2020 Asia Pacific
Consolidated Safety Report

Asia Pacific EMAs/RMAs

For RASMAG/26

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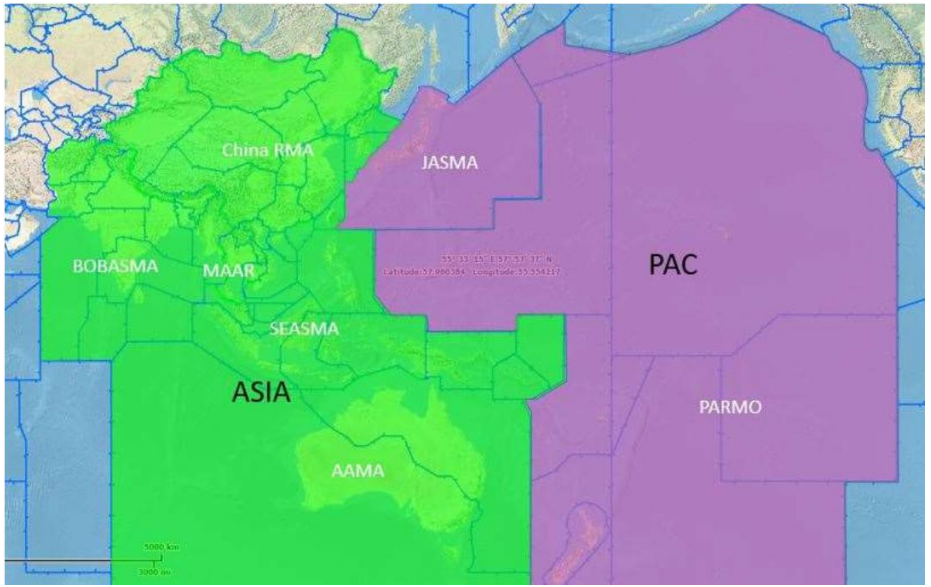
Background

Background

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



The report is divided into:

- **Pacific (PAC) Area**
- **Asia Area**

For each area, there will be a summary of:

- vertical collision risk estimates,
  LHD summary, and their hot spots (if any);
- horizontal collision risk estimates, LLD & LLE summary, and their hot spots (if any); and
- reporting rates in 3 groups: Category A + B + C (related to the pilot/aircrew), D + E + F (related to ATC),
  and G + H + I + J + K + L + M (Other).

Pacific Area (PAC)

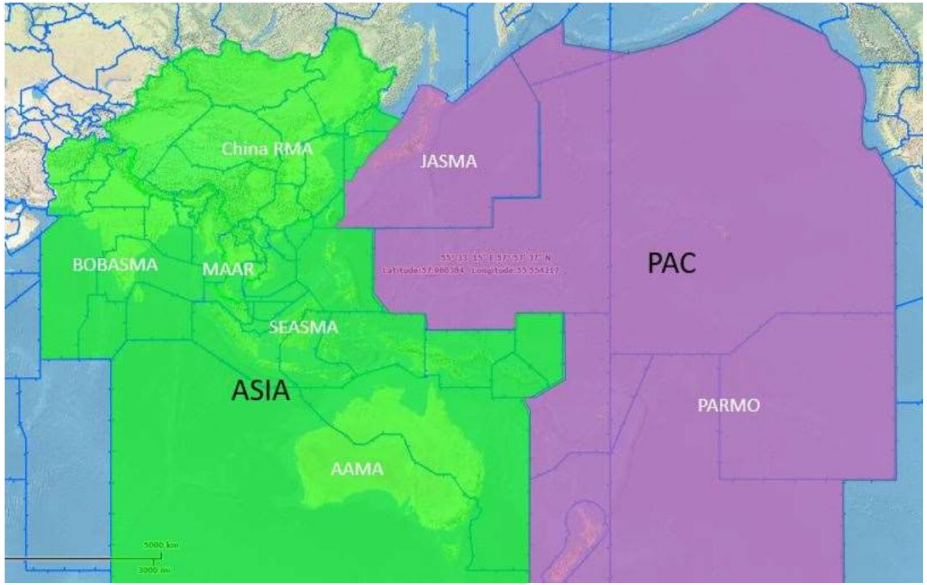
Traffic between North America and Asia, or North America and South Pacific States

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

Monitoring Agencies :

RMAs : JASMA, PARMO

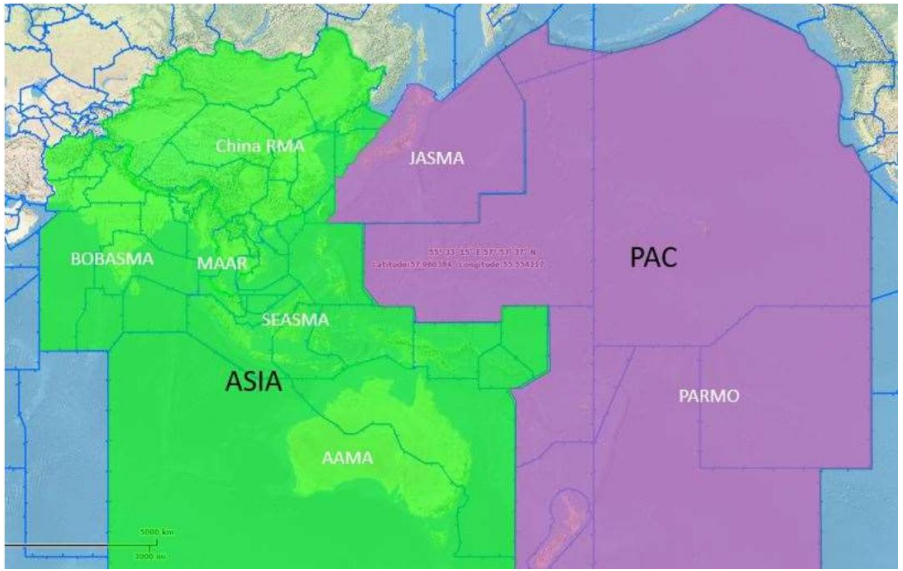
EMAs : JASMA, PARMO



Asia Area (Asia)

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

FIRs : Bangkok, Beijing, Brisbane, Chennai,Colombo, Dhaka, Delhi, Guangzhou, Hanoi, Ho Chi Minh, Hong Kong, Honiara, Incheon, Jakarta, Karachi, Kathmandu, Kolkata, Kota Kinabalu, Kuala Lumpur, Kunming, Lahore, Lanzhou, Male, Manila, Melbourne, Mumbai, Nauru, Phnom Penh, Port Moresby, Pyongyang, Sanya, Shanghai, Shenyang, Singapore, Taibei, Ujung Pandang, Ulaanbaatar, Urumqi, Vientiane, Wuhan, and Yangon



Monitoring Agencies :

RMAs : AAMA, China RMA, MAAR, PARMO

EMAs : AAMA, BOBASMA, PARMO, SEASMA

PAC Area

PAC : Vertical Collision Risk

PAC : Vertical Collision Risk Estimates

Number of annual flying hours: 1,749,178 hours/year

2020 PAC Area	Vertical Risk Estimate (x 10^{-9} FAPFH)	Remark
Vertical Technical Risk	0.14	Below Technical TLS
Vertical Operational Risk	16.57	
2020 Vertical Overall Risk	**16.71**	**Above TLS**

PAC : Vertical Collision Risk Estimates

2016 - 2020

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

PAC : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Aircrew/ Pilot	A	Flight crew failing to climb/descend the aircraft as cleared	6	32.4	3
	B	Flight crew climbing/descending without ATC Clearance	10	29.35	17
	C	Incorrect operation or interpretation of airborne equipment	1	0.43	0
ATC	D	ATC system loop error	8	21.77	16
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	37	142.67	24
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	3	43	0
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	3	3	17
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	0	0	0

PAC : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Weather/ Turbulence	I	Turbulence or other weather related causes leading to unintentional or undetected change of flight level	16	27.29	5
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	5	2.99	0
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	0	0	0
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	0	0	0
	M	Other	2	10	0
		Total	**91**	**312.90**	**82**

PAC : Horizontal Collision Risk

PAC : Horizontal Collision Risk Estimates

Number of annual flying hours: 939,628 hours/year

2020 PAC Area	**Horizontal Risk Estimate** (x 10^{-9} FAPFH)	**Airspace**	**Remark**
30NM Lateral Risk	0.09	Pacific	Below TLS
50NM Lateral Risk	0.65	Japan	Below TLS
30NM Longitudinal Risk	3.73	Pacific and Japan	Below TLS
50NM Longitudinal Risk	2.22	Pacific	Below TLS
10MIN Longitudinal Risk	0.25	Japan	Below TLS
2019 PAC Area	**Horizontal Risk Estimate** (x 10^{-9} FAPFH)	**Airspace**	**Remark**
Lateral Risk (All operations)	3.35	Pacific	Below TLS
50NM Lateral Risk	1.45	Japan	Below TLS
30NM Longitudinal Risk	4.10	Pacific and Japan	Below TLS
50NM Longitudinal Risk	2.02	Pacific	Below TLS
10MIN Longitudinal Risk	20.10	Japan	Above TLS

