International Civil Aviation Organization

Thirtieth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/30)

Bangkok, Thailand, 14 – 17 July 2025

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

CHINA RMA VERTICAL SAFETY REPORT

(Presented by China RMA)

SUMMARY

This paper presents the results of the airspace safety oversight for the RVSM operation in the airspace of 9 Chinese FIRs and Pyongyang FIR for 2024. The report updates vertical collision risk of the above-mentioned airspace and summarizes the LHD reports as received.

1. INTRODUCTION

1.1 China Regional Monitoring Agency (China RMA) is assigned with the annual task of reporting over RVSM (Reduced Vertical Separation Minimum) safety requirements compliance in the Shenyang FIR, Beijing FIR, Shanghai FIR, Guangzhou FIR, Kunming FIR, Wuhan FIR, Lanzhou FIR, Urumqi FIR, Sanya FIR and Pyongyang FIR.

2. DISCUSSION

2.1 This paper provides the results of the airspace safety oversight for the RVSM operation in the airspace of Chinese FIRs for the time of January 2024 to December 2024, as reflected in the Attachment A. The analysis conducted for the 9 Chinese FIRs is based on one-month traffic sample data (TSD) collected in December 2024 and the latest 12-month Large Height Deviation (LHD) reports until December 2024. Attachment B presents the risk assessment for Pyongyang FIR of DPR Korea.

Executive Summary-RVSM airspace of Chinese FIRs

2.2 **Table 1** summarizes Chinese FIRs RVSM technical, operational, and total risks. **Figure 1** presents collision risk estimate trends during the period from January 2024 to December 2024.

Table 1: Risk Estimates for the RVSM airspace of Chinese FIRs

The RVSM Airspace of Chinese FIRs – estimated annual flying hours = 2878308.0 hours *(note: estimated hours based on Dec 2024 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG 29 Total Risk	*0.75×10^{-9}*	*5.0×10^{-9}*	*Below TLS*
Technical Risk	0.10×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	0.42×10^{-9}	-	-
Total Risk	**0.52×10^{-9}**	5.0×10^{-9}	**Below TLS**

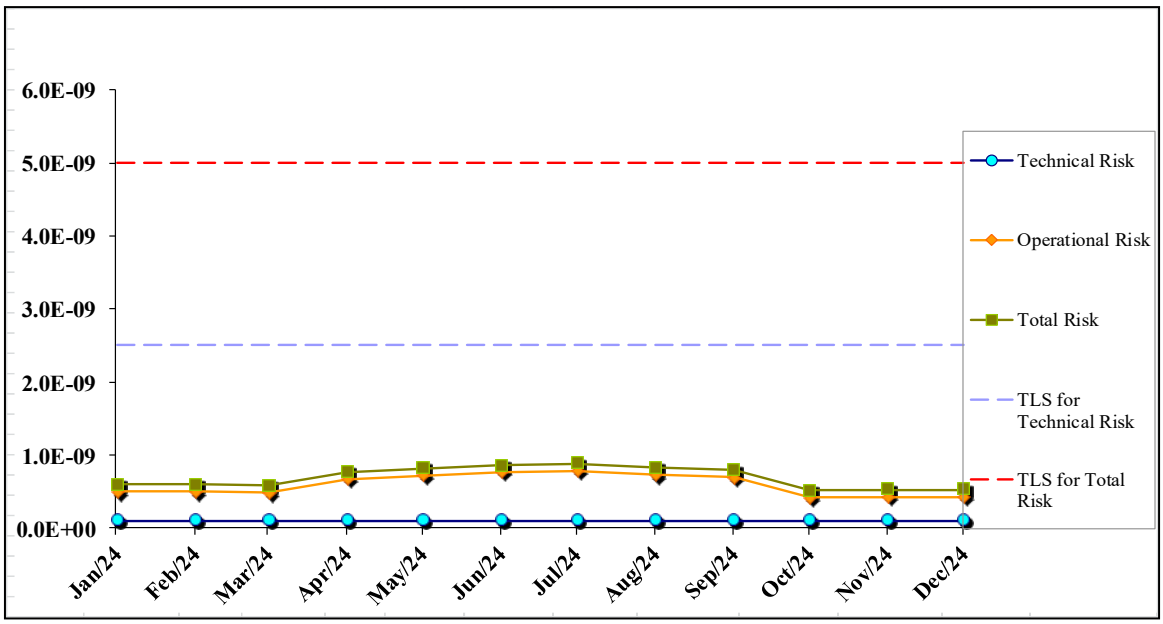

Figure 1: Chinese FIRs RVSM Risk Estimate Trends

2.3 **Table 2** presents a summary of the LHD causes within airspace of Chinese FIRs from January 2024 to December 2024.

Table 2: Summary of LHD Causes within Airspace of Chinese FIRs

Code	LHD Category Description	No.
A	Flight crew fails to climb or descend the aircraft as cleared	4
B	Flight crew climbing or descending without ATC clearance	1
C	Incorrect operation or interpretation of airborne equipment	6
D	ATC system loop error	2
E	Coordination errors in the ATC -to-ATC transfer of control responsibility as a result of human factors issues	14
F	ATC transfer of control coordination errors due to technical issues	3
G	Aircraft contingency leading to sudden inability to maintain level	0
H	Airborne equipment failure and unintentional or undetected level change	2
I	Turbulence or other weather-related cause leading to unintentional or undetected change of flight level	55
J	TCAS resolution advisory; flight crew correctly climb or descend following the resolution advisory	8
K	TCAS resolution advisory; flight crew incorrectly climb or descend following the resolution advisory	0
L	An aircraft being provided with RVSM separation is not RVSM approved	0
M	Others	95
Total		190

2.4 **Figure 2** provides the geographic location of risk-bearing LHD reports within Airspace of Chinese FIRs during the assessment period.

