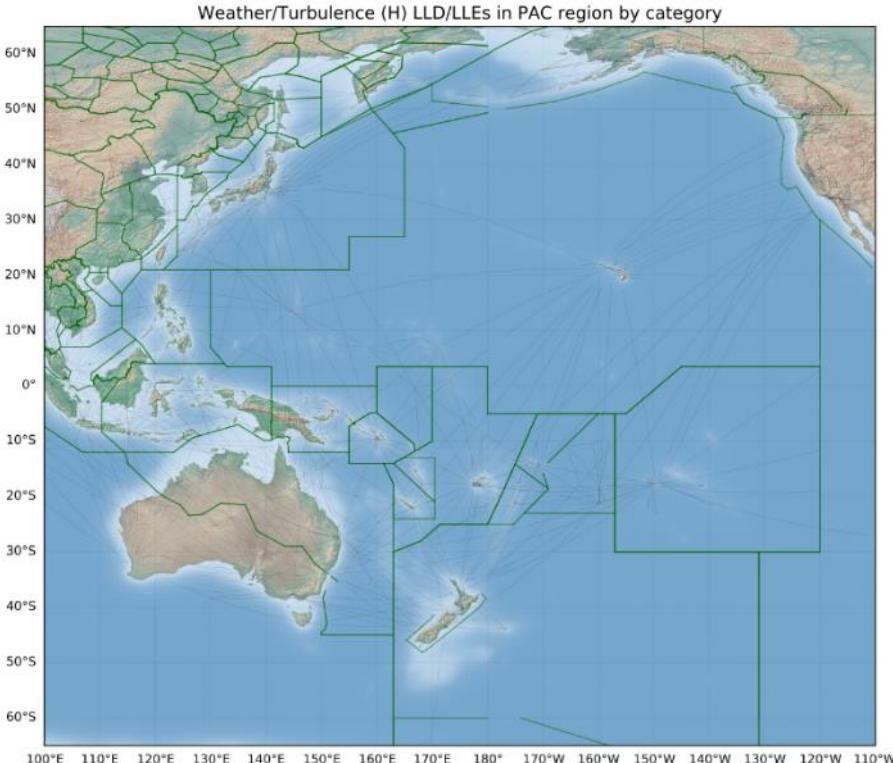
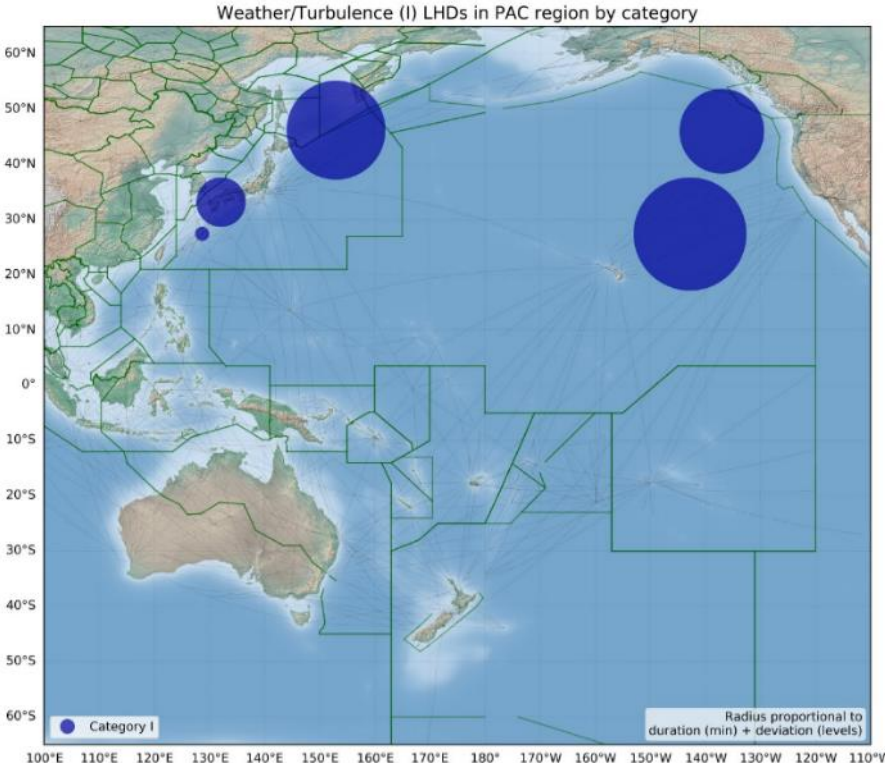
Aircraft/Avionics/Contingencies (G, H) LHDs in PAC region by category



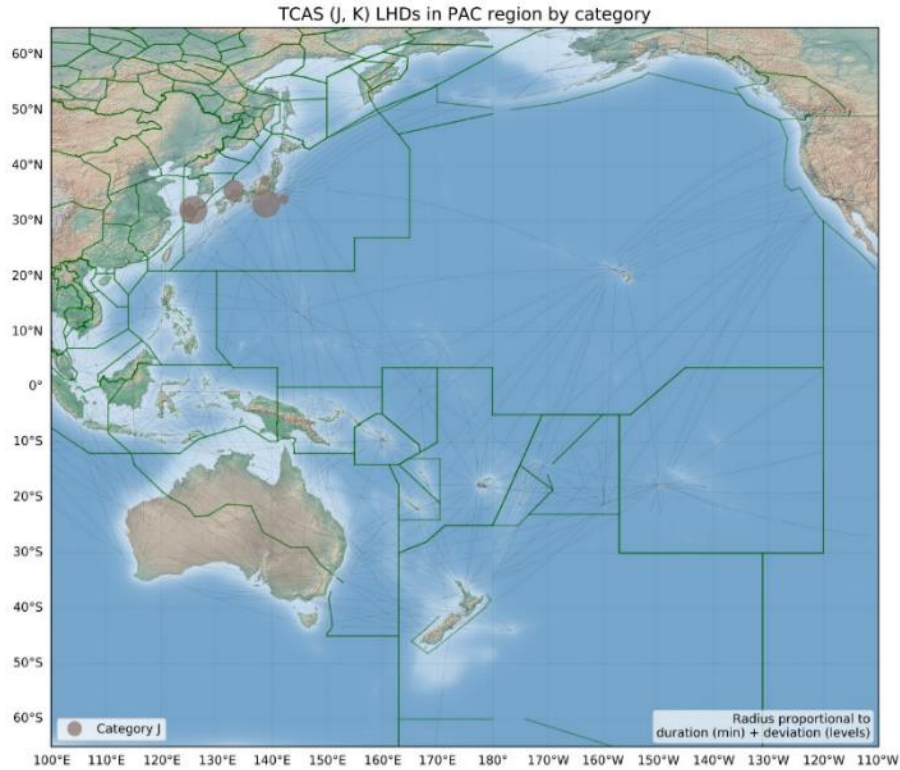
Aircraft/Avionics/Contingencies (G) LLD/LLEs in PAC region by category



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



PAC : TCAS (LHD:J, K)



PAC : Hot Spots

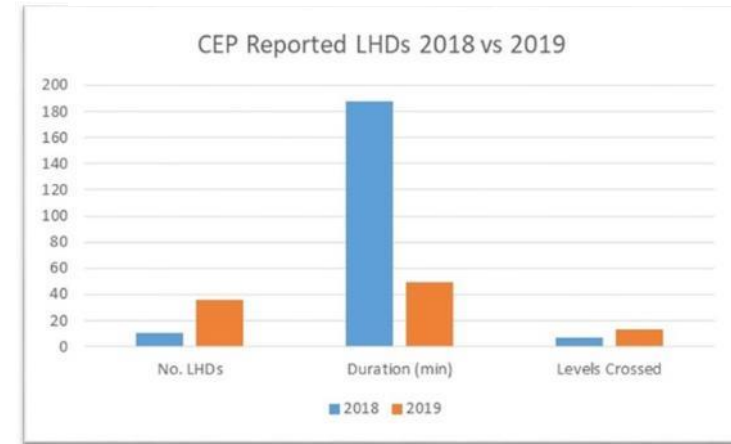
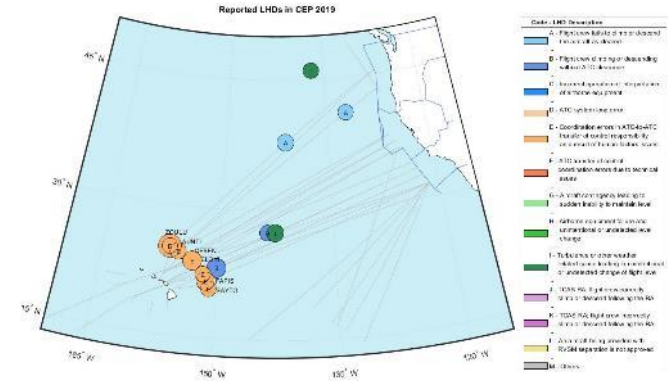
PAC : LHD Hot Spot N (North America - Hawaii CEP)

Nature of Occurrences : In 2018, several long duration LHDs were reported

Contributing Factors : Flight operations using only HF voice for communication provide fewer opportunities for ATC to identify errors

Trend : Zero long duration LHDs reported in 2019, resulting in decreased vertical risk estimate. An increase in category E LHDs observed in 2019.

Mitigations : A task force has been established to work on the category E occurrences, the task force includes personnel from both facilities



Asia

Asia : Vertical Collision Risk

ASIA : Vertical Collision Risk Estimates

Number of annual flying hours: 12,324,4974 hours/year

2019 Asia Sub-Region	Vertical Risk Estimate	Remark
Vertical Technical Risk	0.74 x 10 ⁻⁹ FAPFH	Below Technical TLS
Vertical Operational Risk	12.14 x 10 ⁻⁹ FAPFH	
Vertical Overall Risk	12.88 x 10 ⁻⁹ FAPFH	Above TLS

2018 Vertical Overall Risk	15.50 x 10 ⁻⁹ FAPFH	Above TLS
2017 Vertical Overall Risk	27.30 x 10 ⁻⁹ FAPFH	Above TLS
2016 Vertical Overall Risk	12.53 x 10 ⁻⁹ FAPFH	Above TLS

Asia : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minute)	Number of Levels Crossed
Aircraft/ Pilot	A	Flight crew failing to climb/descend the aircraft as cleared	45	10.5	20
	B	Flight crew climbing/descending without ATC Clearance	34	5.73	28
	C	Incorrect operation or interpretation of airborne equipment	9	0	2
ATC	D	ATC system loop error	40	14.4	27.5
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	597	2,269.75	1
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	12	0	0
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	2	0.5	1
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	3	0	4

Asia : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minute)	Number of Levels Crossed
Weather/ Turbulence	I	Turbulence or other weather related causes leading to unintentional or undetected change of flight level	37	6	24
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	19	1	8
	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	3	95	0
	M	Other	26	9.5	0.5
Total			827	2,412.38	116

Asia : Horizontal Collision Risk

Asia : Horizontal Collision Risk Estimates

Number of annual flying hours: 12,324,497 hours/year

2019 Asia Sub-Region	Horizontal Risk Estimate	Remark
30NM Lateral Risk	0.0001 x 10 ⁻⁹ FAPFH	Below TLS
50NM Longitudinal Risk	0.25 x 10 ⁻⁹ FAPFH	Below TLS
2018 Asia Sub-Region	Horizontal Risk Estimate	Remark
30NM Lateral Risk	0.52 x 10 ⁻⁹ FAPFH	Below TLS
50NM Longitudinal Risk	3.91 x 10 ⁻⁹ FAPFH	Below TLS