PAC : Summary of LLDs and LLEs

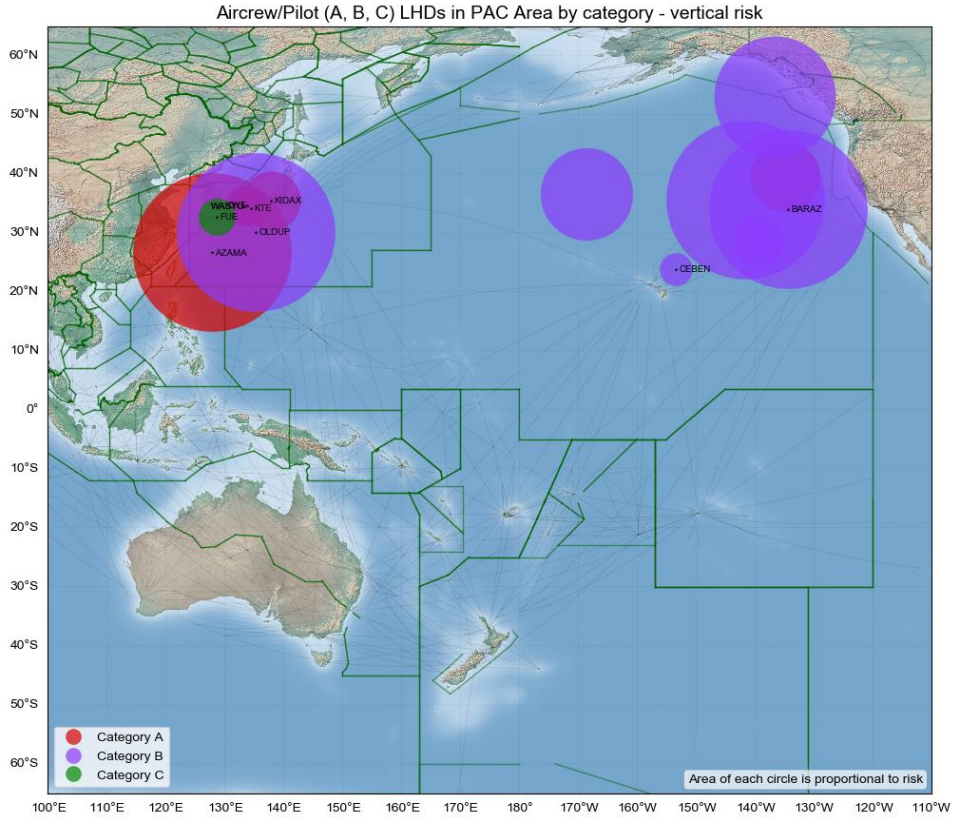
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	10	32	0	168
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	3	21	0	15
	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	70	540	0	0
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	0	0	0	0

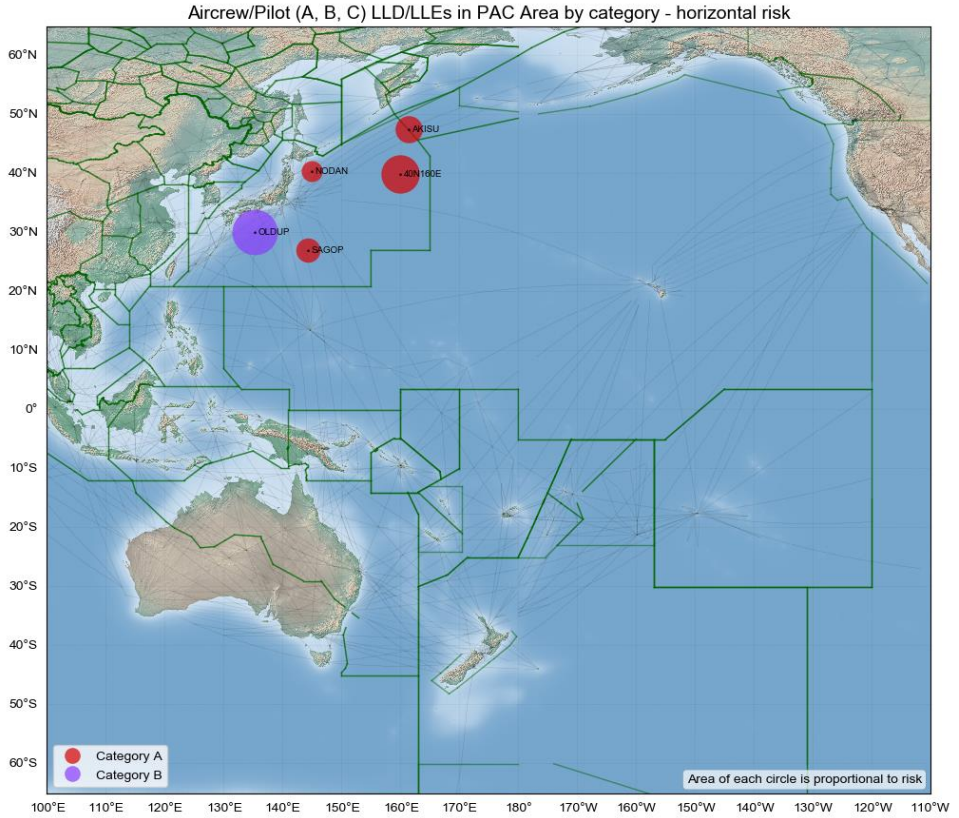
PAC : Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	10	126	0	100
Weather/ Turbulence	H	Turbulence or other weather related causes leading to a deviation in the horizontal dimension	14	62	0	261
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;	0	0	0	0
	J	Other	2	0	0	0
		Total	**109**	**781**	**0**	**544**

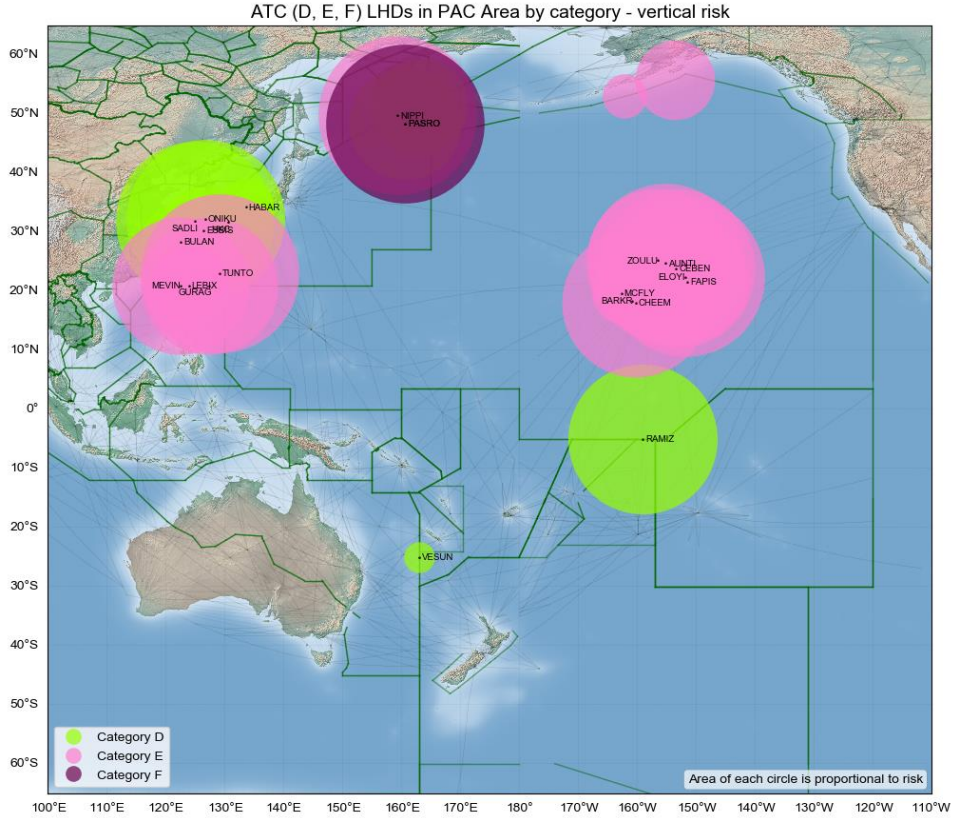
PAC : Geolocation of LHDs/LLDs/LLEs

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





PAC : ATC (D, E, F)