Figure 2: Airspace of Chinese FIRs – Risk-Bearing LHD

Executive Summary-RVSM airspace of Pyongyang FIR

2.5 **Table 3** provides the Pyongyang FIR RVSM technical, operational, and total risk estimates. According to the email response from ATMB of DPR Korea, there was no LHD event (NIL report) and zero flying hours in in Pyongyang FIR in 2024, so the operational risk, the technical risk and the total risk remain 0.

Table 3: Airspace of Pyongyang FIR RVSM Risk Estimates

RVSM Airspace of DPR Korea – estimated annual flying hours = 0 hours *(note: estimated hours based on Dec 2024 traffic sample data)*			
Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG 29 Total Risk	*0*	*5.0 x 10^{-9}*	*Below TLS*
Technical Risk	0	2.5 x 10^{-9}	Below Technical TLS
Operational Risk	0	--	--
Total Risk	**0**	5.0 x 10^{-9}	**Below TLS**

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

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AIRSPACE SAFETY REVIEW FOR THE RVSM OPERATION IN THE NINE CHINESE FLIGHT INFORMATION REGIONS JANUARY 2024 – DECEMBER 2024

Presented by

中国地区监控组织
CHINA REGIONAL MONITORING AGENCY

July 2025

SUMMARY

This report presents the airspace safety oversight from China Regional Monitoring Agency (China RMA) for the reporting time from January to December 2024. The purpose of the report is to compare actual performance to safety goals related to the continued use of Reduced Vertical Separation Minimum (RVSM) in the Chinese FIRs. This report contains a summary of Large Height Deviation Reports received by the China RMA for the most recent reporting period of January 2024 -December 2024. This report also contains an update of the vertical collision risk. The vertical collision risk estimate for Chinese FIRs RVSM airspace in December 2024 is below the target level of safety (TLS) value of 5.0 x 10^{-9} fapfh.

1. Introduction

1.1 The report covers the reporting period from January to December 2024 in the China RMA's responsible FIRs. Each year, China RMA produces one report requested by the Regional Airspace Safety Monitoring Advisory Group (RASMAG).

1.2 It summarizes the airspace safety oversight for the China domestic FIRs, including the Large Height Deviation (LHD) reports analysis and an update of the vertical collision risk estimate for the China Domestic Airspace.

2. Data Submissions

2.1. China RMA requests an annual one-month traffic movement sample and monthly large height deviation reports from the ATS providers in Chinese RVSM airspace. The second and third column of **Table 1** lists the Flight Information Regions (FIRs) and relevant Area Control Centers in China.

2.2. **Traffic Sample Data (TSD)**

2.2.1. Traffic sample data for December 2024 for the airspace of Chinese FIRs were used in the assessment of risk for the RVSM airspace. **Table 1** contains a summary of the traffic sample data received by China RMA for each FIR. Traffic sample data were received from all of the FIRs.

FIR Name	FIR Code	Data Collected in ACCs	Collecting Method	Status	Remarks
Shenyang	ZYSH	Shenyang	Automatic system	Received	Data completed
		Dalian	Automatic system	Received	Data completed
		Harbin	Automatic system	Received	Data completed
Beijing	ZBPE	Beijing	Automatic system	Received	Data completed
Shanghai	ZSHA	Shanghai	Automatic system	Received	Data completed
		Qingdao	Automatic system	Received	Data completed
Guangzhou	ZGZU	Guangzhou	Automatic system	Received	Data completed
		Nanning	Automatic system	Received	Data completed
Kunming	ZPKM	Kunming	Automatic system	Received	Data completed
		Chengdu	Automatic system	Received	Data completed
		Lhasa	Automatic system	Received	Data completed
Wuhan	ZHWH	Included in Beijing and Guangzhou	--	--	Data completed
Lanzhou	ZLHW	Lanzhou	Automatic system	Received	Data completed
		Xi'an	Automatic system	Received	Data completed
Urumqi	ZWUQ	Urumqi	Automatic system	Received	Data completed
Sanya	ZJSA	Sanya	Automatic system	Received	Data completed

Table 1. Summary of Traffic Sample Data of December 2024 in the Airspace of Chinese FIRs

2.3. **Large Height Deviation (LHD)**

2.3.1. Series of cumulative 12-month of LHD reports were used in this safety assessment starting from January 2024 to December 2024. **Table 2** provides the summary of LHD reports submitted by each FIR.

FIR Name	Beijing	Shanghai	Guangzhou	Wuhan	Shenyang	Lanzhou	Urumqi	Kunming	Sanya
Jan-24	X	X	X	X	X	X	X	X	X
Feb-24	X	X	X	X	X	X	X	X	X
Mar-24	X	X	X	X	X	X	X	X	X
Apr-24	X	X	X	X	X	X	X	X	X
May-24	X	X	X	X	X	X	X	X	X
Jun-24	X	X	X	X	X	X	X	X	X
Jul-24	X	X	X	X	X	X	X	X	X
Aug-24	X	X	X	X	X	X	X	X	X
Sep-24	X	X	X	X	X	X	X	X	X
Oct-24	X	X	X	X	X	X	X	X	X
Nov-24	X	X	X	X	X	X	X	X	X
Dec-24	X	X	X	X	X	X	X	X	X

Table 2. Summary of LHD Reports collected from Chinese FIRs

X = Large Height Deviation Report was received for the specified month (including reports indicating "NIL" events)