Asia : Summary of LLDs and LLEs

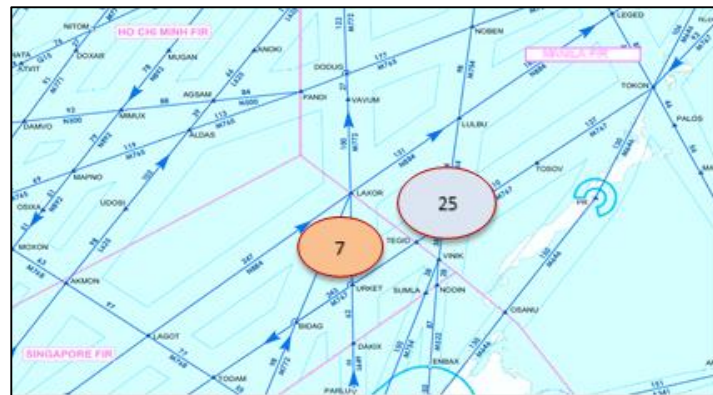
Attributions	Category Code	Description	Number of Occurrences	Duration (minute)	Number of Tracks /Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	1	0	0	50
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	1	3	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	10	0	0	503
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	4	2	0	0

Asia : Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minute)	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;	1	0	0	10
	J	Other	0	0	0	0
Total			17	5	0	563

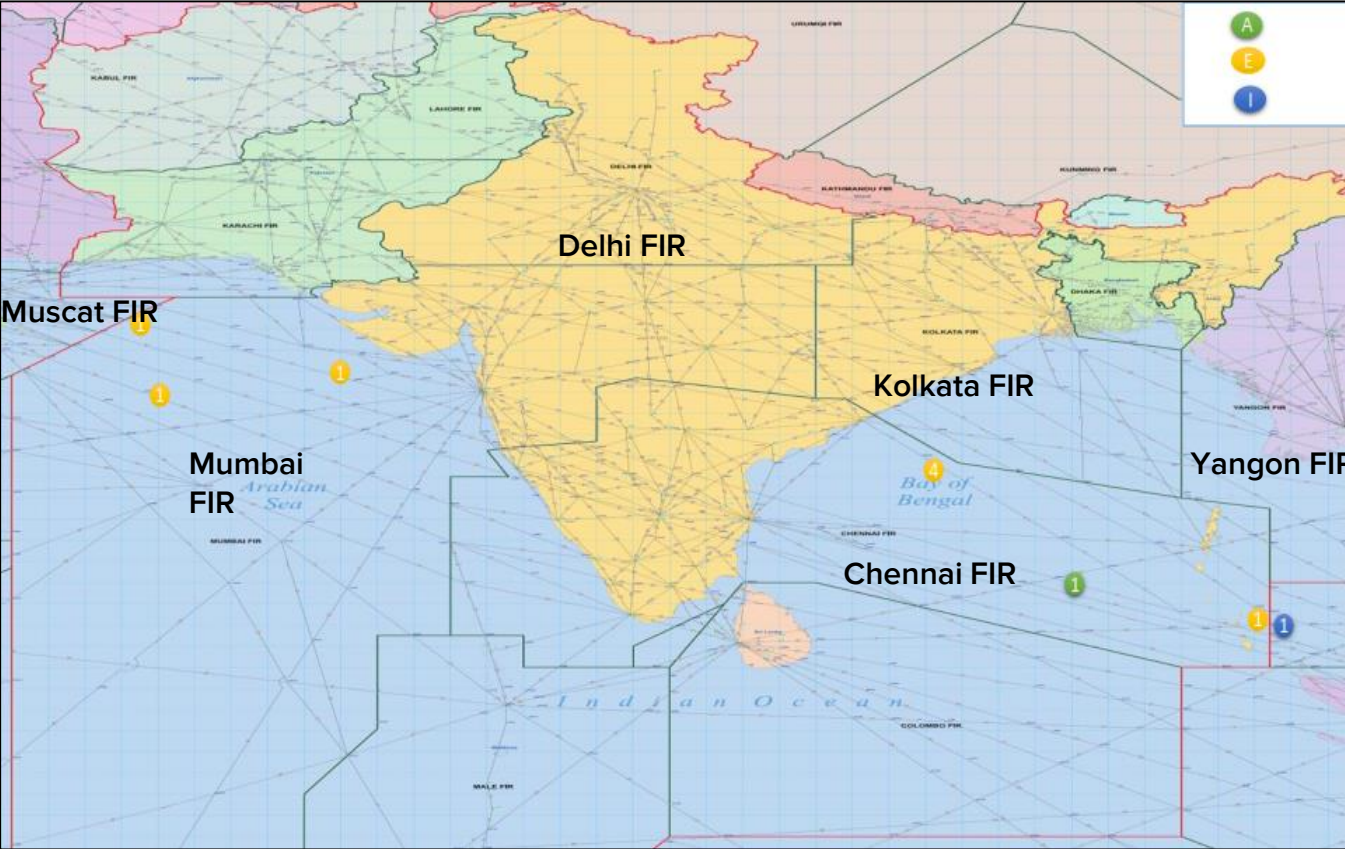
Asia : Summary of LLDs and LLEs (SEA Airspace)

- **Location** : Boundary of Singapore & Manila
- **Natures of Occurrences** : Top Categories, CAT B and CAT F. ■
- **Contributing Factors** : Inaccurate pilots' estimate, negative flight plans leading to AIDC non transfer.
- **Trend** : First identified as a hot spot in 2014. This interface improved 72%, compared to 2018.
- **Mitigation in 2019** : Continual proactive safety awareness and lesson sharing, focused on types of AIDC failures. Use of improved system estimates generated from multiple surveillance sources.



- The number of LLDs and LLEs in 2019
- The number of LLDs and LLEs in 2018

Asia : Summary of LLDs and LLEs (SA/IO Airspace)

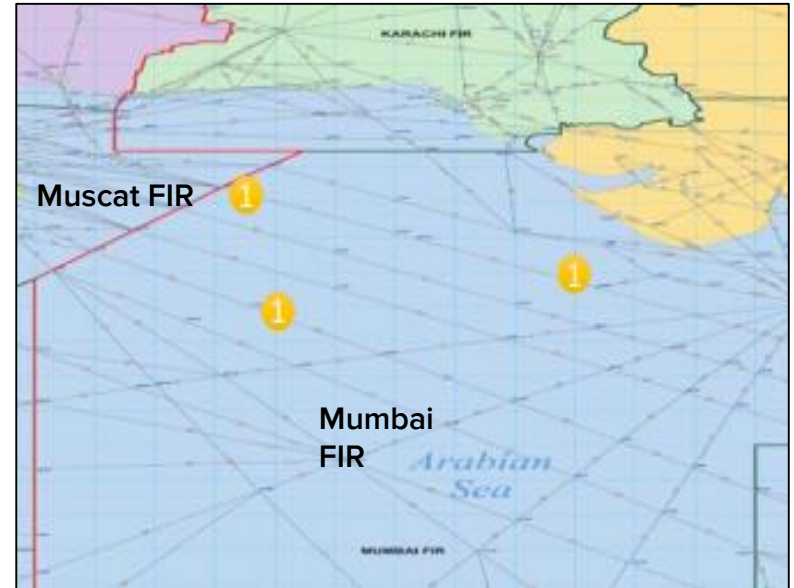


Kuala Lumpur FIR

- Category A (Green circle)
- Category E (Yellow circle)
- Category I (Blue circle)

Asia : Summary of LLDs and LLEs (SA/IO Airspace)

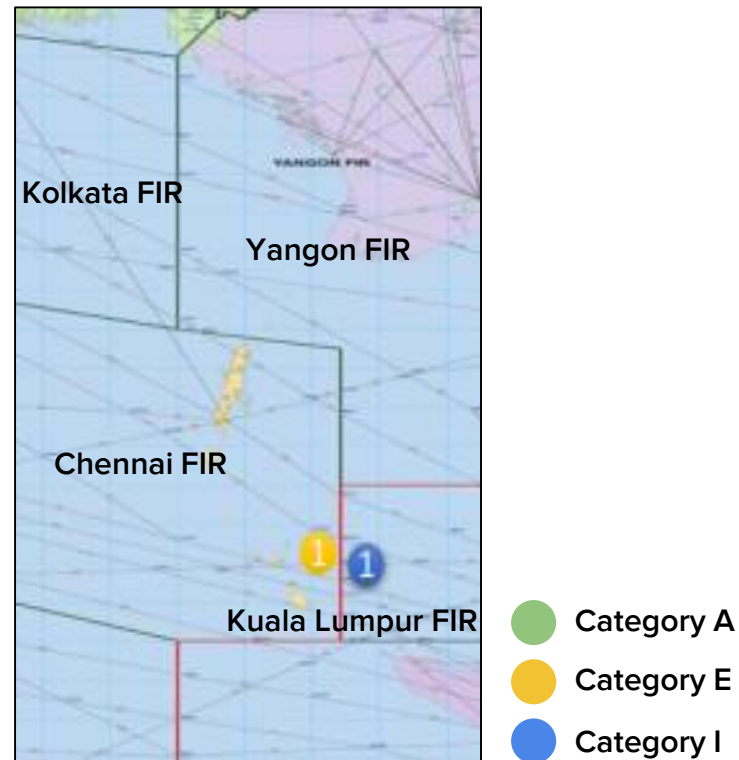
- **Location** : Mumbai/Muscat Boundary
- **Nature of Occurrences** : Category E.
- **Contributing Factors** : Poor communication and surveillance leading to late realization of traffic by ATC.
- **Trend** : -
- **Mitigation in 2019** : AIDC trials conducted in 2018 and Mumbai awaiting response from Muscat. Meanwhile data sharing and video conference between Mumbai and Muscat ATC being conducted to reduce coordination errors. Space-based ADS-B could help mitigate the duration of LLDs and LLEs.