ATC (D, E, F) LHDs in PAC Area by category - vertical risk
NIPPI
PABRO
HABAR
ONIKU
SADLI
BULAN
TUNTO
MEVIN
LEBIX
GURAG
ZOULU
ALINTI
LEBEN
ELOYA
FAPIS
MCFLY
BARKR
CHEEM
RAMIZ
VESUN
Category D
Category E
Category F
Area of each circle is proportional to risk
60°N
50°N
40°N
30°N
20°N
10°N
0°
10°S
20°S
30°S
40°S
50°S
60°S
100°E
110°E
120°E
130°E
140°E
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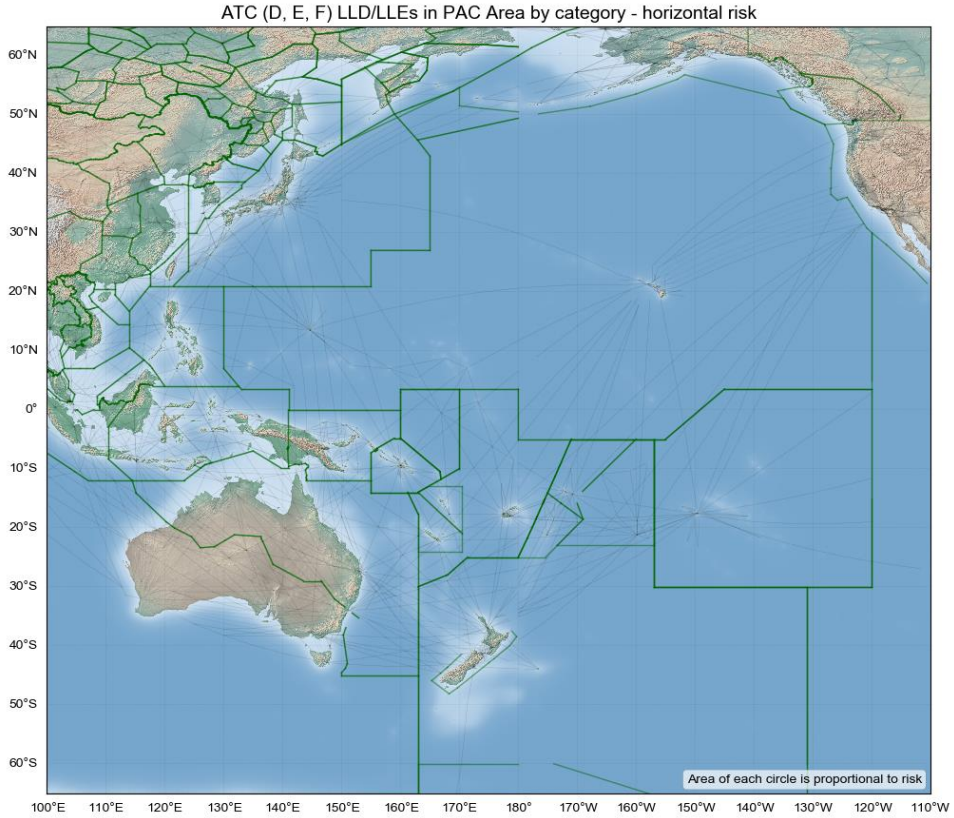
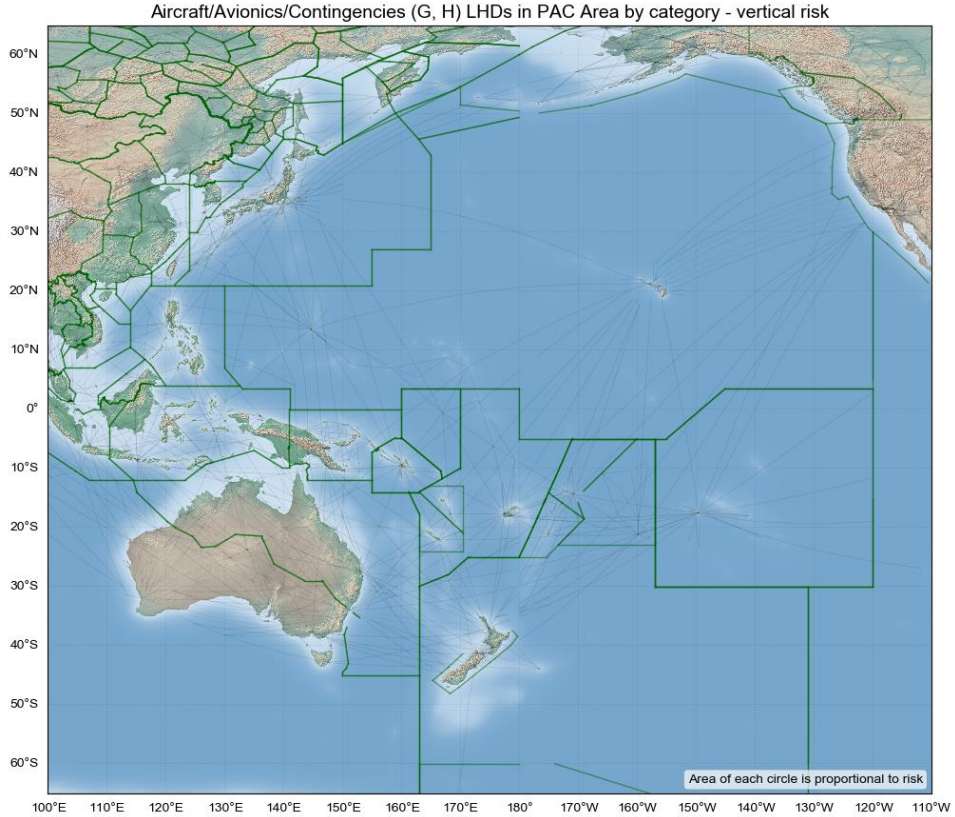
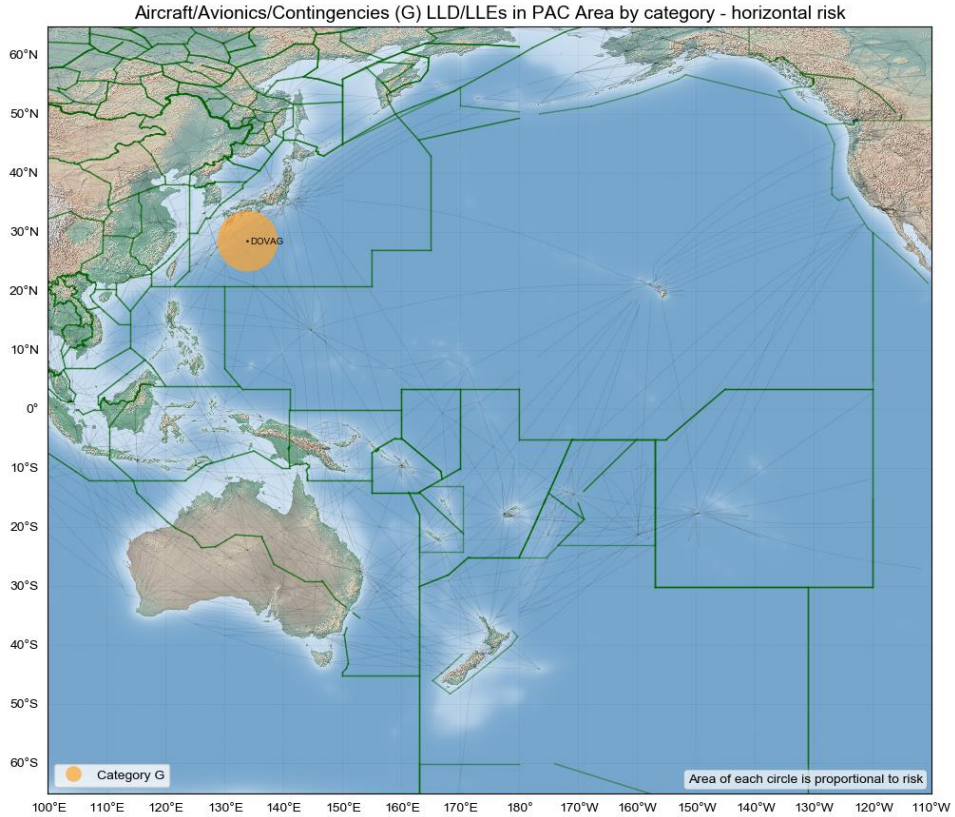
140°W
130°W
120°W
110°W

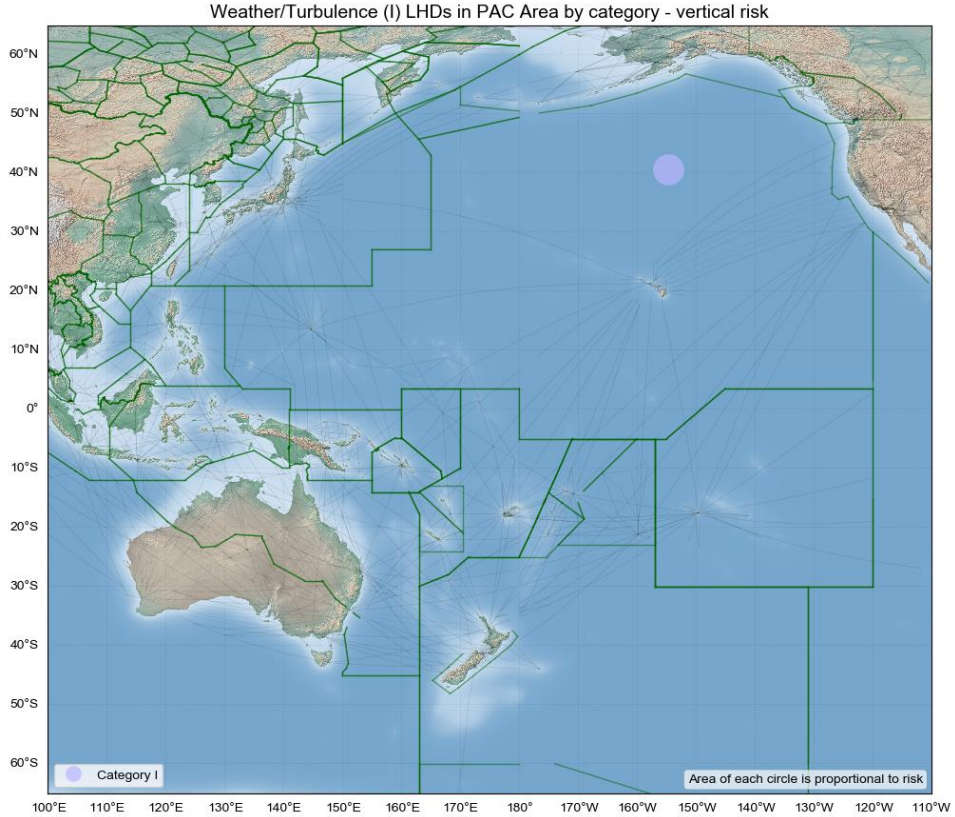

ATC (D, E, F) LLD/LLEs in PAC Area by category - horizontal risk
Area of each circle is proportional to risk
60°N
50°N
40°N
30°N
20°N
10°N
0°
10°S
20°S
30°S
40°S
50°S
60°S
100°E
110°E
120°E
130°E
140°E
150°E
160°E
170°E
180°
170°W
160°W
150°W
140°W
130°W
120°W
110°W

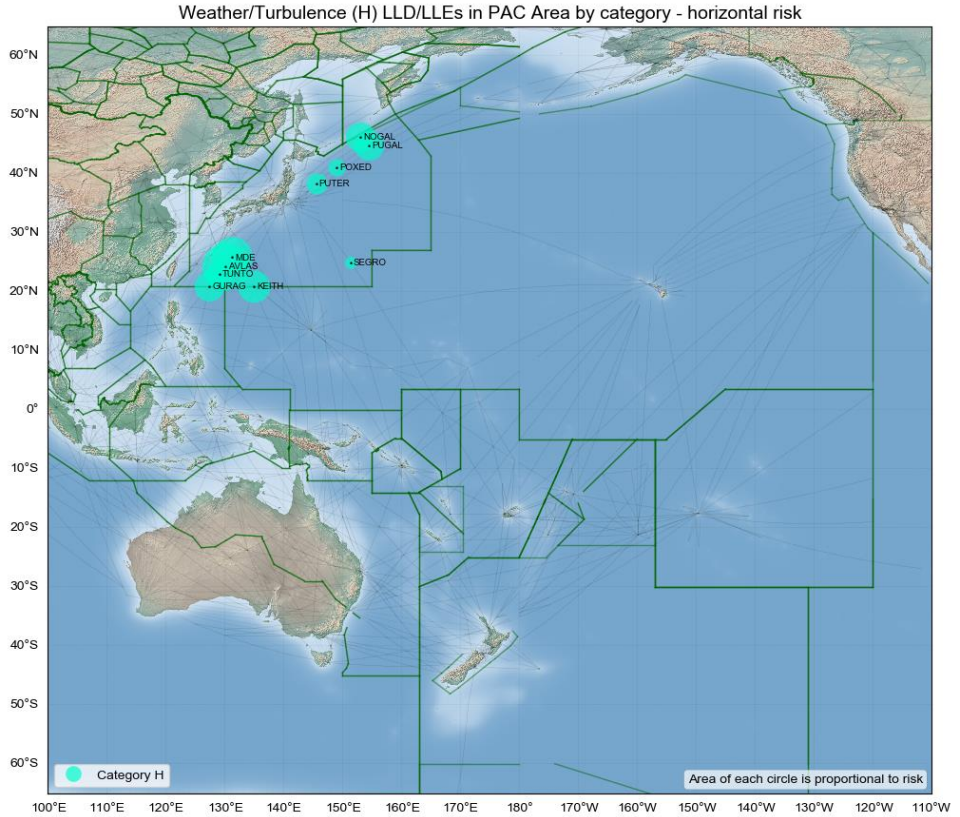
PAC : Aircraft Avionics/Contingencies (G, LHD:H)