3. Summary of LHD Occurrences

3.1. Based on the LHD reports in **Table 2**, the LHD occurrences in 2024 are summarized as below.

3.2. **Table 3** and **Figure 1** summarize the number of LHD occurrences, associated LHD duration (in minutes) and the number of flight levels crossed without clearance by month in Chinese FIRs in the reporting period:

Month-Year	No. of LHD Occurrences	LHD Duration (Minutes)	No. of flight levels transitioned without clearance
Jan-24	12	0	2
Feb-24	18	0	6
Mar-24	15	12	7
Apr-24	17	3	16
May-24	29	0	10
Jun-24	20	1	9
Jul-24	18	0	9
Aug-24	15	0	10
Sep-24	11	0	9
Oct-24	16	0	5
Nov-24	12	0	3
Dec-24	7	0	2
Total	190	16	88

Table 3. Summary of non-nil LHDs in Chinese FIRs in 2024

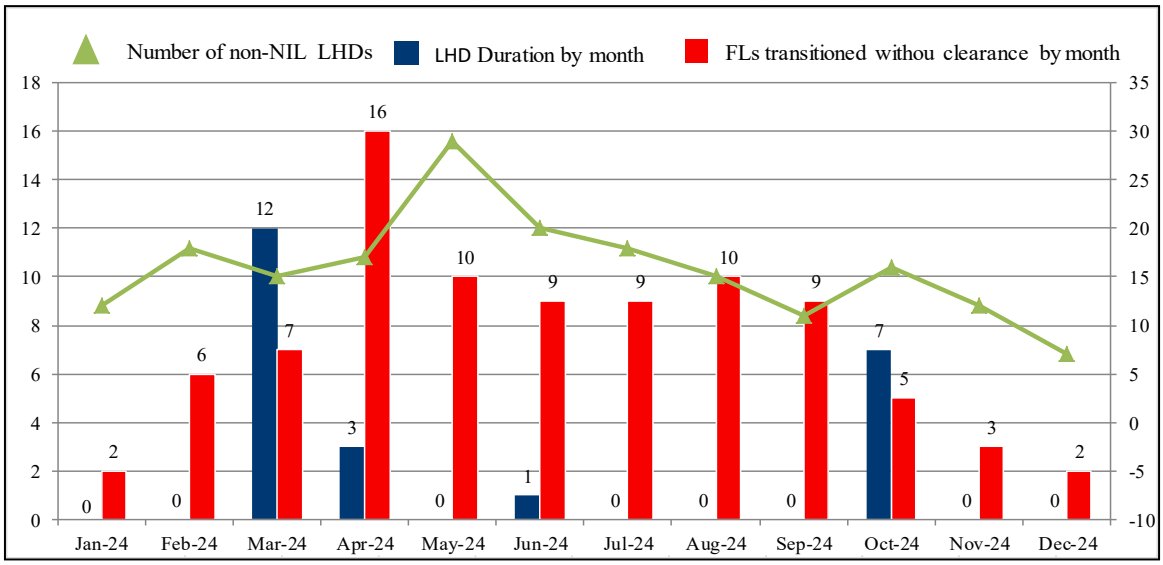

Figure 1. Illustrations of reported LHDs in Chinese FIRs between January 2024 and December 2024

3.3. The LHD reports are categorized by the description of the event. **Table 4**, **Figure 2**, **Figure 3** and **Figure 4** summarize the number of LHD occurrences inside Chinese airspace by the cause of the deviation.

LHD Code	LHD Category Description	No. of LHD Occurrences	LHD Duration (Min)	No. of flight levels transitioned without clearance
A	Flight crew failing to climb/descend the aircraft as cleared	4	0	6
B	Flight crew climbing/descending without Air Traffic Control (ATC) Clearance	1	0	1
C	Incorrect operation or interpretation of airborne equipment	6	0	8
D	ATC system loop error	2	0	2
E	ATC transfer of control coordination errors due to human factors	14	0	0
F	ATC transfer of control coordination errors due to technical issues	3	0	0
G	Aircraft contingency leading to sudden inability to maintain level	0	0	0
H	Airborne equipment failure and unintentional or undetected level change	2	0	2
I	Turbulence or other weather related cause	55	0	55
J	TCAS resolution advisory and flight crew correctly responds	8	0	11
K	TCAS resolution advisory and flight crew incorrectly responds	0	0	0
L	Non-approved aircraft is provided with RVSM separation	0	0	0
M	Other	95	16	3
Total		190	16	88