- Category A
- Category E
- Category I

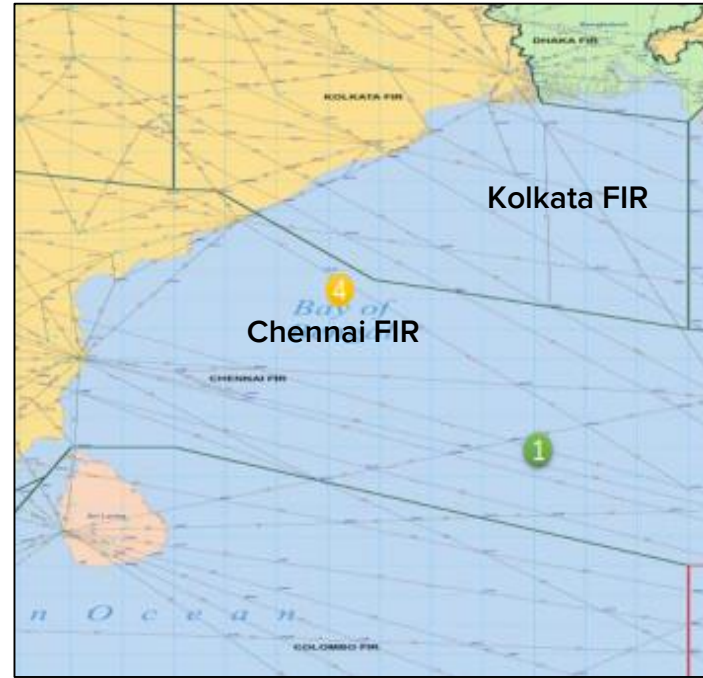
Asia : Summary of LLDs and LLEs (SA/IO Airspace)

- **Location** : Chennai/Kuala Lumpur Boundary
- **Nature of Occurrences** : Category E.
- **Contributing Factors** : Bad weather resulting in aircraft deviation that was not communicated by transferring unit to receiving unit.
- **Trend** : -
- **Mitigation in 2019** : AIDC trials operations since May 2017. MOU for operationalization of AIDC from 1st April 2020 was signed and now AIDC fully operational. AIDC MOU to be part of new LoA to be signed shortly. Space-based ADS-B could help mitigate the duration of LLDs and LLEs.



Asia : Summary of LLDs and LLEs (SA/IO Airspace)

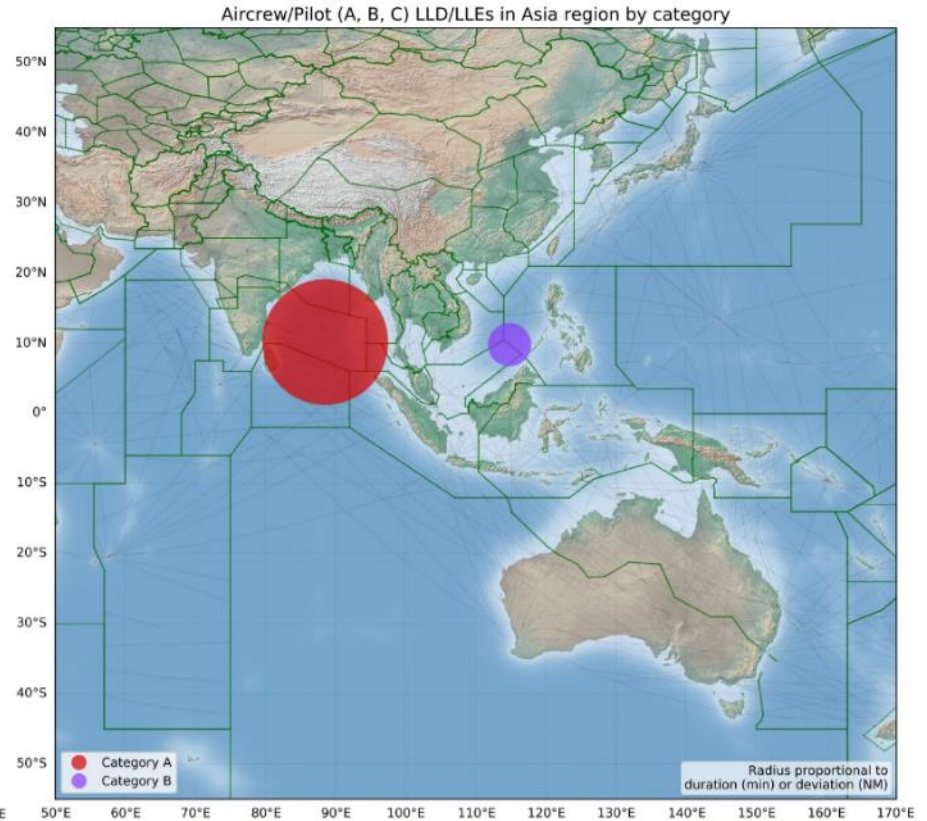
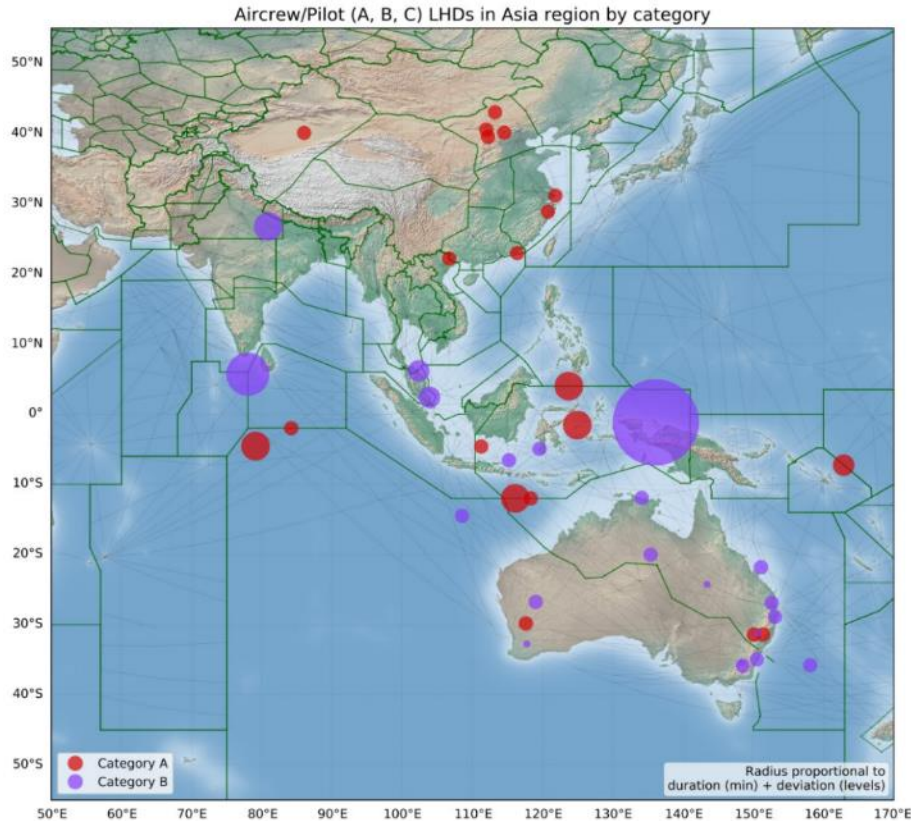
- **Location** : Chennai/Kolkata Boundary
- **Nature of Occurrences** : Category E.
- **Contributing Factors** : Bad weather resulting in aircraft deviation that was not communicated by transferring unit to receiving unit. (Occurred in one day)
- **Trend** : -
- **Mitigation in 2019** : AIDC trial operation between Chennai ACC and Kolkata ACC commenced from November 2019. Phase 2 of AIDC trials between Chennai OCC and Kolkata had to be postponed and will commence shortly.



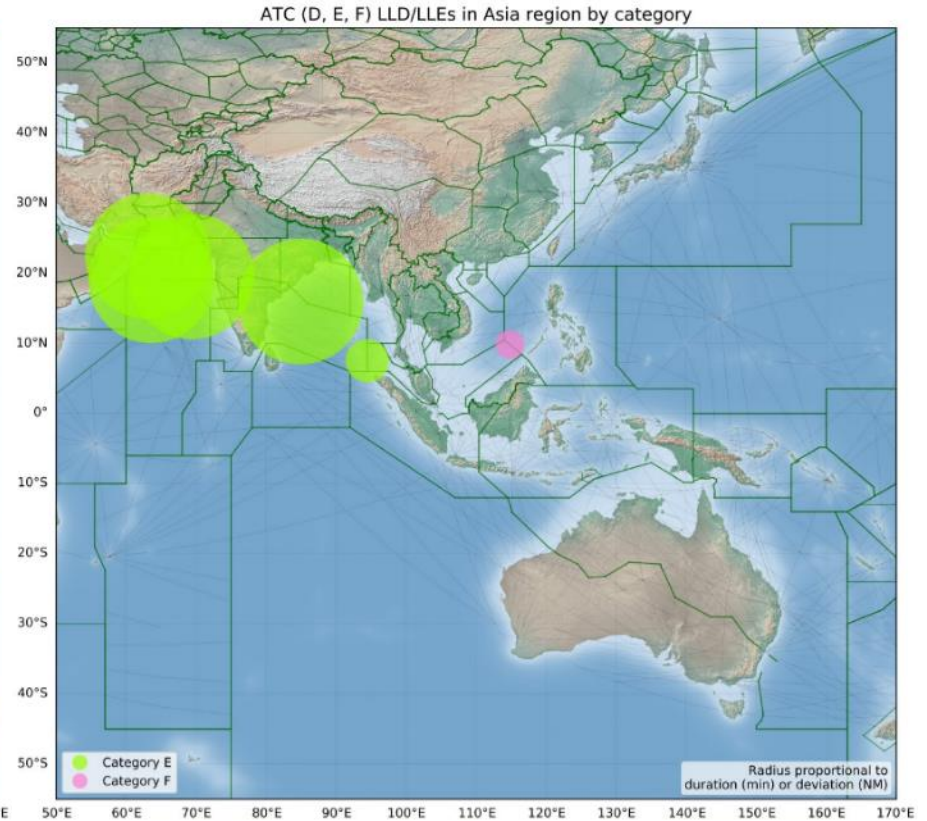
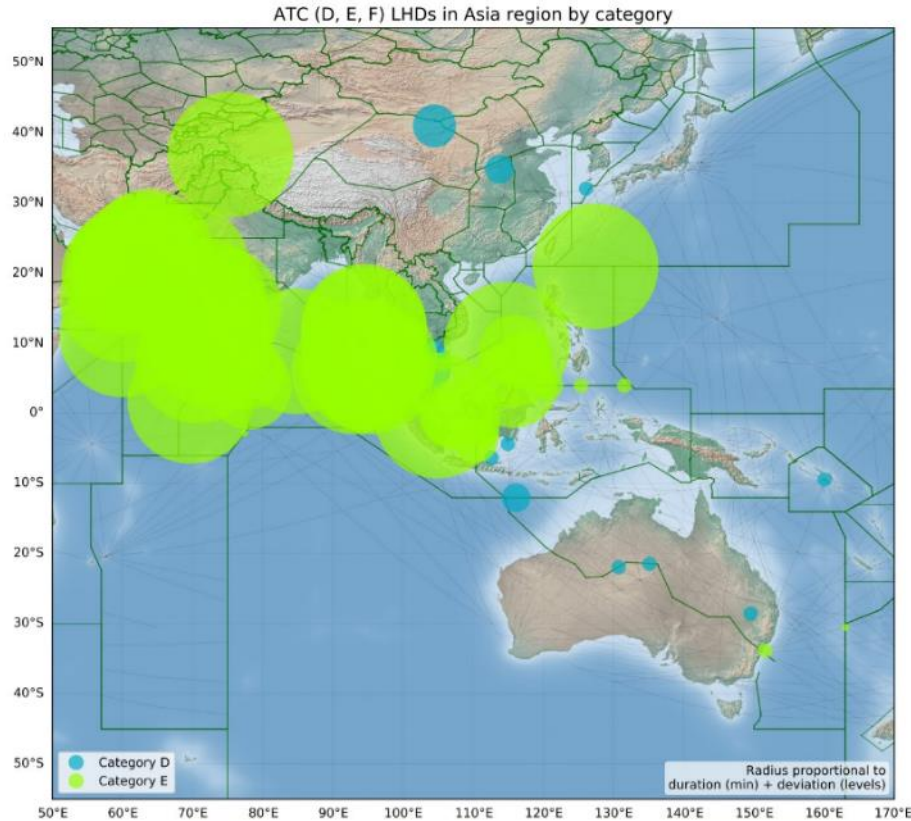
- Category A
- Category E
- Category I