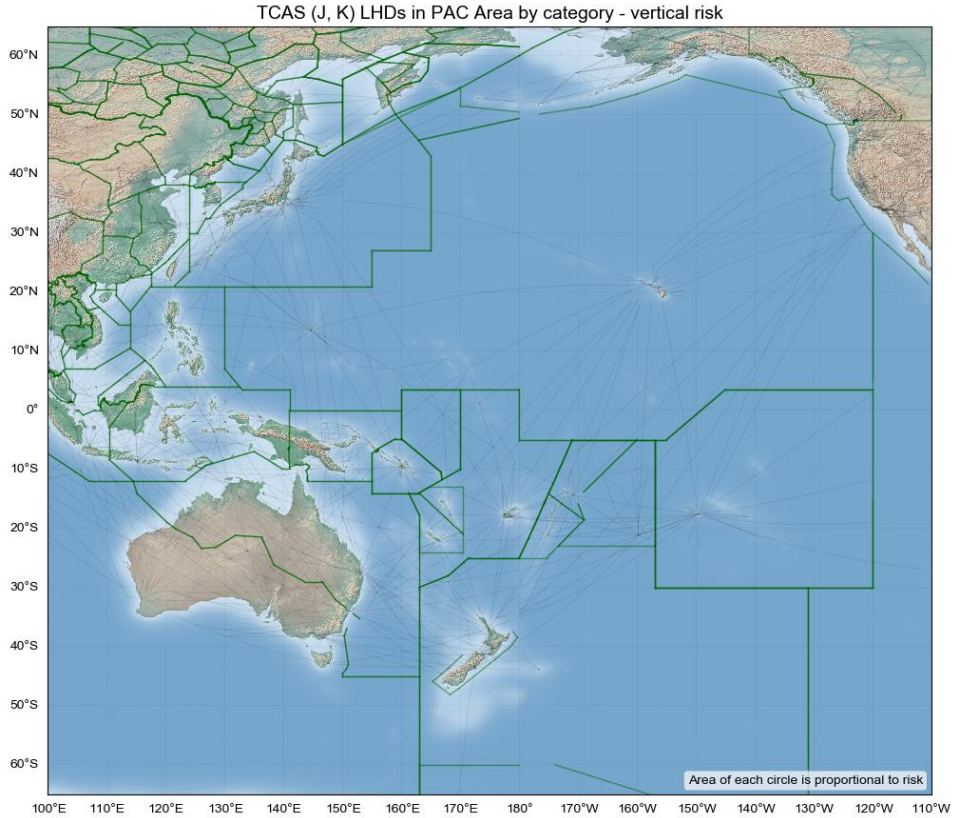


PAC : Weather/Turbulence (LHD:I, LLD/LLE:H)





PAC : TCAS (LHD:J, K)



PAC : Hot Spots

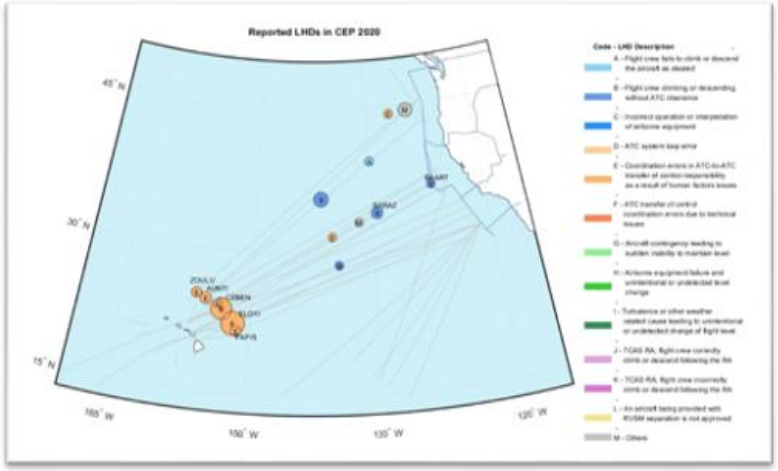
PAC : LHD Hot Spot N (North America - Hawaii CEP)

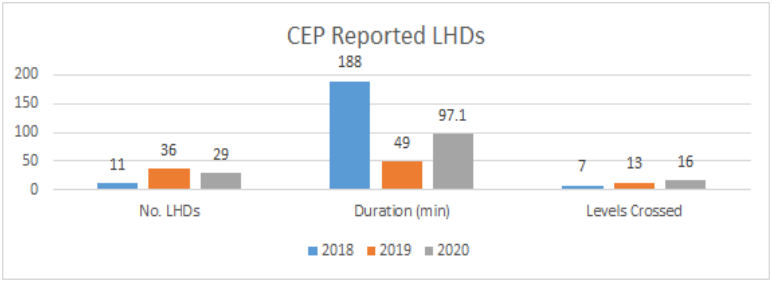
Nature of Occurrences : In 2018, several long duration LHDs were reported. In 2019 and 2020, the reported number of category E LHDs increased.

Contributing Factors : Central East Pacific (CEP) usually consists of high traffic volume. High proportion of flight operations only use HF voice for communication providing fewer opportunities for ATC to identify errors.

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

Mitigations : A task force is established and has developed a long term plan to prevent these occurrences. There is a short-term strategy in place until the new systems can be implemented.





Asia Region

Asia : Vertical Collision Risk

ASIA : Vertical Collision Risk Estimates

Number of annual flying hours: 5,404,154 hours/year

2020 ASIA Area	Vertical Risk Estimate (x 10^{-9} FAPFH)	Remark
Vertical Technical Risk	0.33	Below TLS
Vertical Operational Risk	7.09	
Vertical Overall Risk	**7.42**	**Above TLS**

ASIA : Vertical Collision Risk Estimates

2016 - 2020

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

Asia : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Aircrew/ Pilot	A	Flight crew failing to climb/descend the aircraft as cleared	20	0	7
	B	Flight crew climbing/descending without ATC Clearance	10	2	7
	C	Incorrect operation or interpretation of airborne equipment	7	0	1
ATC	D	ATC system loop error	18	22.73	4
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	198	663	6
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	9	2	0
Aircraft/ Avionics/ Contingencies	G	Aircraft contingency event leading to sudden inability to maintain assigned flight level	8	0.5	0
	H	Airborne equipment failure leading to unintentional or undetected change of flight level	3	0.5	0

Asia : Summary of LHDs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Levels Crossed
Weather/ Turbulence	I	Turbulence or other weather related causes leading to unintentional or undetected change of flight level	36	0	1.25
TCAS	J	TCAS resolution advisory, flight crew correctly climb or descend following the resolution advisory	9	0.67	0.45
	K	TCAS resolution advisory, flight crew incorrectly climb or descend following the resolution advisory	0	0	0
Other	L	An aircraft being provided with RVSM separation is not RVSM approved	2	5	0
	M	Other	20	0	0
		Total	340	696.4	26.7

Asia : Horizontal Collision Risk

Asia : Horizontal Collision Risk Estimates

Number of annual flying hours: 746,276 hours/year

2020 Asia Area	**Horizontal Risk Estimate** (x 10^{-9} FAPFH)	**Remark**
30NM Lateral Risk	0.0004	Below TLS
50NM Longitudinal Risk	0.85	Below TLS
2019 Asia Area	**Horizontal Risk Estimate** (x 10^{-9} FAPFH)	**Remark**
30NM Lateral Risk	0.0001	Below TLS
50NM Longitudinal Risk	0.25	Below TLS
2018 Asia Area	**Horizontal Risk Estimate** (x 10^{-9} FAPFH)	**Remark**
30NM Lateral Risk	0.52	Below TLS
50NM Longitudinal Risk	3.91	Below TLS

Asia : Summary of LLDs and LLEs

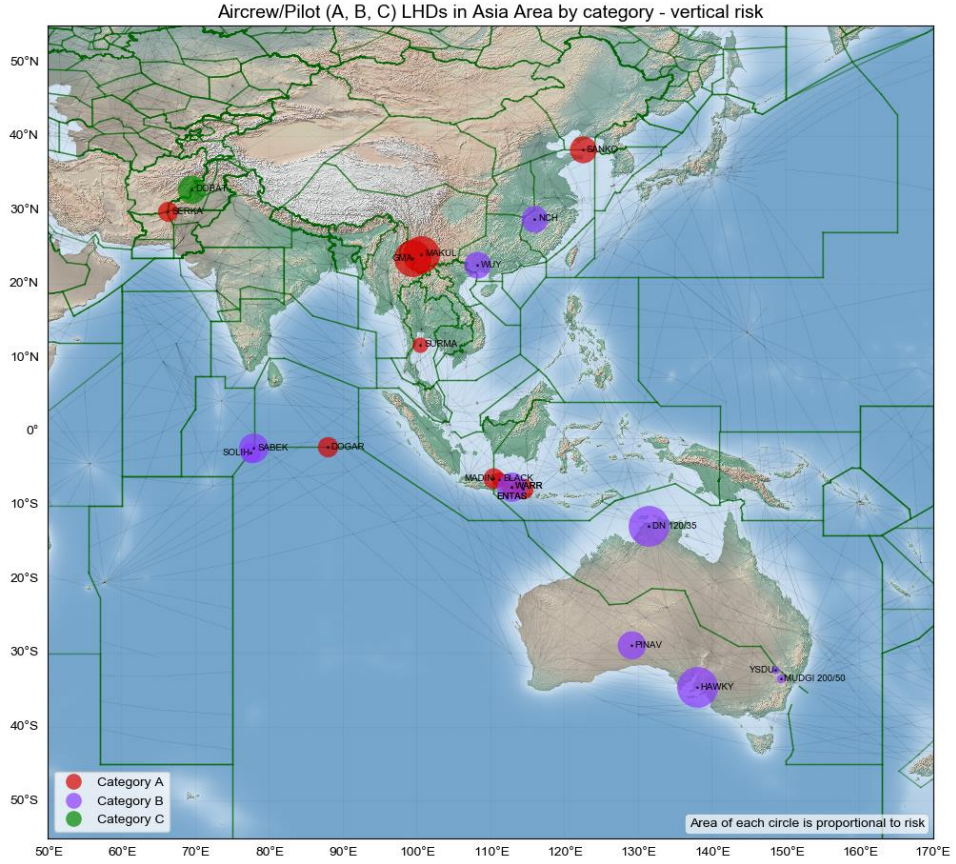
Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircrew/ Pilot	A	Flight crew deviate without ATC Clearance	0	0	0	0
	B	Incorrect estimate or route provided due to incorrect operation or interpretation of airborne equipment	0	0	0	0
	C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position	0	0	0	0
ATC	D	ATC system loop error	1	0	0	0
	E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues	0	0	0	0
	F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	2	9	0	0