Table 4. Summary of LHD Categories during the reporting period

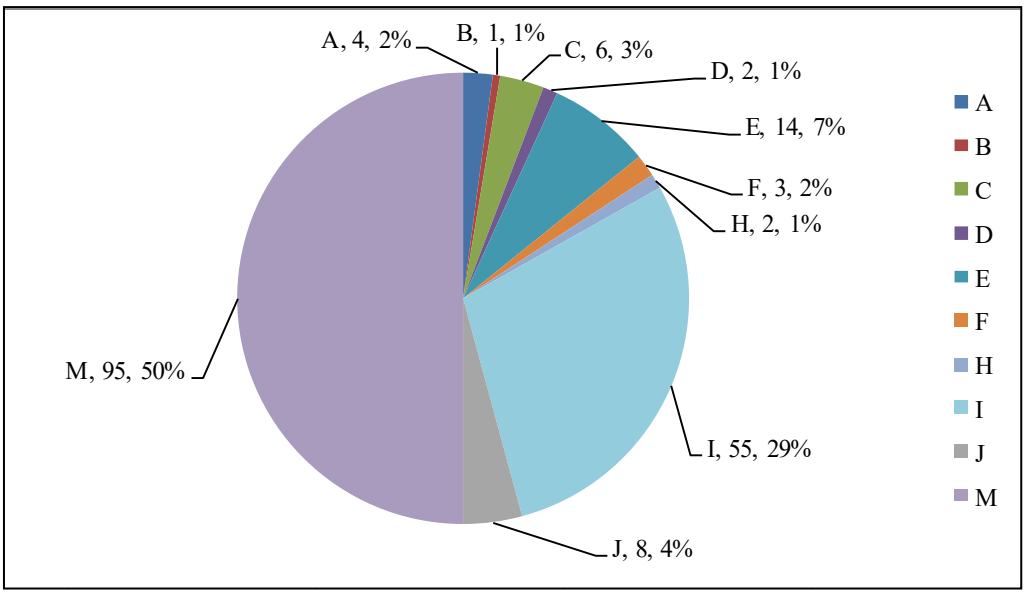

Figure 2. The LHD Events Sorted by Category

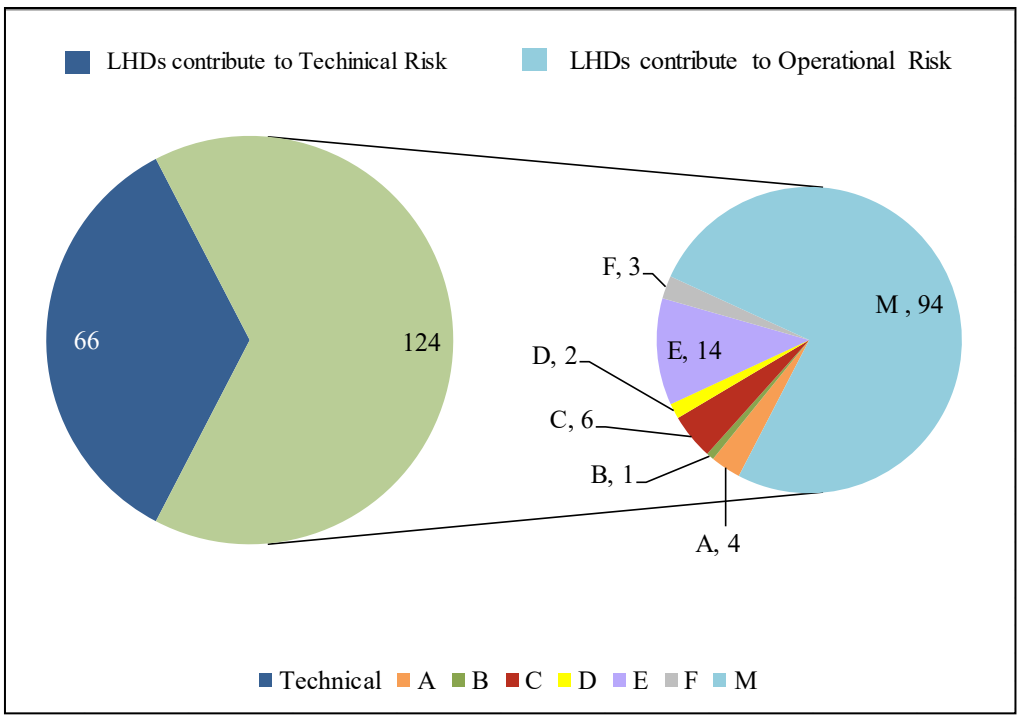

Figure 3. Breakdown of Operation Risk Contributors (Category and Number of Events)

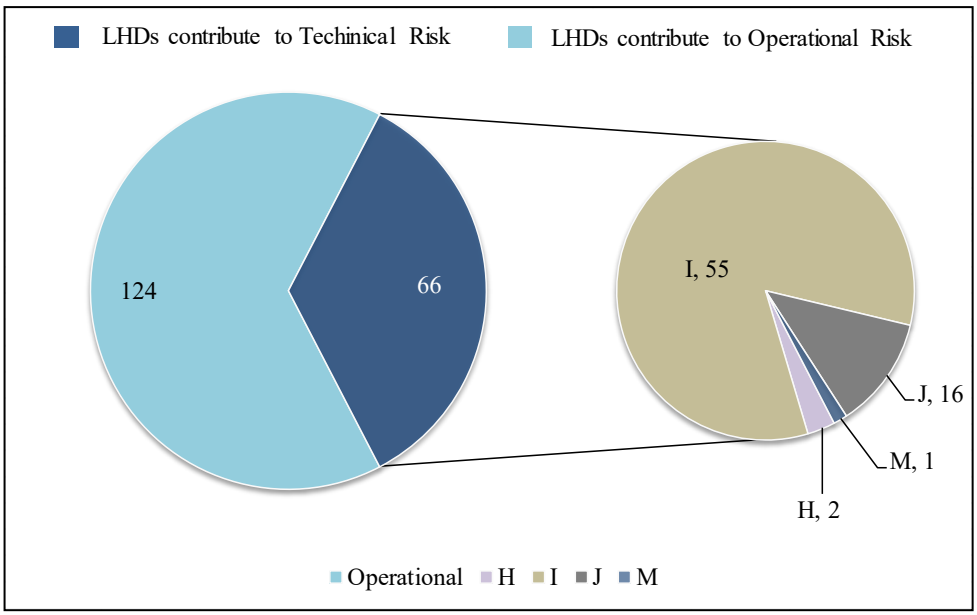

Figure 4. Breakdown of Technical Risk Contributors (Categories and Number of Events)

3.4. **Figure 5** demonstrates the monthly operational risk assessment and the individual event contribution, while **Figure 6** presents the operational risk estimate by categories visualizing the individual event contribution.