Asia : Geolocation of LHDs/LLDs/LLEs

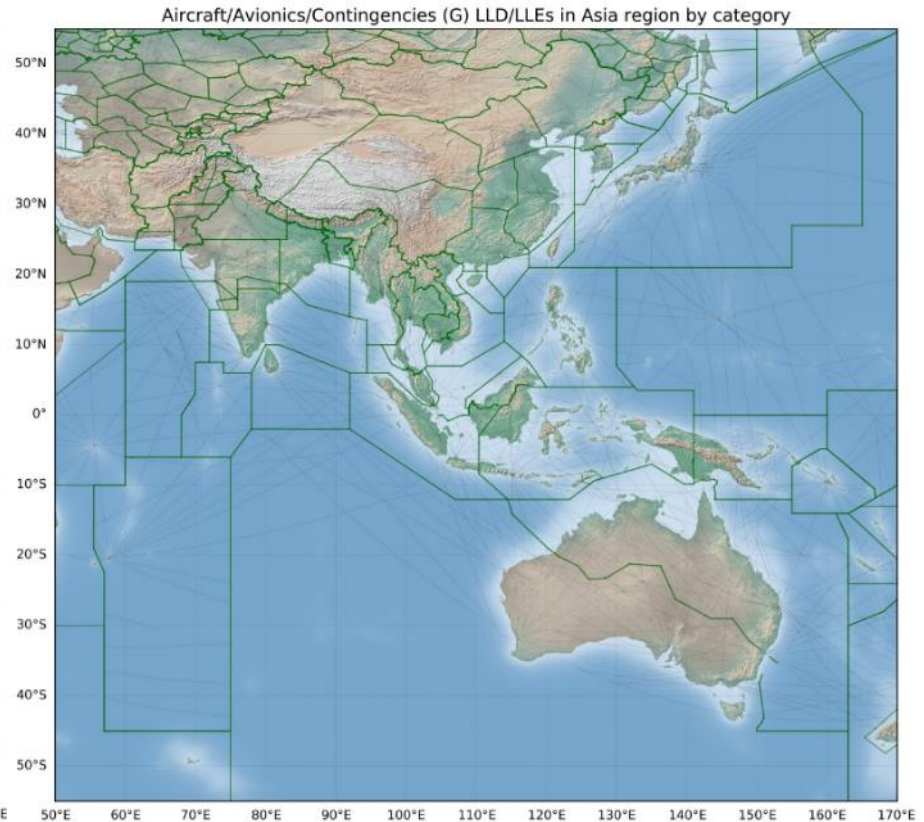
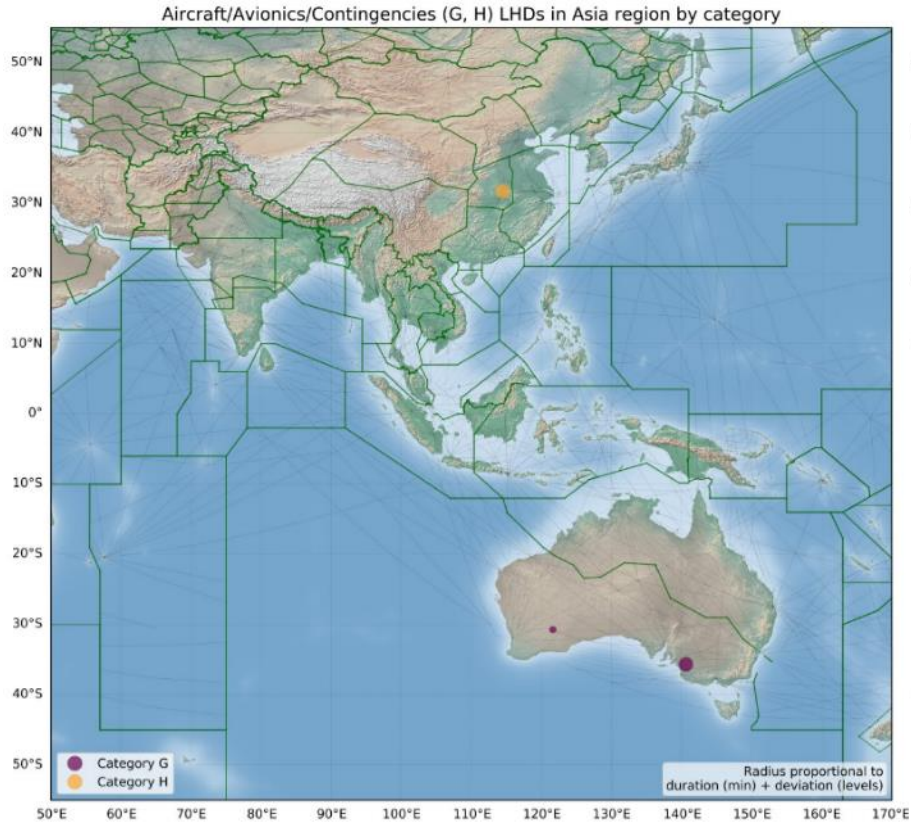
Asia : Aircrew/Pilot Related (A, B, C)



Asia : ATC Related (D, E, F)

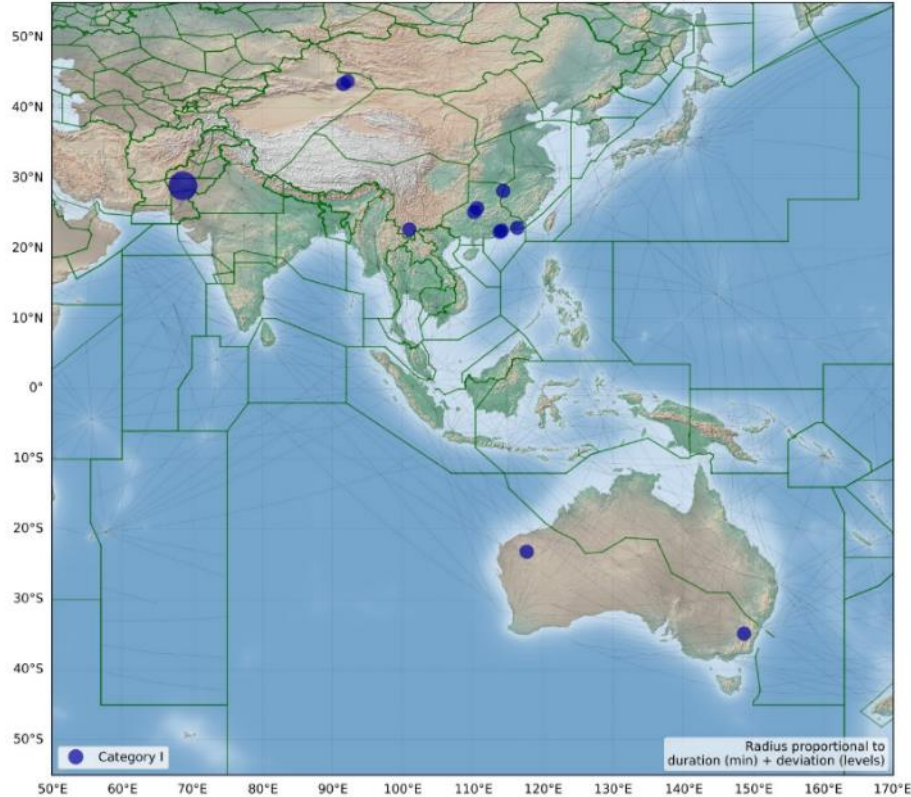


Asia : Aircraft Avionics/Contingencies (G, LHD:H)

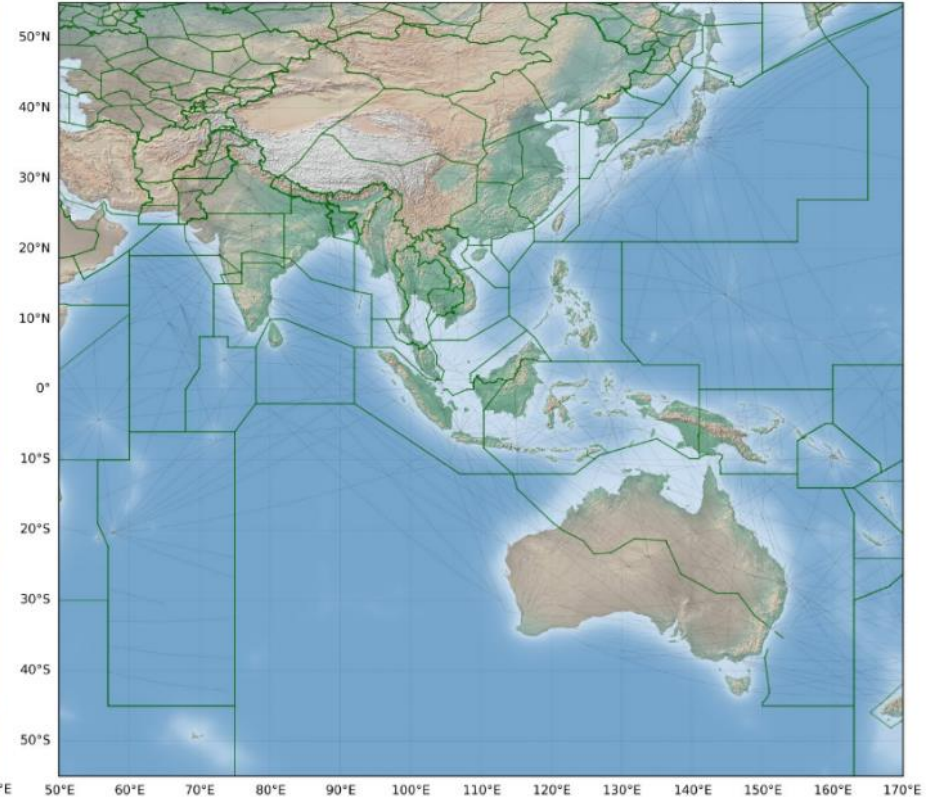


Asia : Weather/Turbulence (LHD:I, LLD/LLE:H)