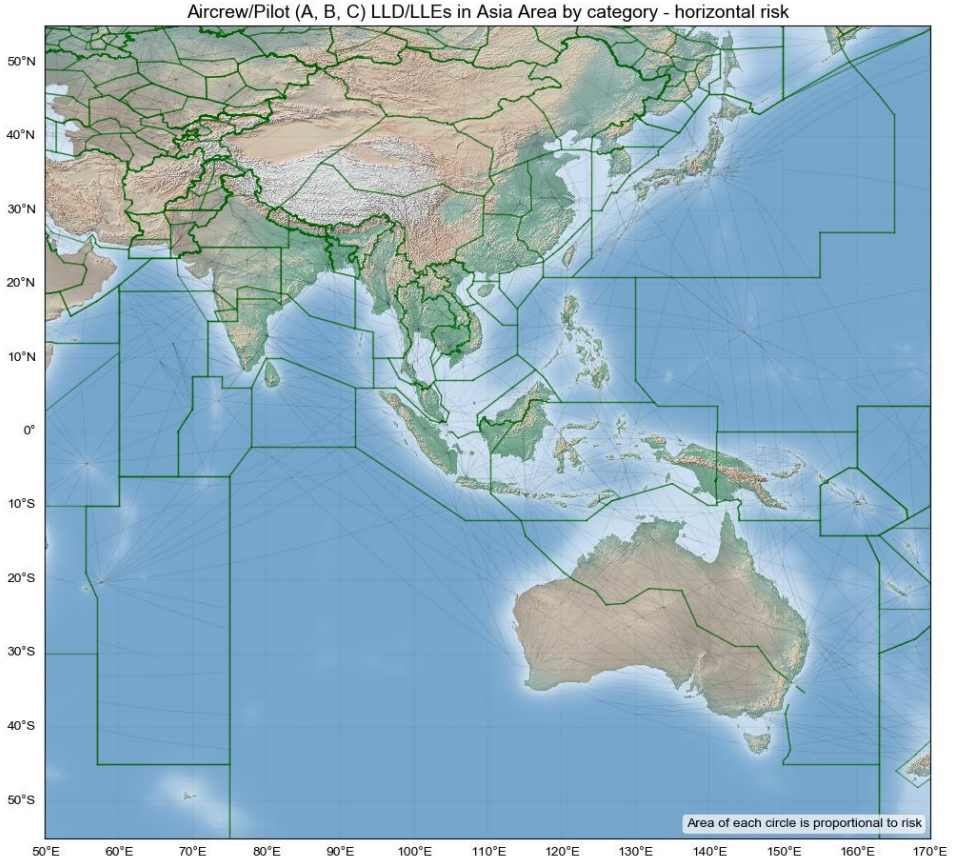
Asia : Summary of LLDs and LLEs

Attributions	Category Code	Description	Number of Occurrences	Duration (minutes)	Number of Tracks/Routes Crossed	Horizontal Deviation (NM)
Aircraft/ Avionics/ Contingencies	G	Navigation errors due to airborne equipment failure	0	0	0	0
Weather/ Turbulence	H	Turbulence or other weather related causes leading to a deviation in the horizontal dimension	0	0	0	0
Other	I	An aircraft was provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specification;	0	0	0	0
	J	Other	0	0	0	0
		Total	3	9	0	0

Asia : Geolocation of LHDs/LLDs/LLEs

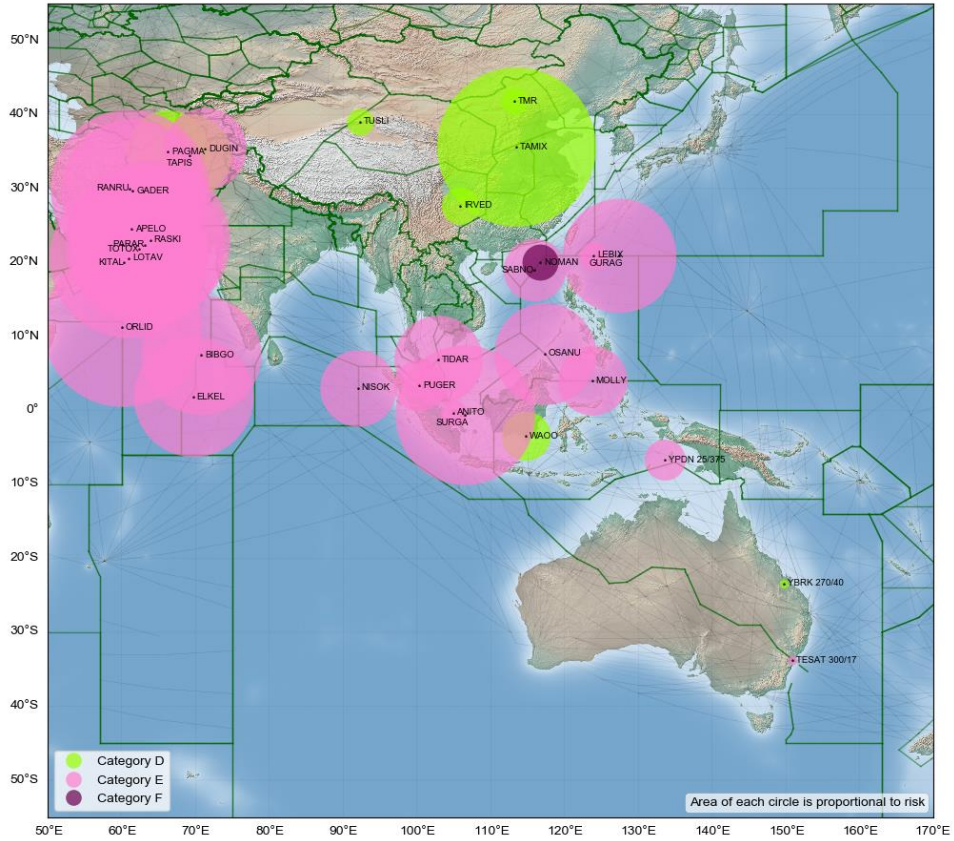
Asia : Aircrew/Pilot (A, B, C)



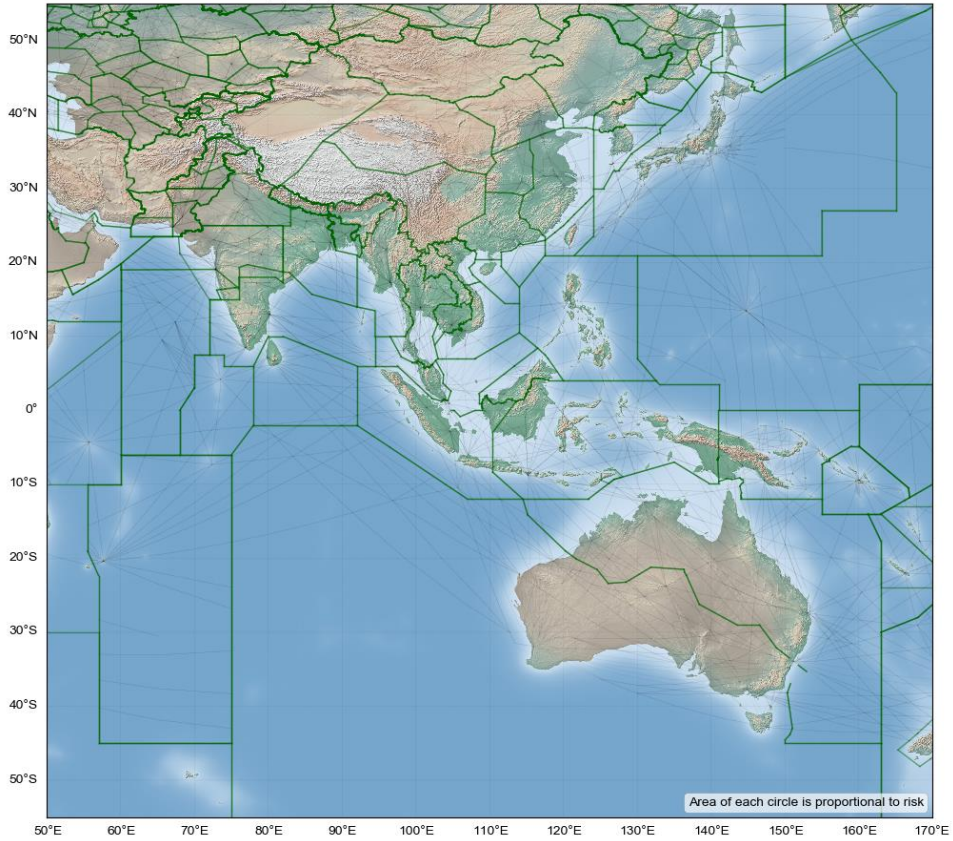


Asia : ATC (D, E, F)