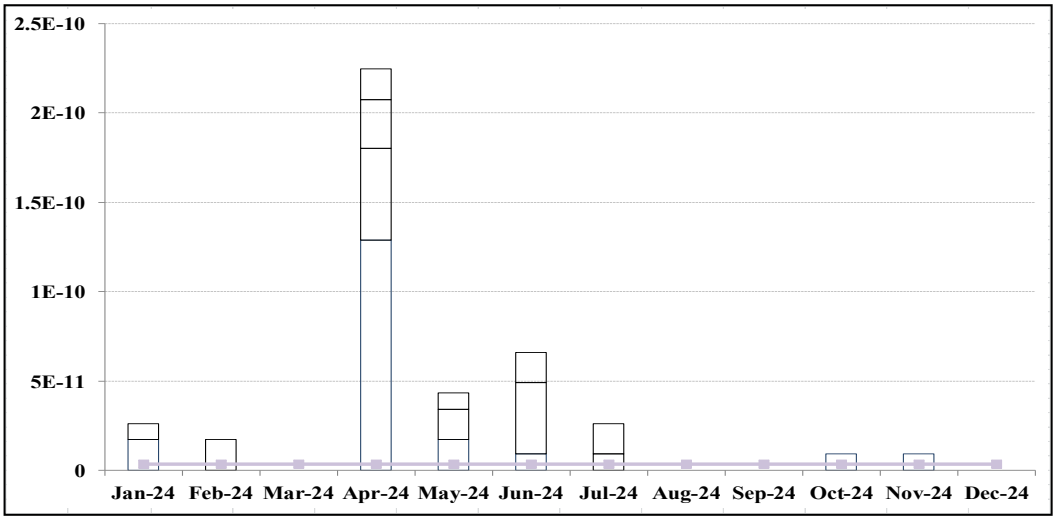

Figure 5. Monthly Assessed Risk Demonstrating the Individual Event Contribution

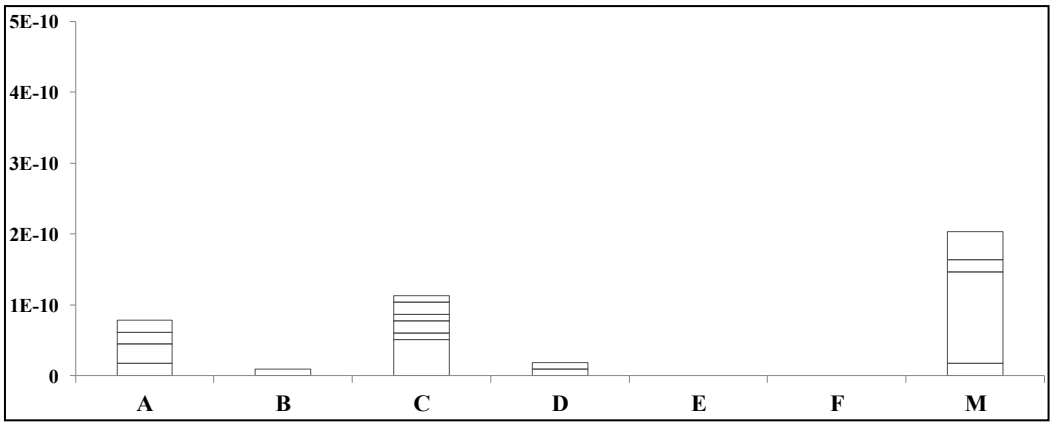

Figure 6. Operational Risk Estimate by Categories Demonstrating the Individual Event Contribution

3.5. LHD Analysis and Safety Treatment of Identified LHDs

3.5.1. 206 LHD events were received during the reporting period. 190 events occurred inside Chinese ATS area, and 16 events occurred outside Chinese ATS area.

3.5.2. 182 LHD events were received from Chinese ATC units, 8 LHD events from Chinese operators, and 16 LHD events shared by PARMO. China RMA has made great efforts to improve the reporting mechanism of Chinese operators, including conducting training and research ,some Chinese operators could report "NIL" or LHD events every month, and have established internal reporting mechanism.

3.5.3. 30 category E and 3 category F events were received in 2024. 26 events occurred in AKARA Corridor between Shanghai ACC and Incheon ACC, 4 events occurred between Urumqi ACC and Islamabad ACC, 3 events occurred between Urumqi ACC and Almaty ACC. All events were transfer events, and receiving ACC could confirm the transfer information before the aircraft passing the transfer point, so there was no operational risk during these events.

3.5.4. There were 124 operational risk events occurred in 2024, and only 17 events affected operational risk, which were 4 category A, 1 category B, 6 category C, 2 category D and 4 category M. The largest quantities of operational risk events were category M events, which were 94 in the whole year. Most of the category from the aircraft losing RVSM capability during the flight because of the on-board equipment failure (most were TCAS failure events). China RMA conducted field investigations covering 7 Chinese Reginal ATMBs in the first half of 2024 and had in-depth exchanges with controllers from various regions on the flight scenarios over mid-air TCAS equipment failure and the work procedures of pilots and controllers, the discuss result is that TCAS failure itself does not affect aircraft height-keeping performance, thus TCAS midair failures should not be considered as a rationale for losing RVSM operational capability. Therefore, China RMA assisted ATMB of CAAC make amendments of the corresponding regulation in the first half of 2025, including the content that TCAS midair failure events will not be recognized LHD, which may significantly reduce the number of LHD events collected by China RMA in future.