Weather/Turbulence (I) LHDs in Asia region by category

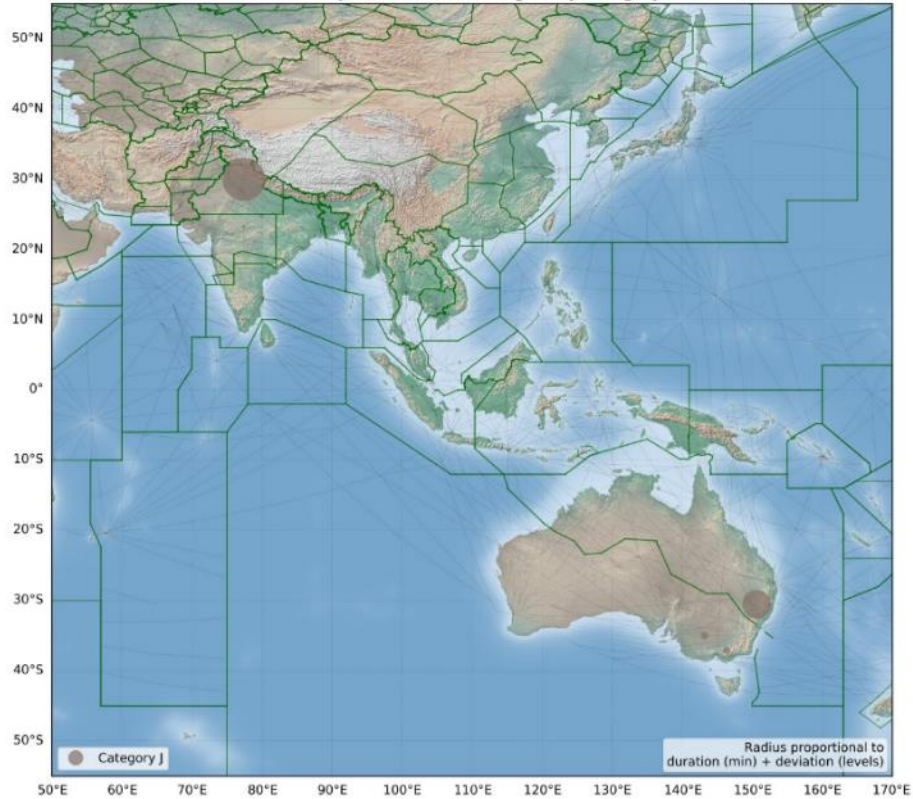


Weather/Turbulence (H) LLD/LLEs in Asia region by category



Asia : TCAS (LHD:J, K)

TCAS (J, K) LHDs in Asia region by category



Asia : Hot Spots

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

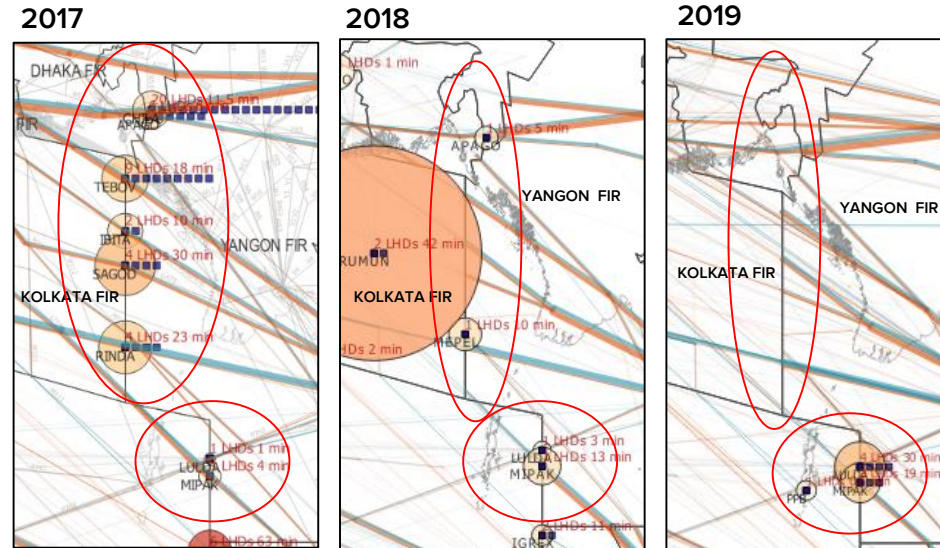
Nature of Occurrences : Coordination errors as a result of human factors issues (Cat E)

Contributing Factors : The interfaces are oceanic airspace, which has some gaps in communication and surveillance coverage.

Trend : The number of LHDs and the operational risk from 2017 to 2019 significantly decreased at the interface between Kolkata/Dhaka and Yangon FIR but increased at the interface between Chennai and Yangon FIR.

Mitigations : ADS-B data sharing between Kolkata and Yangon FIR commenced in June 2018. The remaining non-zero-duration LHDs are now concentrated around LULDA and MIPAK, where no ADS-B data sharing. AIDC implementation is also expected to help reduce LHD occurrences. Also it might be beneficial to review the procedure of handling an aircraft on route L759 between MIPAK and LIBDI where there is a brief crossing into Chennai FIR.

Operational risk (FAPFH)		
2017	2018	2019
2.06×10^{-9}	0.66×10^{-9}	0.80×10^{-9}



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

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

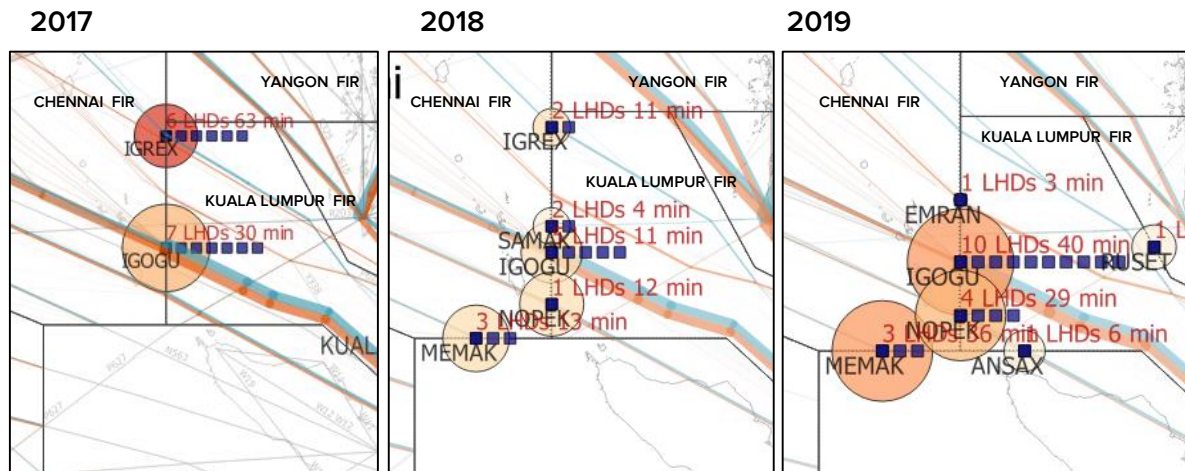
Contributing Factors : There are still some gaps in communication and surveillance coverage along the Chennai and Kuala Lumpur boundary.

Trend : The operational risk decreased by 1/3 from 2017 to 2018, but increased again in 2019

Mitigation :

- AIDC between Chennai and Kuala Lumpur is fully operational from 1st April 2020.
- Surveillance data sharing planned for 2021

Operational risk (FAPFH)		
2017	2018	2019
0.91×10^{-9}	0.66×10^{-9}	1.14×10^{-9}



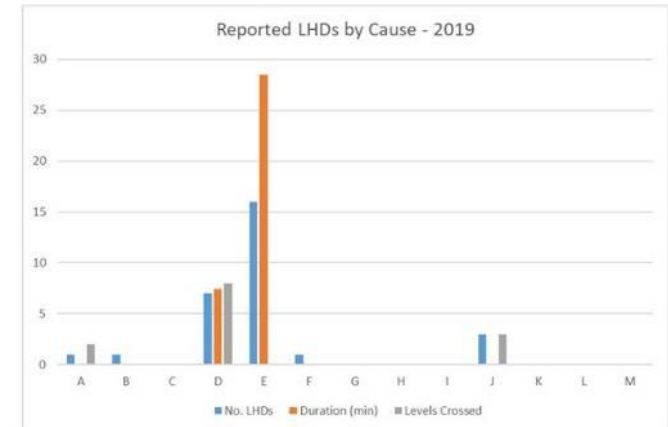
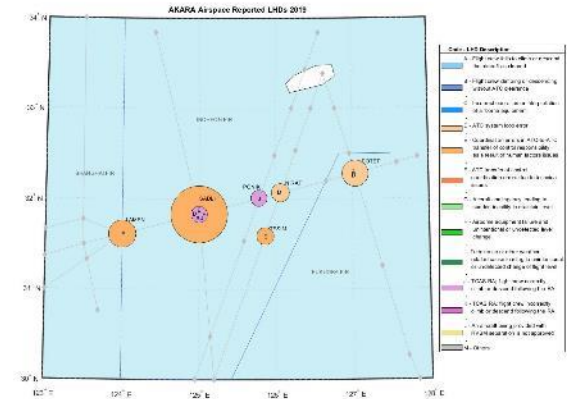
Asia : LHD Hot Spot B (AKARA Airspace)

Nature of Occurrences : Category D, E, and F occurrences. Category E and F occurrences are usually mitigated due to available surveillance but are complex to investigate due to unique ATS agreements.

Contributing Factors : High vertical risk due to high opposite direction vertical passing frequency. This is caused by traffic volume and limited availability of flight levels.

Trend : Identified as a hot spot since 2015. Increased reporting of occurrences in 2019 over previous years.

Mitigation : In 2018, a Task Force was formed; FUKUE-AKARA Corridor Technical Working Group (TWG).



Asia : LHD Hot Spot C (Hong Kong – Guangzhou)

Nature of Occurrences : Transfer Error

Contributing Factors : The major cause of the category E LHDs reported in this area was the late revision of flight information (including time and altitude) to the next ATSU.

Trend : The number of category E & F LHDs in this area has greatly reduced from 2015 to 2019. China RMA has not yet receive any event in this area since 2018.

Mitigations : China RMA took remedial actions to reduce the events and coordinated with other RMAs to mitigate the risk. The South China Sea Scrutiny Group meeting for Large Height Deviations (LHDs) was held in Haikou, China in July 2015. Hong Kong, Guangzhou, Zhan Jiang, Sanya and Shanghai ATC all assigned a point of contact for LHD reporting and established LHD data exchanging mechanism to confirm the events respectively. Guangzhou, Zhanjiang, Sanya and Shanghai ATC also refined their internal procedures for LHD reporting, especially coordination errors, after the scrutiny group meeting.

Proposed to be re-classified as a non-hot spot

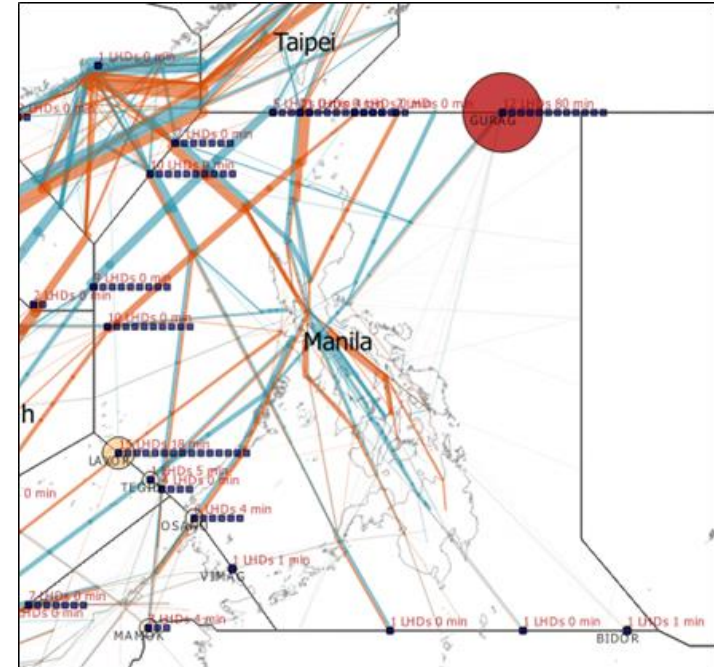
Asia : LHD Hot Spot D (Manila - Hong Kong/ Singapore/Taipei)

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

Contributing Factors : Even though Manila FIR now has much improved communication and surveillance coverage, there are still some gaps in communication and surveillance coverage along the boundaries of Manila FIR.