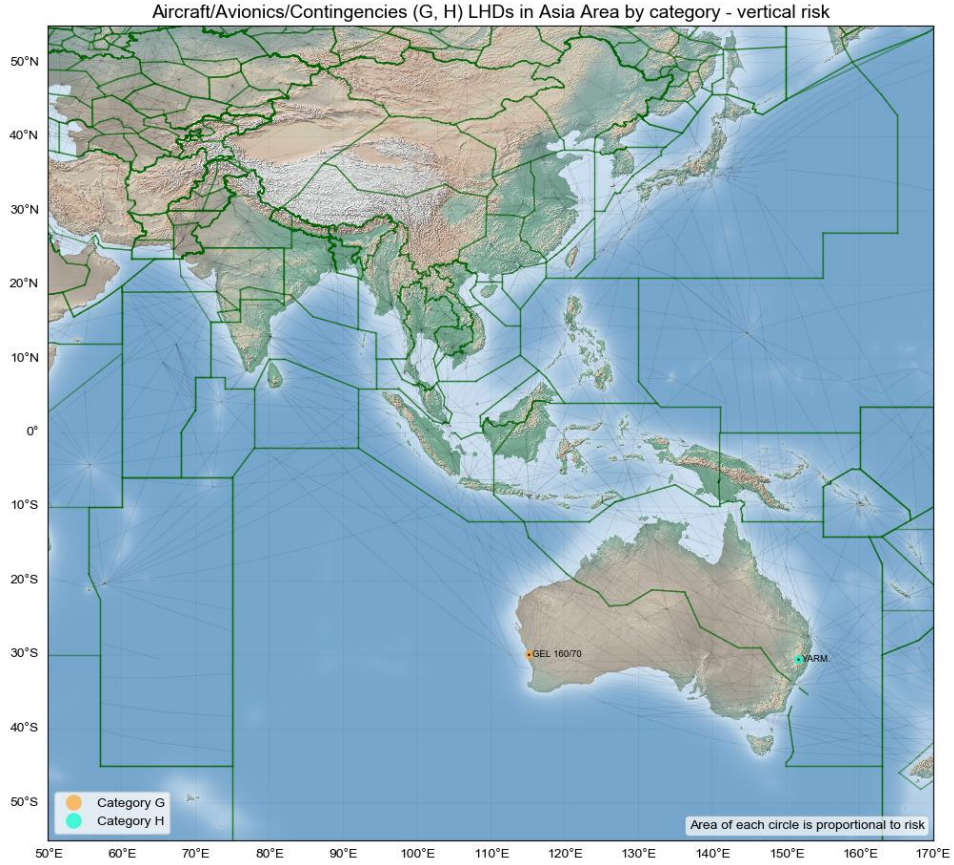
ATC (D, E, F) LHDs in Asia Area by category - vertical risk

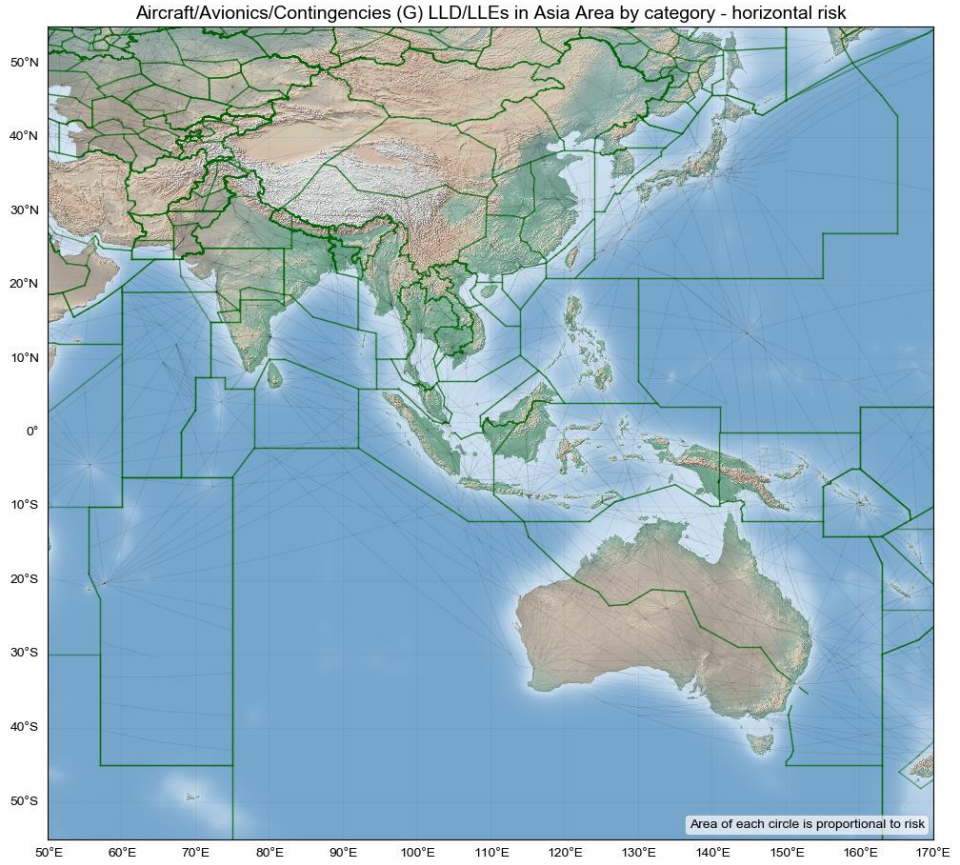


ATC (D, E, F) LLD/LLEs in Asia Area by category - horizontal risk

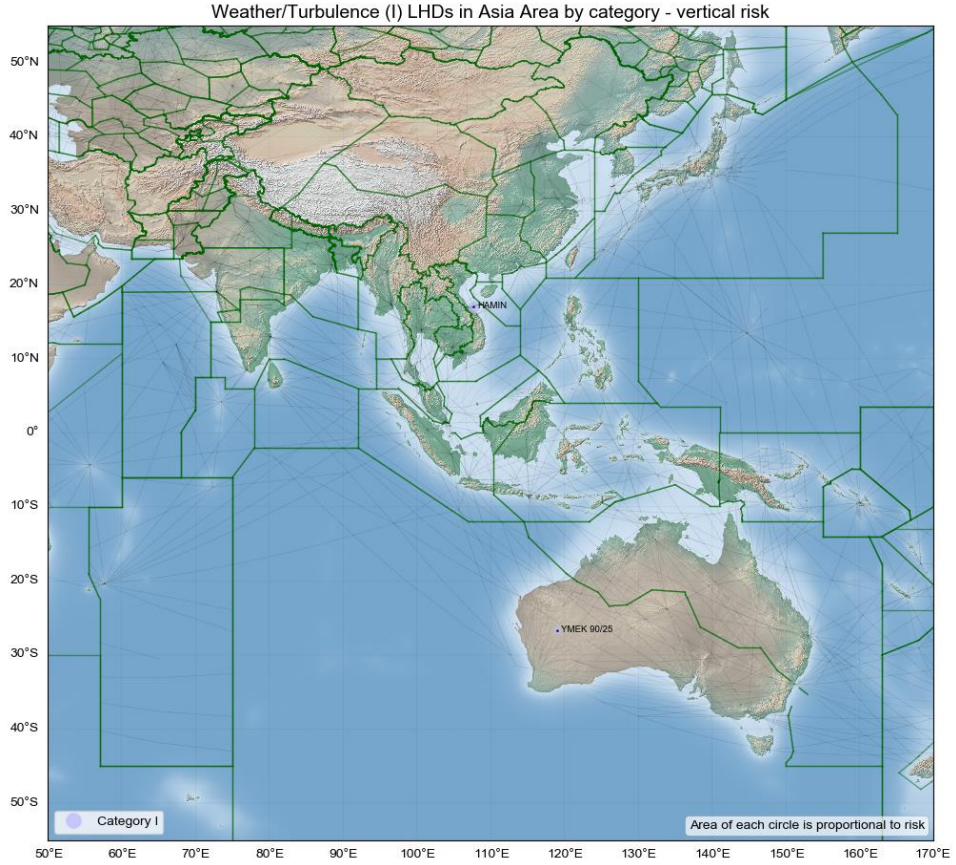


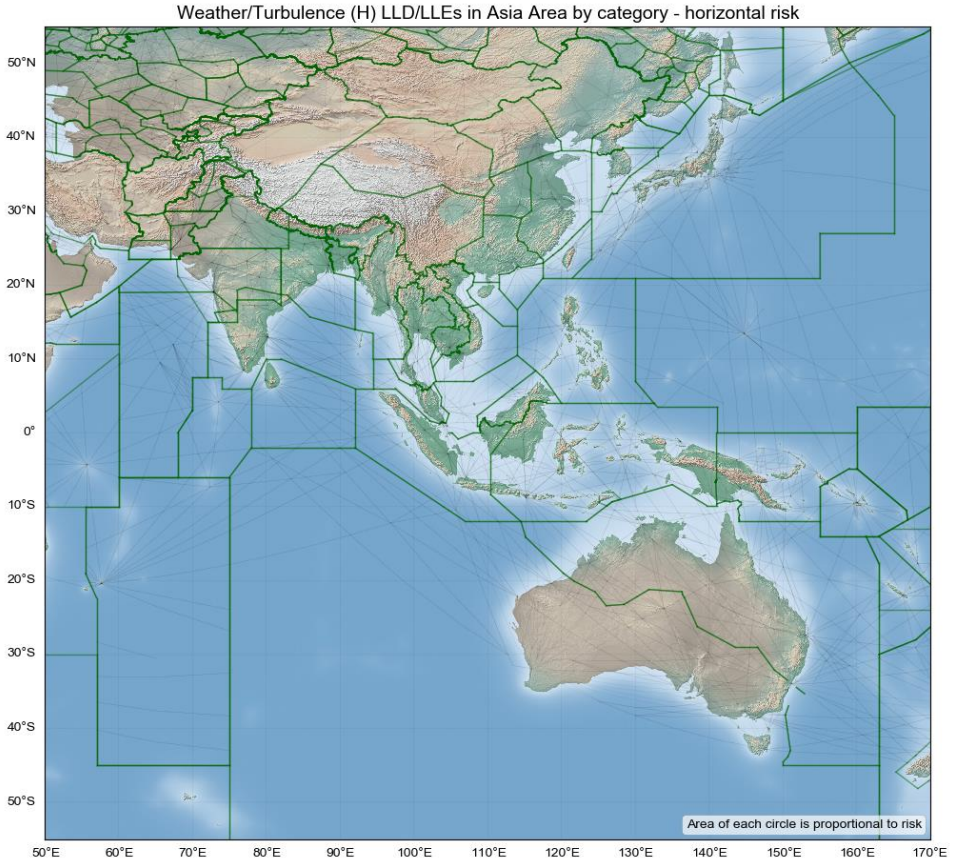
Asia : Aircraft Avionics/Contingencies (G, LHD:H)