3.6. Hot spot identification in trial

3.6.1. According to the method proposed in MAWG/9 WP07 in RASMAG/27 meeting, China RMA identified 3 clusters as showed in **Figure 7**, **Figure 8** and **Figure 9**. The cluster 1 is the transfer point SADLI between Shanghai ACC and Incheon ACC in AKARA Corridor. The cluster 2 is at or near the boundary of Beijing FIR and Wuhan FIR, and the cluster 3 is at Kunming FIR.

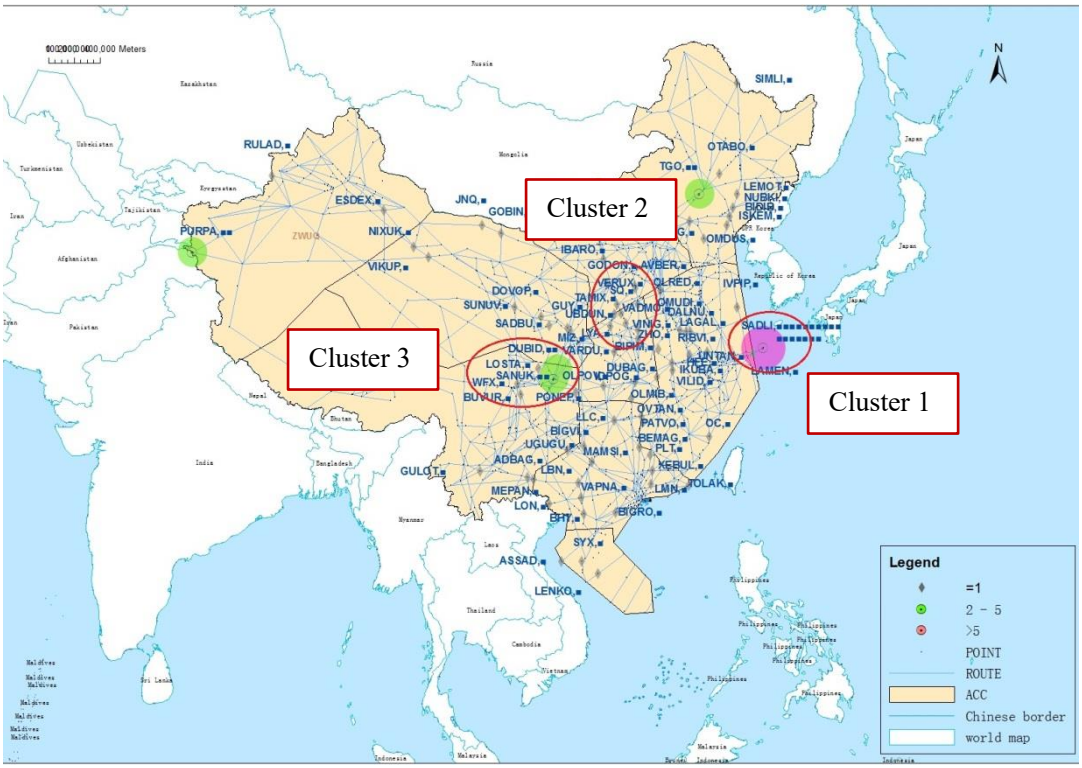

Figure 7. Cluster identification in Chinese airspace for 2024

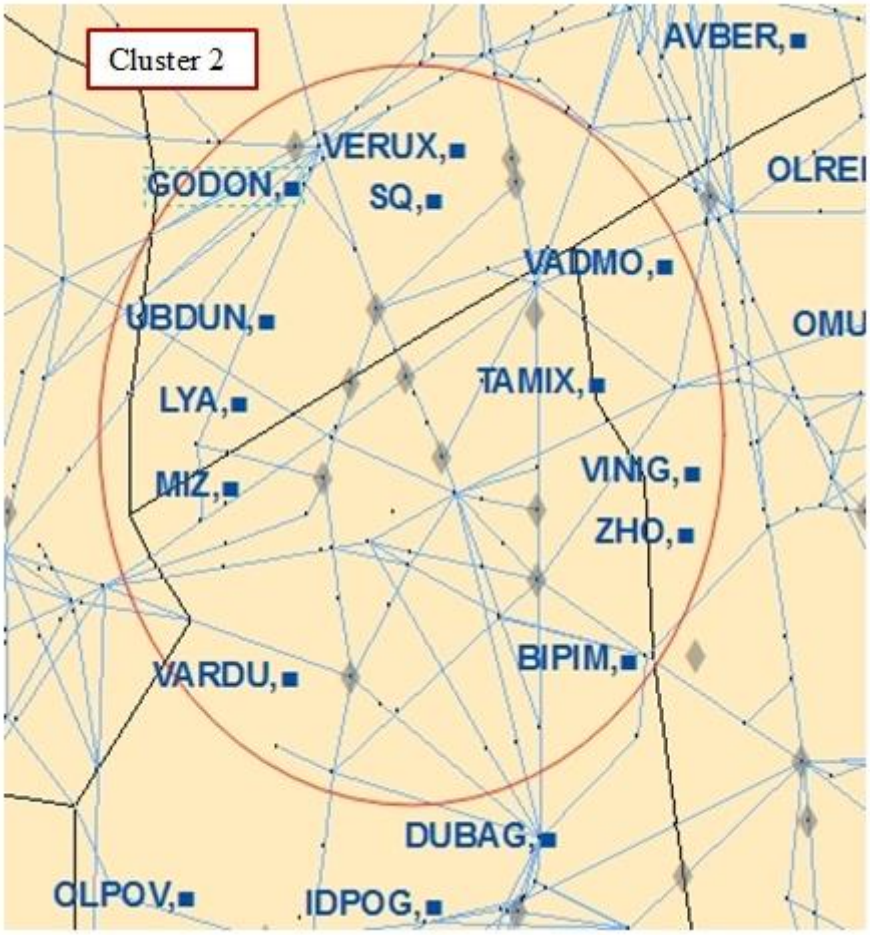

Figure 8. Cluster 2 area zoomed in

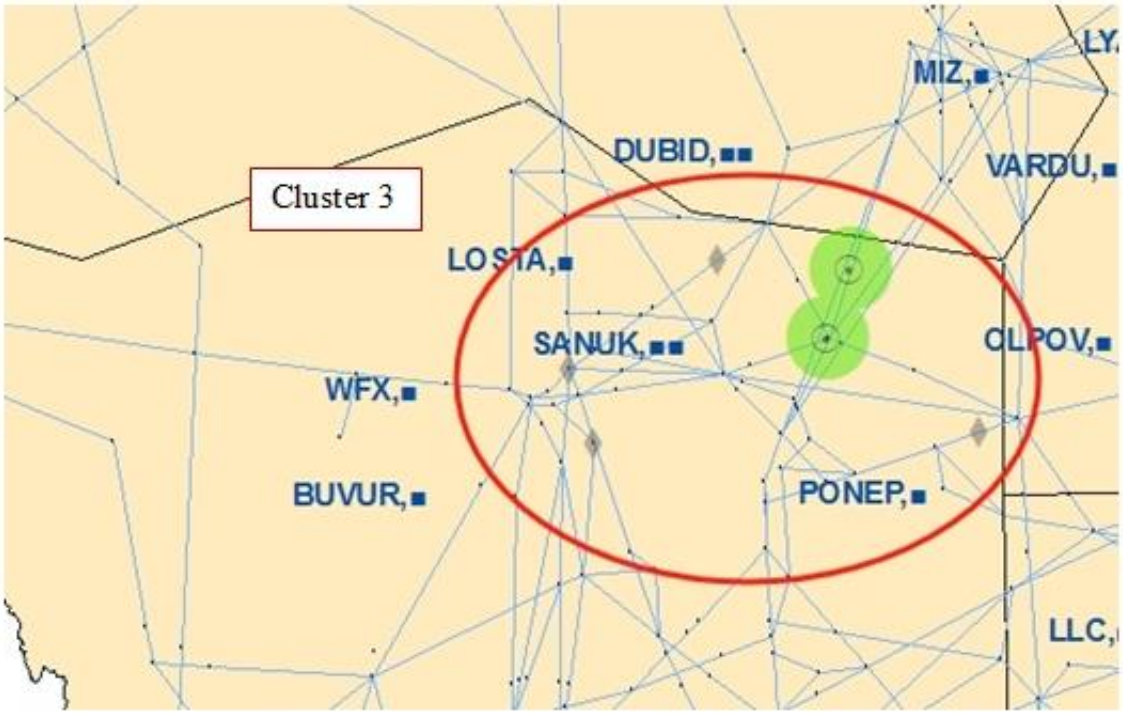

Figure 9. Cluster 3 area zoomed in

3.6.2. **Table 5** shows the Hot Spot criteria and **Table 6** shows the result against the criteria

	2024
Number of Clusters	3
Number of Operational LHD Events	124
Operational Risk ($x10^{-9}$)	0.42
Criteria: Number	31
Criteria: Risk ($x10^{-9}$)	0.11

Table 5. The Hot Spot criteria in 2024

	Cluster 1	Cluster 2	Cluster 3
Number of Operational LHDs	17	12	8
Check Criteria: Number	Negative	Negative	Negative
Risk ($x10^{-9}$)	0.01	0	0.04
Check Criteria: Risk	Negative	Negative	Negative
Check Criteria: TLS	Negative	Negative	Negative

Table 6. The results of checking against the criteria

3.6.3. According to the result of cluster identification, there was no Hot Spot in Chinese airspace. The total risk of 2024 is 0.52 x 10^{-9}, which is below TLS, and there was also no high risk event occurred in this year.

4. Estimate of Vertical Collision Risk for Chinese RVSM Airspace

4.1. The vertical collision risk estimate is to determine whether the Target Level of Safety (TLS) continued to be met in China Domestic airspace, thus supporting the ongoing safe application of RVSM.

4.2. This section updates the results of safety oversight for the RVSM implementation in the monitored airspace. Accordingly, the internationally accepted collision risk methodology is applied in the safety of the RVSM implementation assessment in the airspace.

4.3. The TSD of December 2024, the continuous LHD reports in the airspace of Chinese domestic airspace between January 2024 and December 2024 were adopted to produce the risk estimates presented in this report.

4.4. **Collision Risk Model (CRM) parameters Estimate**

4.4.1. **Table 7** summarizes the value and source material for values estimation of the empirical parameters of the CRM. The CRM is adopted for the risk assessment and the safety oversight for the RVSM implementation in the China domestic airspace.