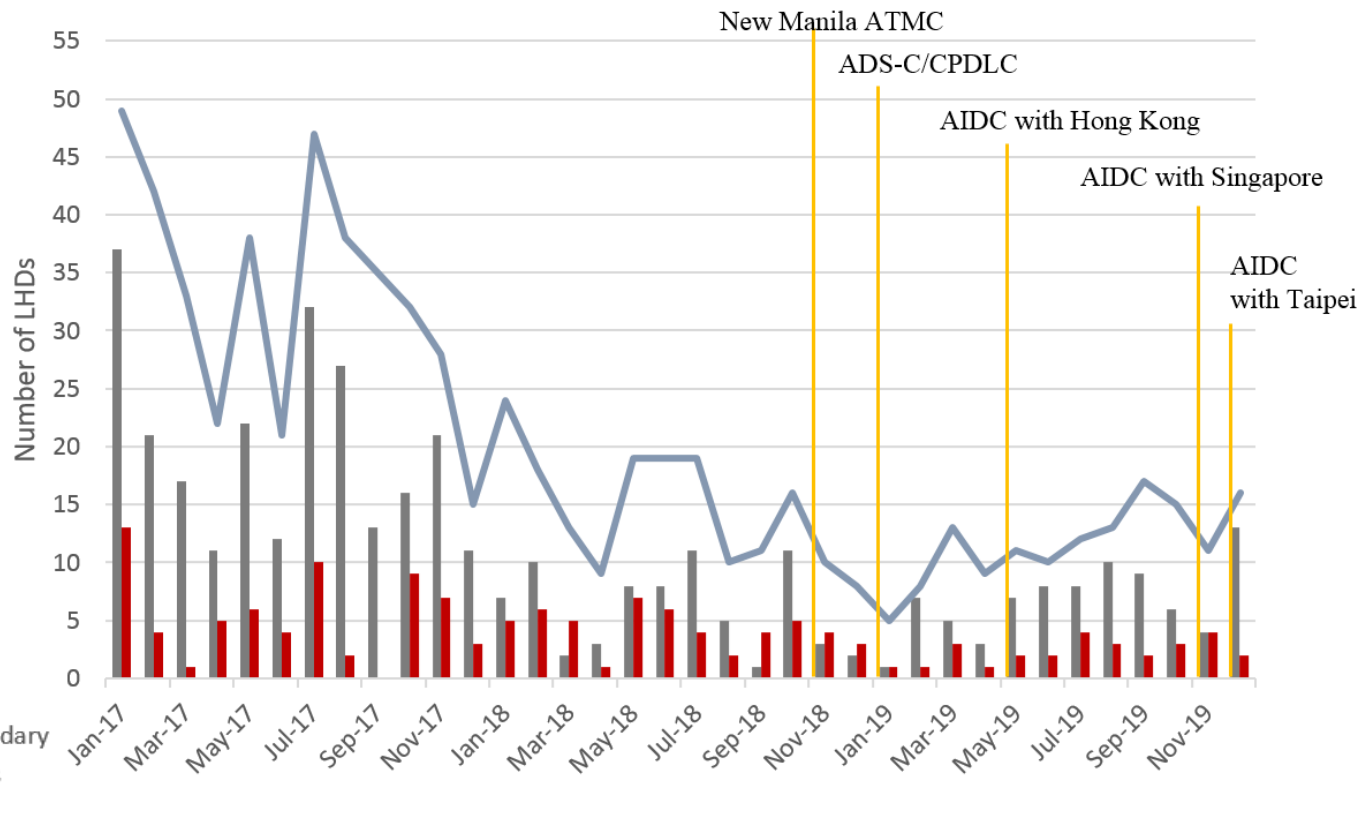
Trend : The operational risk slightly decreased in 2019. The most frequent LHDs were Category E while a number of Category F LHDs can be observed this year.

Mitigation : In November 2018, the Manila ACC upgraded to the new ATM system. This upgrade included the enhanced capabilities of VHF radio, radar and ADS-B coverage, and allowed ATC workload to be split into more sectors. In 2019, ADS-C/CPDLC in oceanic airspace, AIDC with Hong Kong, Singapore and Taipei FIRs were implemented. Further improvements are planned and presented to RASMAG/24 and 25 by the Philippines' representatives.



Asia : LHD Hot Spot D (Manila - Hong Kong/ Singapore/Taipei)

Timeline of safety enhancement initiatives implemented by the Philippines, compared to all LHD occurrences in SEA airspace.



Asia : LHD Hot Spot D (Manila - Fukuoka)

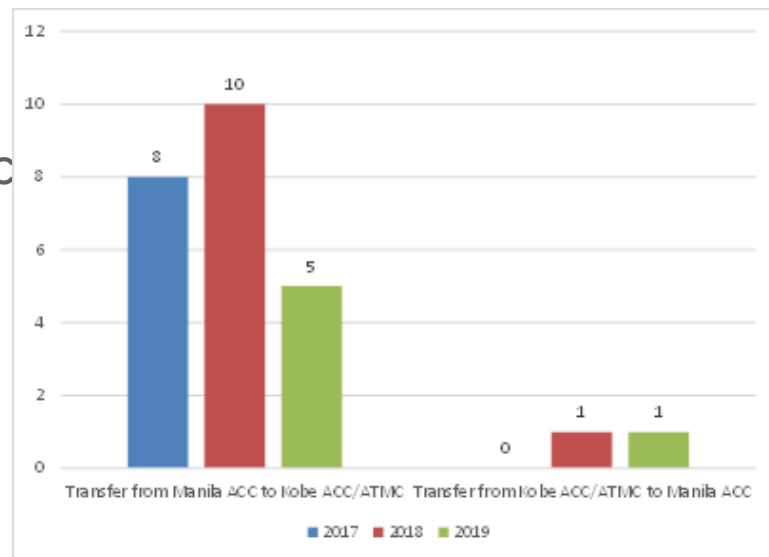
Nature of Occurrences : Transfer error

Contributing Factors : There were six Category-E LHD events, five transfer errors from Manila ACC to Kobe ACC and one transfer error from Kobe ACC to Manila ACC. All factors were forgetting to send revised transfer information of altitude.

Trend : The number of the category E LHD events decreased from 2018 in 2019.

Mitigations :

- LHD Preventive/Mitigation Measures presented by the Philippines at the RASMAG/24
- Timely LHD information sharing between Kobe ACC/ATMC and Manila ACC



Asia : LHD Hot Spot E (Lahore – Urumqi)

Nature of Occurrences : Transfer Error

Contributing Factors : The category E LHDs reported in this area were mainly due to COM deficiencies between China and Pakistan

Trend : Urumqi and Lahore FIR has confirmed that the communication and surveillance ability has been enhanced and the number of LHDs is reducing year by year. There was only one LHD reported due to coordination error occurred in 2018 and 2019.

Mitigation : In order to address the issue and develop a solution to the identified COM deficiencies between China and Pakistan, the Communication (COM) coordination meeting between China and Pakistan hosted by ICAO Regional Office organized in May 2015 at headquarters of ATMB, Beijing, China. After that, Xinjiang regional ATMB established a VHF station with 2 channels and an ADS-B station at Taxkorgan in 2015 and an ADS-B station at Shache airport in 2017. Now the signal coverage for PURPA of communication and surveillance has been greatly enhanced.

Proposed to be re-classified as a non-hot spot

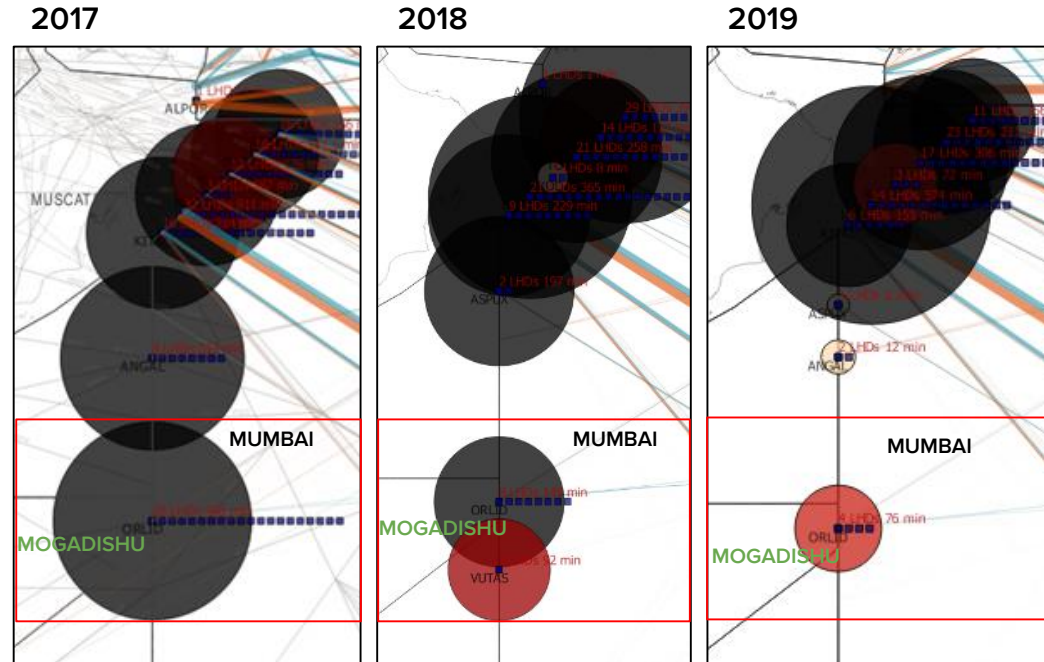
Asia : LHD Hot Spot F (Mogadishu – Mumbai)

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

Contributing Factors : The interface of Mogadishu FIR and Mumbai FIR (Waypoint: ORLID, Route: G450) is in oceanic airspace, which has poor communication and surveillance coverage. Most of LHDs were in Category E (Negative transfer and FL information in transfer estimates was incorrect).

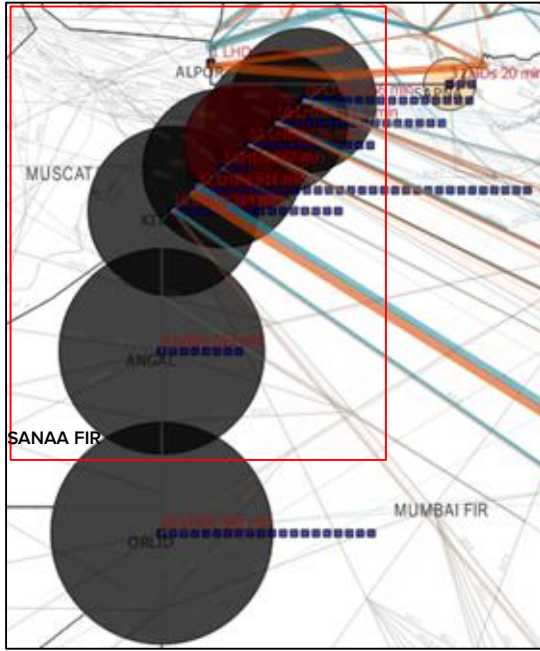
Trend : The number of LHDs and operational risk significantly decreased in 2018 and 2019.