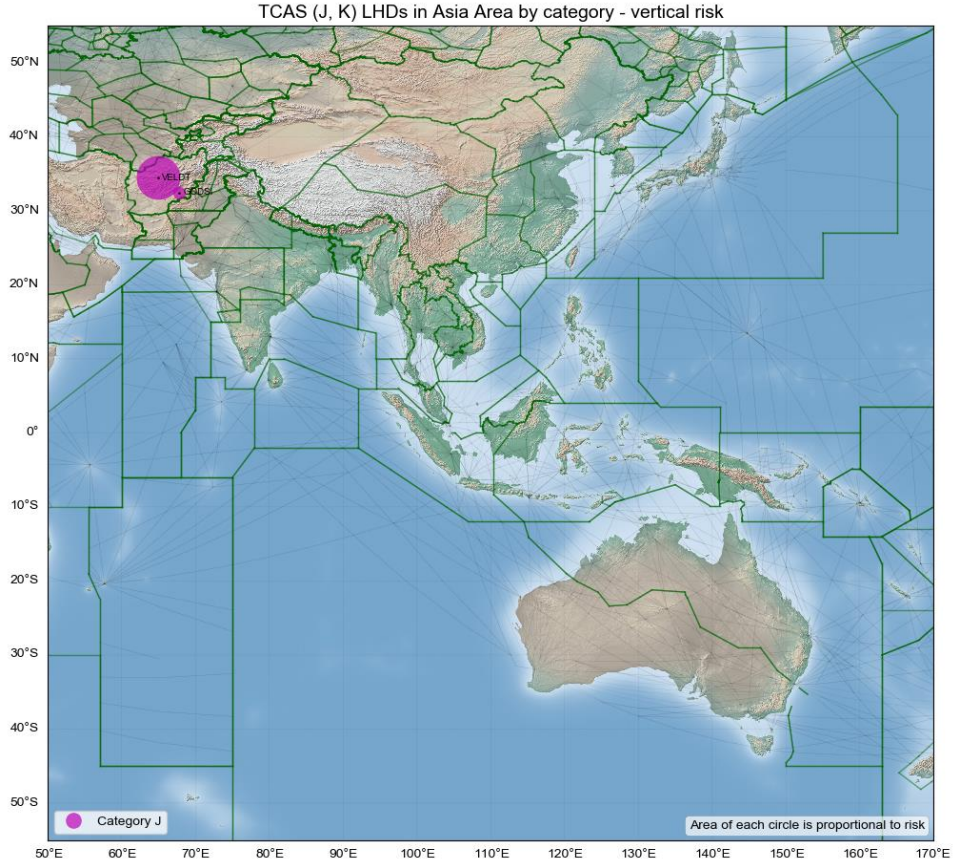


Asia : Weather/Turbulence (LHD:I, LLD/LLE:H)





Asia : TCAS (LHD:J, K)



Asia : Hot Spots

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

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

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

Trend : The number of reported LHDs has been significantly decreasing at all interfaces since 2018. All reported LHDs in 2020 had 0-min duration, resulting in the operational risk of 0 FAPFH.

Mitigations :
- At the Kolkata-Yangon interface, a new procedure among Dhaka, Kolkata and Yangon has been implemented since June 2019.
- AIDC implementation and ADS-B data sharing are identified as the key improvements at these interfaces.

Interface	The Number of LHDs		
	2018	2019	2020
Kolkata-Yangon	168	59	8
Chennai-Yangon	14	16	3

Interface	Operational Risk ($\times 10^{-9}$ FAPFH)		
	2018	2019	2020
Kolkata-Yangon	0.60	0.31	0
Chennai-Yangon	0.06	0.49	0

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

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

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

Trend : The number of reported LHDs has been significantly decreasing since 2018. All reported LHDs in 2020 had 0-min duration, resulting in the operational risk of 0 FAPFH.

Mitigations : AIDC has been implemented between the two ACCs since 1 June 2021.

Interface	The Number of LHDs		
	2018	2019	2020
Chennai-Kuala Lumpur	93	88	13
Interface	**The Operational Risk (x 10^{-9} FAPFH)**		
	2018	**2019**	**2020**
Chennai-Kuala Lumpur	0.66	1.14	0

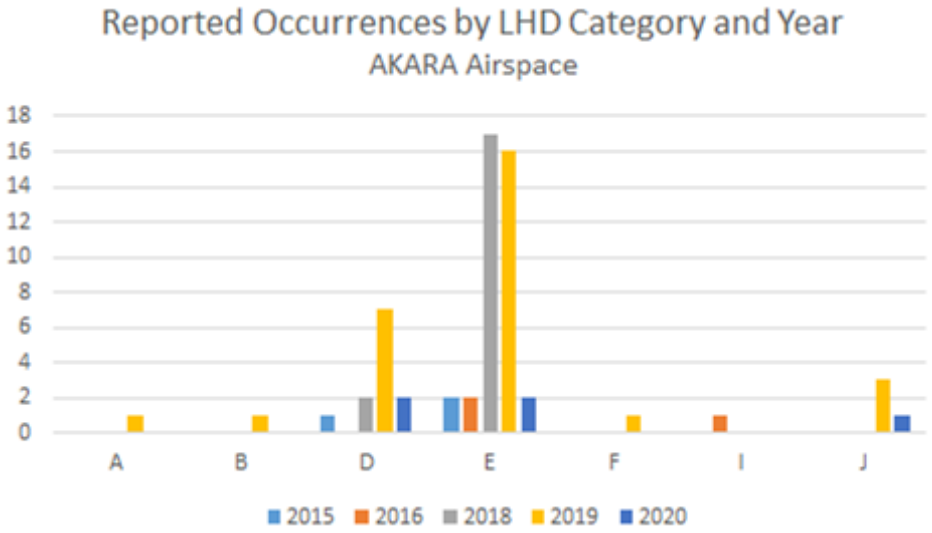
Asia : LHD Hot Spot B (AKARA Airspace)

Nature of Occurrences : Reported occurrences classified as category E are most common. Available surveillance provides mitigation but can be complex due to unique ATS agreements.

Contributing Factors : High traffic volume, limited availability of flight levels, and high opposite direction passings.

Trend : COVID-19 pandemic and associated reduction in air travel affected trends for calendar year 2020. Identified as a hot spot since 2015.

Mitigations : As of March 2021, new Air Traffic Flow Management operation procedures were established.



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

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

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

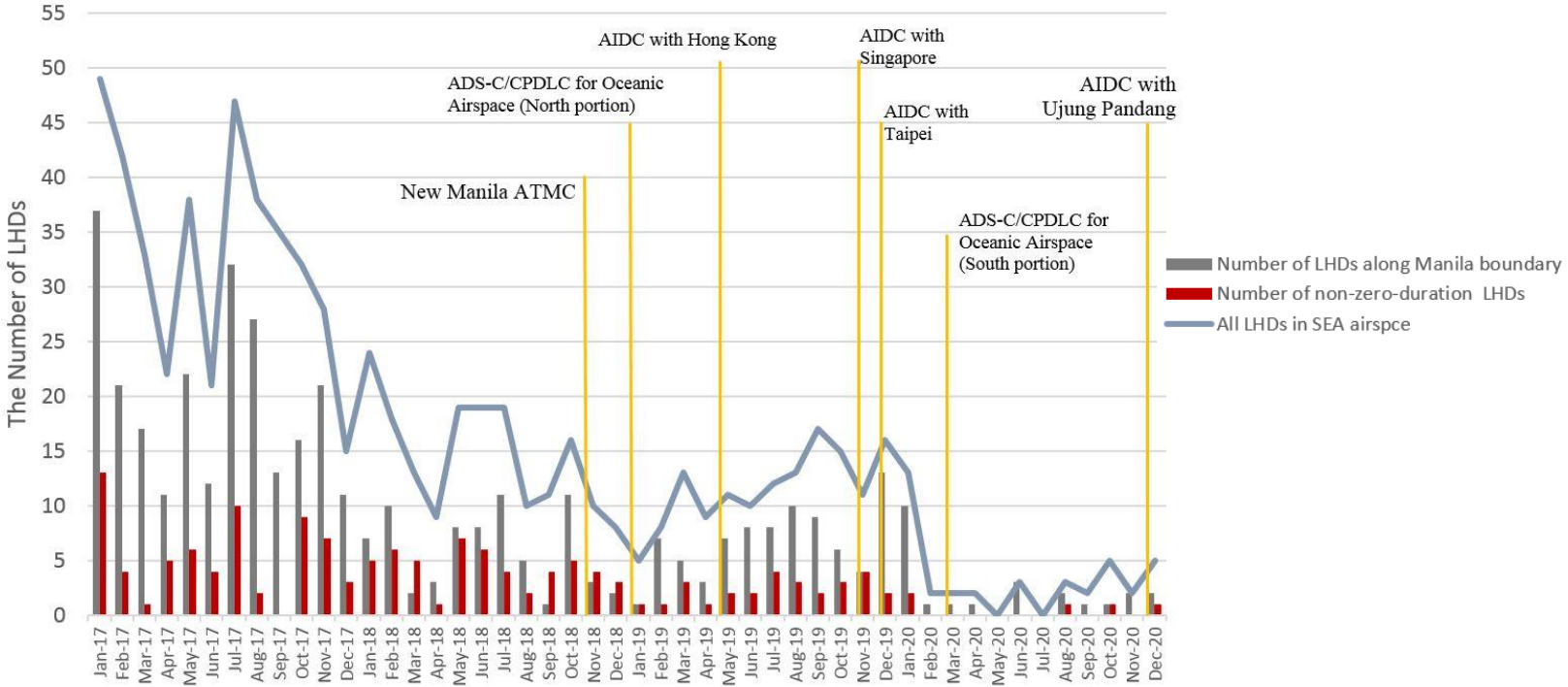
Trend : In 2020, the number of LHDs and operational risk along the boundaries of Manila FIR significantly decreased from 2019. The number of Category F LHDs decreased from 9 LHDs in 2019 to 6 LHDs in 2020. Those 6 LHDs was caused by the AIDC system failure and the unsuccessful transfer via AIDC.

Mitigations :

- The new ATM system at Manila ACC allows ATC workload to be split into more sectors.
- The capabilities of VHF radios, radars and ADS-B coverages were enhanced.
- The ADS-C/CPDLC coverage was expanded and expected to completely cover the whole Manila FIR.
- The AIDC has been successfully implemented with Hong Kong, Singapore, Taibei and Ujung Pandang ACC. The connection with Ho Chi Minh, Oakland, Kota Kinabalu, Kobe, and Fukuoka is planned.