Mitigation : AIDC implementation and surveillance coverage enhancement are recommended to help reduce and mitigate the

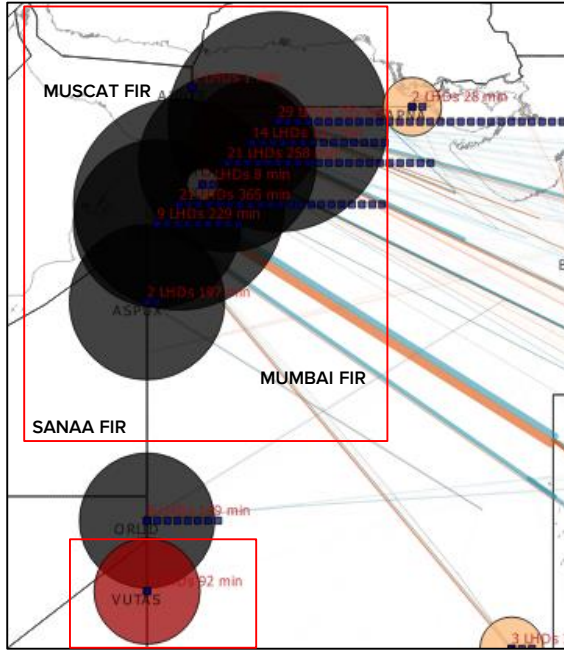


Asia : LHD Hot Spot G (Sanaa/Muscat – Mumbai)

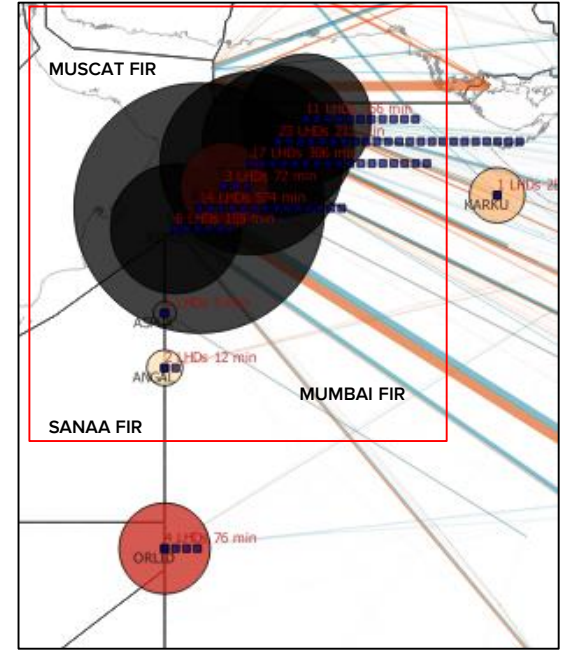
2017



2018



2019



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

Nature of Occurrences : Coordination errors as a result of human factors issues. (Cat E - Negative transfer and wrong FL in the transfer)

Contributing Factors : The interfaces of Sanaa/Muscat and Mumbai FIR are oceanic airspace with poor communication and surveillance coverage. Therefore, long duration LHDs were still prevalent on these interfaces.

There was also an effect from Pakistan airspace closure during 27 February to 16 July 2019 rerouting traffic to Muscat FIR with L301 (RASKI waypoint) as the closest route next to the Pakistani border.

Trend : The number of LHDs and operational risk at Mumbai-Muscat interface decreased slightly from 2017 to 2019. However, the number of LHDs and operational risk are still very high comparing to other areas.

Risk at Mumbai-Sanaa interface decreased significantly from the previous years.

Mitigation : AIDC trials were conducted in 2018 and Mumbai awaiting response from Muscat. Meanwhile information sharing and video conference between Mumbai and Muscat ATCOs are being conducted to reduce the coordination errors. Space-based ADS-B could help mitigate the duration of LHDs.

Interface	Operational Risk (x 10 ⁻⁹ FAPFH)		
	2017	2018	2019
Mumbai-Muscat	32.82	30.38	24.71
Mumbai-Sanaa	6.25	2.28	0.20
Total	39.07	32.66	24.91

Asia : LHD Hot Spot H (Guangzhou – Wuhan)

Nature of Occurrences : Communication failure.

Contributing Factors : Flight crews were unable to establish normal air-ground communications with the responsible ATS unit.

Trend : The number of communication failure events have greatly reduced, especially the long duration events. The communication failure event without flight level change has not been considered as LHD events since RASMAG23 meeting.

Mitigation : China RMA has conducted a number of investigations and a series of Scrutiny Group meetings with representatives from China RMA, ATMB, regional ATMBs, and China Airline Pilots Association. CAAC issued CCAR-129R1 on 18 December 2017, adding the mandatory requirement for foreign flight crews to keep monitoring the VHF emergency frequency 121.5MHz. Moreover, China RMA is cooperating with IATA and has established investigation mechanism for the foreign airlines.

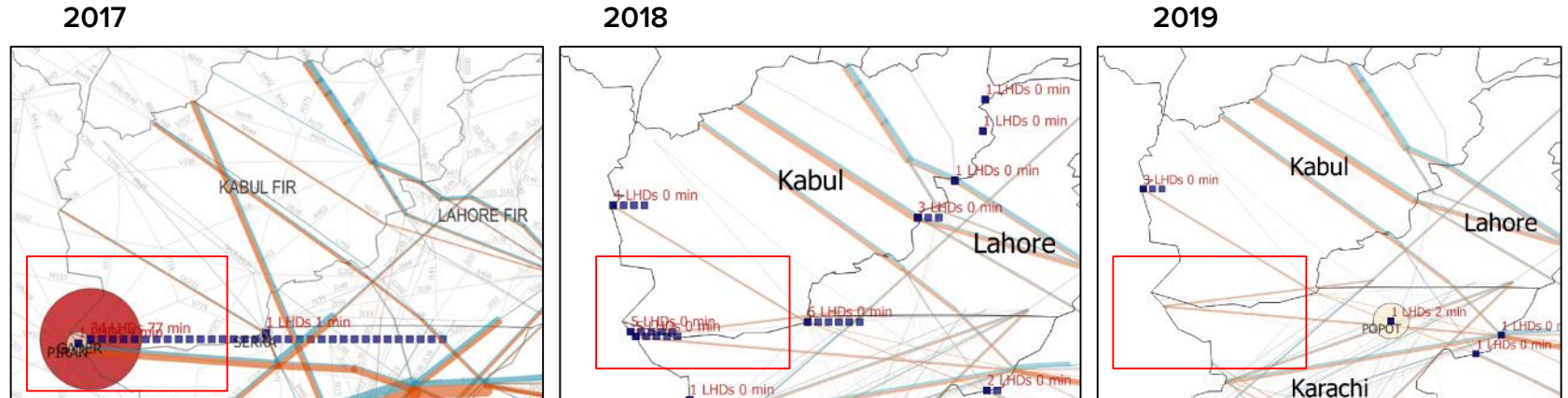
Proposed to be re-classified as a non-hot spot (ref. a separate paper by China RMA)

Asia : LHD Hot Spot I (Karachi – Kabul)

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

Contributing Factors : The A453 route segment between GADER and PIRAN is a short distance and involves Kabul, Karachi, and Tehran FIR. Thus, the aircraft transfer in this area was rather complicated.

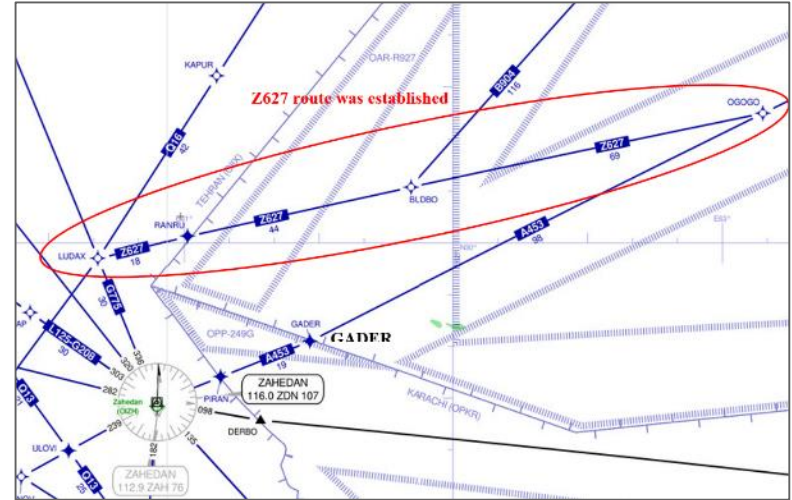
Trend : The number of LHDs and risk between Karachi and Kabul FIR significantly decreased from 2017 to 2019.



Asia : LHD Hot Spot I (Karachi – Kabul)

Mitigation : The new route, Z627, between Tehran FIR to Kabul FIR was established in July 2019. Since then, the traffic, the number of LHDs and the risk at GADER on route A453 has significantly decreased. The complication of handling an aircraft among the 3 units is avoided.

Proposed to be re-classified as a non-hot spot from the improved situation in 2018 and 2019.



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

Nature of Occurrences : In 2019, there were 21 reports of LHDs

- 18 are coordination errors between Singapore and Jakarta
- 3 are coordination errors between Kota Kinabalu and Jakarta

Contributing Factors :

- The majority of the LHDs involved not revising FL change to the accepting ACC (both Jakarta and Singapore) due to having multiple changes in flight levels so as to facilitate optimal flight level safely.
- Roughly half of the occurrences involving transfers to Singapore ACC are negative transfers.
- Three occurrences involved route deviations due to weather.

Trend : The number of LHDs in 2019 stay roughly the same as in 2018.

Mitigations :

- Continual proactive safety awareness and lesson sharing, minimise last minute revision of flight levels near the boundary to prevent revision errors.
- Use of surveillance to detect incorrect flight levels well in advance before boundary.
- AirNav Indonesia have reached out to SEASMA via AAMA to collaborate on developing additional mitigating measures to reduce coordination errors. This discussion has been put on hold as a result of the COVID-19 pandemic.

Transferring → Accepting	Non-Zero-Duration LHDs		All LHD Reports	
	2018	2019	2018	2019
Singapore → Jakarta	5	11	5	11
Jakarta → Singapore	5	1	16	7
Jakarta → Kota Kinabalu	1	0	4	3

Asia : LHD Hot Spot K (Jakarta – Ujung Pandang)

Nature of Occurrences : In 2019, there were five reports of LHDs, all involving coordination errors as a result of human factors issues. The majority of these involved the incorrect level information being passed. One LHD involved a readback error by Jakarta ATC, which was not detected by Ujung Pandang ATC. The majority of the LHDs occurred at TAVIP.

Contributing Factors : Contributing factors included readback errors and late revision of flight level.