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

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



Asia : LHD Hot Spot D (Manila - Ujung Pandang FIRs)

Nature of Occurrences : There were four occurrences on the Manila—Ujung Pandang FIR boundary, all Category E (coordination errors due to human factors issues). Two of these were assessed as non-zero-duration.

Contributing Factors : Two occurrences involved late or no transfer from Manila to Ujung Pandang. The remaining two occurrences involved the transfer being originally made by AIDC, but no subsequent level/TOC revision being made.

Trend : In 2020, the number of events on the Manila—Ujung Pandang FIR boundary has doubled compared with 2019.

Mitigations : The AIDC system between Ujung Pandang and Manila has been in a trial phase in early 2020, with intended implementation by the end of 2020. This has the potential to decrease Category E occurrences (human factors issues) but could increase the number of Category F occurrences (technical issues).

Asia : LHD Hot Spot D (Manila - Fukuoka)

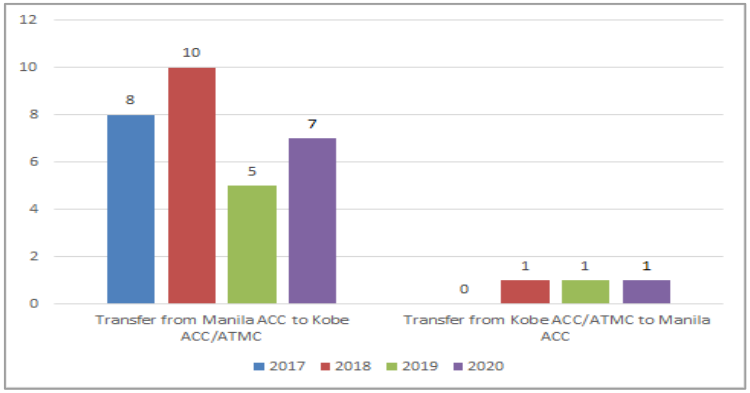
Nature of Occurrences : Transfer Error due to human factors (Category E)

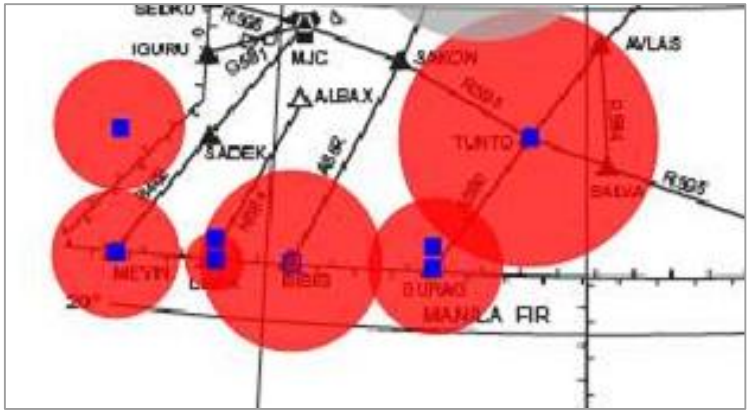
Contributing Factors : There were a total of 8 Category E LHD events. 7 LHDs were due to transfer errors from Manila ACC to Fukuoka ATMC/Kobe ACC and 1 LHD was due to transfer error from Kobe ACC to Manila ACC. One of the 7 LHDs was also an LLE.

Trend : Category E LHD events have occurred regularly.

Mitigations :

- All LHD preventive/mitigation measures are previously presented.
- The sharing of LHD information between Kobe ACC/Fukuoka ATMC and Manila ACC, and JASMA and MAAR has been very prompt and effective.





Asia : LHD Hot Spot F (Mogadishu – Mumbai)

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

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

Trend : The number of LHDs were about the same but the operational risk significantly increased in 2020, mainly due to long duration LHDs.

Mitigations : AIDC implementation and surveillance enhancement such as space-based ADS-B are recommended to help reduce and mitigate the LHDs.

Interface	The Number of LHDs		
	2018	2019	2020
Mogadishu-Mumbai	26	9	8
Interface	**The Operational Risk ($\times 10^{-9}$ FAPFH)**		
	2018	2019	2020
Mogadishu-Mumbai	5.13	0.74	4.8

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

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

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

Trend :
- The number of reported LHDs and the operational risk significantly decreased.
- At Sanaa-Mumbai interface, all the reported LHDs in 2020 had 0-min duration, resulting in the risk of 0 FAPFH.
- At Muscat-Mumbai interface, the risk was still high and accounted for 42% of the SA/IO airspace due to long duration LHDs.

Mitigations : AIDC implementation and surveillance enhancement such as space-based ADS-B are recommended to help reduce and mitigate the LHDs.

Interface	The Number of LHDs		
	2018	2019	2020
Sanaa-Mumbai	1	5	1
Muscat-Mumbai	161	143	48
Interface	**The Operational Risk (x 10^{-9} FAPFH)**		
	2018	2019	2020
Sanaa-Mumbai	2.28	0.20	0
Muscat-Mumbai	30.38	24.71	6.37

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

Nature of Occurrences : In 2020, there were five occurrences on the Jakarta—Singapore FIR boundary, all Category E (coordination errors due to human factors issues). Jakarta was the accepting FIR in two of these occurrences, and Singapore was the accepting FIR in the remaining three.

There were no reported occurrences on the Jakarta—Kota Kinabalu FIR boundary.

Contributing Factors : Four of the occurrences on the Jakarta—Singapore FIR boundary involved no or late FL revision. For one of the occurrences in which Singapore was the accepting FIR, there was no revision of the TOC estimate with the aircraft arriving 1 hour ahead of its estimate.

Trend : The number of occurrences on the Jakarta—Singapore boundary decreased from 18 total reports in 2019. Similarly, the number of occurrences on the Jakarta—Kota Kinabalu boundary decreased from three in 2019.

Mitigations : As previously report in RASMAG/25,

- Proactive safety awareness and lessons sharing were conducted to minimise last minute revision of flight levels near the boundary to prevent revision errors.
- Surveillance coverage beyond boundary is used 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.

Asia : LHD Hot Spot M (Colombo – Melbourne)

Nature of Occurrences : There was one Category E occurrence (coordination errors due to human factors issues) on the Colombo—Melbourne FIR boundary. It was assessed as zero-duration.

Contributing Factors : The aircraft was coordinated by Colombo to Melbourne at the incorrect level, with no level revision being made. The aircraft was observed by Melbourne ATC via ADS-C and thus the situation was assessed as managed prior to the aircraft crossing into Melbourne FIR.

Trend : The number of occurrences on the Colombo—Melbourne FIR boundary is decreasing, and thus Hot Spot M was proposed to be removed from the list of Hot Spots during the RASMAG/25 meeting.

Mitigations : Various mitigations have been implemented as a result of collaboration between AAMA and Colombo ATC, including:

- Sectorisation of Colombo Oceanic airspace to achieve ATC sector capacity, including the associated Safety Assessment
- ATC awareness training
- Liaison with operators involved in the occurrences

Reporting Rate
of LHDs/LLDs/LLEs

Traffic

In 2020, the estimated flying hours decreased due to the spread of COVID-19 pandemic.

Airspace	Estimated Flying Hours		Changes in Flying Hours
	2019	2020	
DPRK	3,341	571	-83%
Mongolia	164,276	101,705	-38%
China	2,458,432	2,283,671	-7%
ROK	644,602	129,826	-80%
SEA	3,385,767	1,054,468	-69%
Indonesia	649,248	312,229	-52%
Japan	1,598,660	972,648	-39%
SW Pacific	942,831	319,862	-66%
SA/IO	3,492,377	1,201,822	-66%
Pacific	1,754,212	858,079	-51%
Total	**15,677,369**	**7,234,881**	**-54%**

2020 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	571	0	-	0	-	0	-	0	-
Mongolia	101,705	0	-	0	-	0	-	0	-
China	2,283,671	11	1: 207,606	14	1: 163,119	60	1: 38,061	85	1: 26,867
ROK	129,826	0	-	4	1: 32,457	1	1: 129,826	5	1: 25,965
SEA	1,054,468	2	1: 527,234	37	1: 28,499	3	1: 351,489	42	1: 25,106
Indonesia	312,229	5	1: 62,446	10	1: 31,223	3	1: 104076	18	1: 17,346
Japan	972,648	13	1: 74,819	22	1: 44,211	31	1: 31,376	66	1: 14,737
SA/IO	1,201,822	4	1: 300,456	144	1: 8,346	4	1: 300,56	152	1: 7,907
SW Pacific	319,862	16	1: 19,991	21	1: 15,232	9	1: 35,540	46	1: 6,954
Pacific	858,079	17	1: 50,475	96	1: 8,938	21	1: 40,861	134	1: 6,404
Total	**7,234,881**	**68**	**1: 106,395**	**348**	**1: 20,790**	**132**	**1:54,810**	**548**	**1: 13,202**

Reporting Rate of LHDs/LLDs/LLEs

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**

Notes:

- Indonesia resolved the issues with TSD collection in 2018. The flying hours and, hence, the reporting rate significantly changed in 2018.

Conclusion

RVSM TLS Compliance - Vertical

- 2020 PAC vertical overall risk is 16.71×10^{-9} FAPFH. The overall risk is above the TLS and increases from 2016 to 2020 due to the improvement of reporting culture.
- 2020 ASIA vertical overall risk is 7.42×10^{-9} FAPFH. The overall risk continues to decline from 2017 due to various safety improvement initiatives. However, the overall risk remains above the TLS.

RVSM TLS Compliance - Horizontal

- All horizontal risk estimates in 2020 are below the TLS.

Hot Spots

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**
N	Oakland USA - Hawaii CEP	2019	Cat. E LHDs increasing

Reporting Rate of LHDs/LLDs/LLEs

- Even though the flying hours decreased in 2020 due to the pandemic, the 2020 overall reporting rate of LHDs/LLDs/LLEs slightly improved from the 2019 overall reporting rate.
- China, Indonesia, Japan, Pacific and SW Pacific States had improved the reporting rate in 2020.
- DPRK had no LHD/LLD/LLE report since 2016.
- Mongolia had no LHD/LLD/LLE report in 2020.
- China, ROK and SEA are among the lowest reporting rate in 2020.

Thank You