Trend : There was a slight increase of LHDs in 2019, with one in 2018 and three in 2017.

Mitigation : AirNav Indonesia reports on contributing factors/causes, possible mitigations, target date for these mitigations, progress, and effectiveness to AAMA. This ongoing reporting and discussion appears to be having a positive overall effect on coordination errors in Hot Spot K.

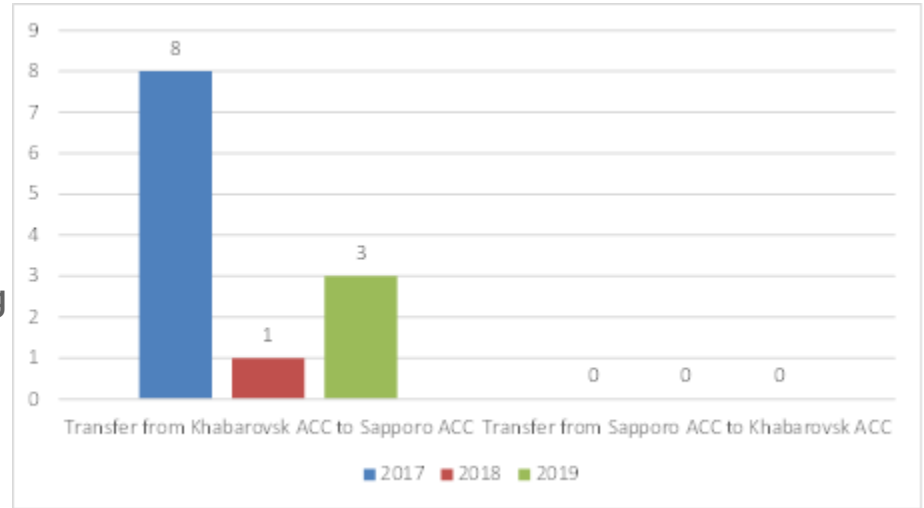
Proposed to be re-classified as a non-hot spot

Asia : LHD Hot Spot L (Fukuoka – Khabarovsk)

Nature of Occurrences : Transfer error

Contributing Factors : There were three category E LHD events, transfer errors from Khabarovsk ACC to Sapporo ACC.

There were two factors, one was not receiving revised transfer information for altitude change, and the other was misunderstanding of transfer altitude.



Trend : There was a significant reduction of category E LHD events after 2017, but they still occurred a few times per year in 2018 and 2019.

Mitigation : Japan Civil Aviation Bureau plans to introduce the AIDC between Khabarovsk ACC and Sapporo ACC near the future.

Proposed to be re-classified as a non-hot spot from the improved situation in 2018 and 2019.

Asia : LHD Hot Spot M (Colombo – Melbourne)

Nature of Occurrences : In 2019, there was one LHD involving Hot Spot M. The occurrence was a coordination error involving incorrect readback by Melbourne ATC. Colombo ATC did not detect the incorrect readback, and the error was detected when Melbourne ATC received the first ADS-C return for the aircraft. The error was assessed as being resolved prior to entering the Melbourne FIR, and was therefore assessed as zero-duration.

Contributing Factors : Incorrect readback.

Trend : Hot spot M was newly identified as a hot spot in 2019, following three LHDs in 2017 and four LHDs in 2018. The number of LHDs involving Hot Spot M has decreased in 2019.

Mitigation : In 2017 - 2018, a number of the coordination errors between Colombo and Melbourne ATC resulted from Male ATC coordinating the incorrect level to Colombo ATC. The number of LHDs of this nature appears to have decreased.

Proposed to be re-classified as a potential non-hot spot.

Reporting Rate of LHDs/LLDs/LLEs

2019 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	3,341	0	-	0	-	0	-	0	-
Mongolia	164,276	1	1: 164,276	0	-	1	1: 164,276	2	1: 82,138
Indonesia	1,232,871	6	1: 205,479	30	1: 41,096	1	1: 1,232,871	37	1: 33,321
China	2,458,432	19	1: 129,391	9	1: 273,159	51	1: 48,205	79	1: 31,119
SEA	3,385,767	7	1: 483,681	138	1: 24,535	7	1: 1,692,883	152	1: 22,275
Japan	1,598,660	8	1: 199,833	28	1: 57,095	41	1: 38,992	77	1: 20,762
ROK	644,602	4	1: 161,151	26	1: 24,792	4	1: 161,151	34	1: 18,959
Pacific	1,754,212	23	1: 76,270	144	1: 12,182	46	1: 292,368	173	1: 10,139
SW Pacific	942,831	48	1: 19,642	33	1: 28,571	20	1: 47,142	101	1: 9,335
SA/IO	3,492,377	5	1: 698,475	427	1: 8,179	7	1: 498,911	439	1: 7,955
Total	15,677,369	121	1: 129,565	835	1: 18,775	138	1: 113,604	1,094	1: 14,330

Reporting Rate of LHDs/LLDs/LLEs

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

- Notes:
- **Indonesia** resolved the issues with TSD collection in 2018. The flying hours and, hence, the reporting rate significantly changed in 2018.
 - **ROK, Pacific, and SW Pacific** have significantly improved their reporting rates in 2019.

Airspace Risk Assessment Conclusion

Vertical TLS Compliance

- 2019 PAC vertical overall risk is 30.21×10^{-9} FAPFH (above the TLS) with an increasing trend since 2016 from the improved reporting culture.
- 2019 ASIA vertical overall risk is 12.88×10^{-9} FAPFH (above the TLS) with a decreasing trend since 2017 from various safety improvement initiatives.

Horizontal TLS Compliance

- 10MIN longitudinal risk estimate of Japan airspace is 20.1×10^{-9} FAPFH (above the TLS). However, this is due to a technical issue in the computation.
- All else are below the TLS.

Hot Spot Proposals

LHD Hot Spots

- C (Hong Kong - Guangzhou),
- E (Lahore - Urumqi),
- H (Guangzhou - Wuhan),
- I (Karachi - Kabul),
- K (Jakarta - Ujung Pandang), and
- L (Fukuoka – Khabarovsk)

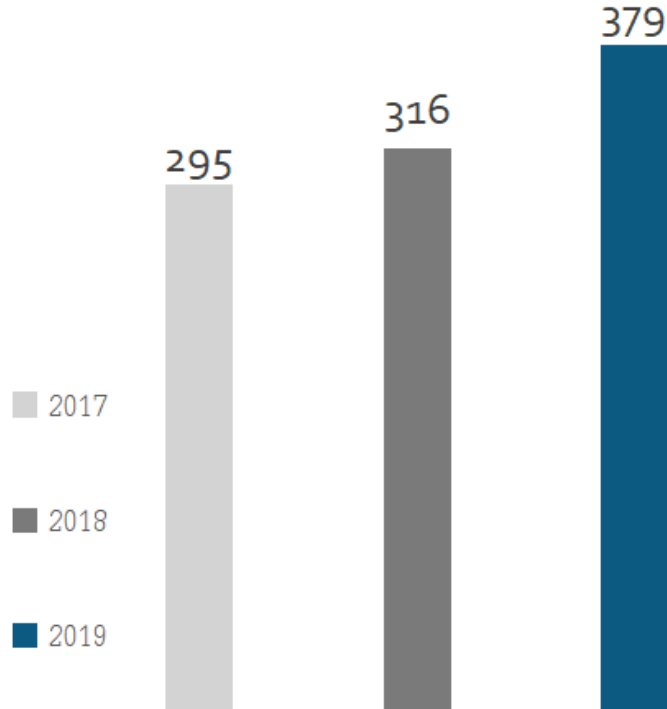
are proposed to be reclassified as non-hot spots.

Reporting Rate of LHDs/LLDs/LLEs

- The reporting rate of LHDs/LLDs/LLEs is improving in general.
- DPRK: no LHD/LLD/LLE report in 2017, 2018 or 2019.
- Mongolia: the reporting rate in 2019 was significantly lower than others.
- ROK, Pacific States and SW Pacific States: the reporting rate in 2019 significantly improved.

Long-Term Height Monitoring (LTHM) Compliance

No. of Aircraft Remaining to Be Monitored 2017-



In 2019, the total number of aircraft remaining to be monitored in APAC increased from 2018 by **20%**

MAAR : **206** aircraft remaining to be monitored

- Accounts for 54% of all aircraft remaining to be monitored in APAC
- Pakistan CAA indicates that the flight hours of some aircraft have not reached 1,000 hours yet, so they consider these aircraft compliant to the MMR.
- Afghanistan has the highest percentage of remaining monitoring burden at 85%.
- Small fleet operators from India, the Philippines, and Afghanistan only have EGMU as the only height monitoring option. Due the travel restrictions during the COVID-19 pandemic, AEROTHAI is unable to provide them with the services.
- Nepal and Bhutan, whose aircraft on a regular basis conduct the monitoring via AHMS, also have difficulties with the operation during COVID-19.

China RMA : **82** aircraft remaining to be monitored

- Accounts for 22% of all aircraft remaining to be monitored in APAC
- The aircraft remaining to be monitored are those aircraft not equipped with ADS-B Out, which gives EGMU as the only remaining height monitoring option. Due the travel restrictions during the COVID-19 pandemic, EGMU service could not be performed for these aircraft.

AAMA : **71** aircraft remaining to be monitored

- Accounts for 19% of all aircraft remaining to be monitored in APAC
- Australia has 16% of remaining monitoring burden, predominantly due to military aircraft being unable to be detected using AAMA's ADS-B Height Monitoring System (AHMS).
- Indonesia has 42% remaining monitoring burden
- Unavailability of EGMU monitoring for aircraft that are not ADS-B equipped
- AAMA is currently engaging with Indonesian Authorities to establish sharing of aircraft specific ADS-B data so that more effective monitoring of Indonesian aircraft can take place.
- The Solomon Islands has only 1 aircraft which was yet to be monitored (100%), while Papua New Guinea has 1 airframe out of 13 (8%) to be monitored

JASMA : 9 aircraft remaining to be monitored

- JASMA has relatively very small remaining monitoring burden, only 9.
- Most of the remaining aircraft are operated by small operators, coast guard, and military, of which flight hours are not likely to have reached 1,000 hrs.

States with Remaining Monitoring Burden \geq 30%

State	2018	2019		2019
		Remaining	Required	
Afghanistan (MAAR)	38%	11	13	85%
India (MAAR)	25%	106	245	46%
Pakistan (MAAR)	56%	13	28	46%
Indonesia (AAMA)	21%	24	57	41%
Nepal (MAAR)	0%	5	11	45%
The Philippines (MAAR)	26%	30	70	43%
Bhutan (MAAR)	0%	2	5	40%

List of Deficiencies: Proposal

- RASMAG/23 agrees that States failing to meet monitoring requirements with the remaining burden of 30% or more will be proposed to be listed in the APANPIRG List of Deficiency.
- India, Indonesia, The Philippines and Bhutan would have been included in the deficiency list proposal.
- However, unavailability of EGMU services due to travel restrictions during the COVID-19 pandemic was the major cause for the non-compliance.
- RASMAG/25 agreed to delay the proposal to include States in the APANPIRG List of Deficiencies to the next RASMAG.
- Malaysia has updated a massive list of de-registered aircraft to MAAR, causing a decrease in monitoring burden to 26% → proposed to be removed