Parameter Symbol	Parameter Definition	Parameter Value	Source for Value
S_x	Longitudinal separation standard for a region, or Length of longitudinal window used to calculate occupancy	80Nm	Standard value used in overall airspace
S_h	Planned Horizontal Separation	80Nm	Standard value used in overall airspace
$P_z(0)$	Probability of vertical overlap (with planned vertical separation equal to zero)	0.4026	Estimated based on the radar data form from Upper Control Area of Beijing, Guangzhou, Shanghai, August 2008
$P_z(S_z)$	Prob. that 2 aircraft nominally separated by the vertical separation minimum S_z are in vertical overlap.	5.604 x 10^{-9}	
$P_y(0)$	Probability of Lateral Overlap	0.025	Estimated by FAA Technical Center based on the proportion of GPS operations observed in the TSD data collected in China
$P_h(\theta)$	Probability of Horizontal Overlap	6.88 x 10^{-7}	Value used in the Western Pacific/South China Sea safety assessment
$\left\lvert\overline{h(\dot{\theta})}\right\rvert$	Average relative horizontal speed during overlap for aircraft pairs on routes with crossing angle θ (let θ=45°)	367.4 knots	Value used in Western Pacific/South China Sea safety assessment (corresponds to an average aircraft speed of 480 knots)
$\lvert\bar{\dot{y}}\rvert$	Average absolute relative cross track speed for an aircraft pair nominally on the same track	2.8 knots	Estimated by FAA Technical Center based on the proportion of GPS operations observed in the TSD data collected in China
$\lvert\bar{\dot{z}}\rvert$	Average absolute relative vertical speed of an aircraft pair that has lost all vertical separation	1.5 knots	Value used in NAT RVSM safety assessment
λ_x	Average aircraft length	0.02345Nm	Estimated based on the collected TSD
λ_y	Average aircraft wingspan	0.02073Nm	

Parameter Symbol	Parameter Definition	Parameter Value	Source for Value
λ_z	Average aircraft height	0.0070 Nm	
λ_h	Diameter of the disk representing the shape of an aircraft in the horizontal plane	0.02345Nm	

Table 7. Estimate of the empirical Parameters in the CRM

4.4.2. **Table 8** summarizes the value and source material for values estimate of the empirical parameters of the TSD. The TSD is adopted for the risk assessment and the safety oversight for the RVSM implementation in the airspace.

Parameter Symbol	Parameter	Parameter Definition
T	2878308.0	Annual flight hours
E_z(same)	0.1329	Same-direction vertical occupancies
E_z(opposite)	0.0813	Opposite-direction vertical occupancies
Crossing pairs	2793780	Annual estimate of crossing pairs in crossing route
$\overline{\lvert \Delta V \rvert}$	35.8655	Average relative along-track speed between aircraft on same direction routes
$\overline{\lvert V \rvert}$	452.8520	Average absolute aircraft ground speed

Table 8. Estimate of the Parameters Based on the Collected TSD

4.5. **Estimate of Vertical Collision Risk for Chinese RVSM Airspace**

4.5.1. This section summarizes the results of the safety assessment for the airspace of Chinese FIRs. **Figure 10** presents the Technical Risk computed by the TSD collected in December 2024.

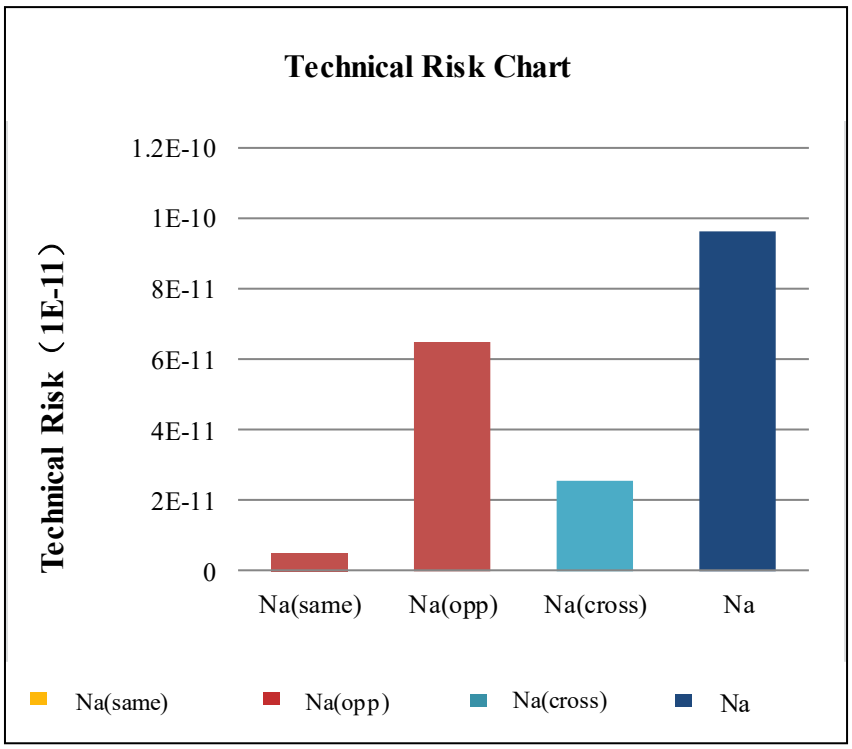

Figure 10. Technical Risk Bar Chart Computed by the TSD Collected in December 2024

4.5.2. **Table 9** presents the estimates of vertical collision risk for the airspace of Chinese FIRs, in terms of the technical, operational, and total risks. The technical risk is estimated to be 0.10 x 10^{-9} fapfh. The operational risk estimate is 0.42 x 10^{-9} fapfh. The estimate of the overall vertical collision risk is 0.52 x 10^{-9} fapfh, which is below the overall TLS value of 5.0x 10^{-9} fapfh.

The RVSM Airspace of Chinese FIRs – estimated annual flying hours = 2878308.0 hours *(note: estimated hours based on Dec 2024 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Technical Risk	0.10 x 10^{-9}	2.5 x 10^{-9}	Below Technical TLS
Operational Risk	0.42 x 10^{-9}	--	--
Total Risk	**0.52 x 10^{-9}**	**5.0 x 10^{-9}**	**Below Overall TLS**

Table 9. Risk Estimates for the RVSM Implementation in the airspace of Chinese FIRs

4.5.3. **Figure 11** presents the trends of collision risk estimates for each month using the appropriate cumulative 12-month of LHD reports.

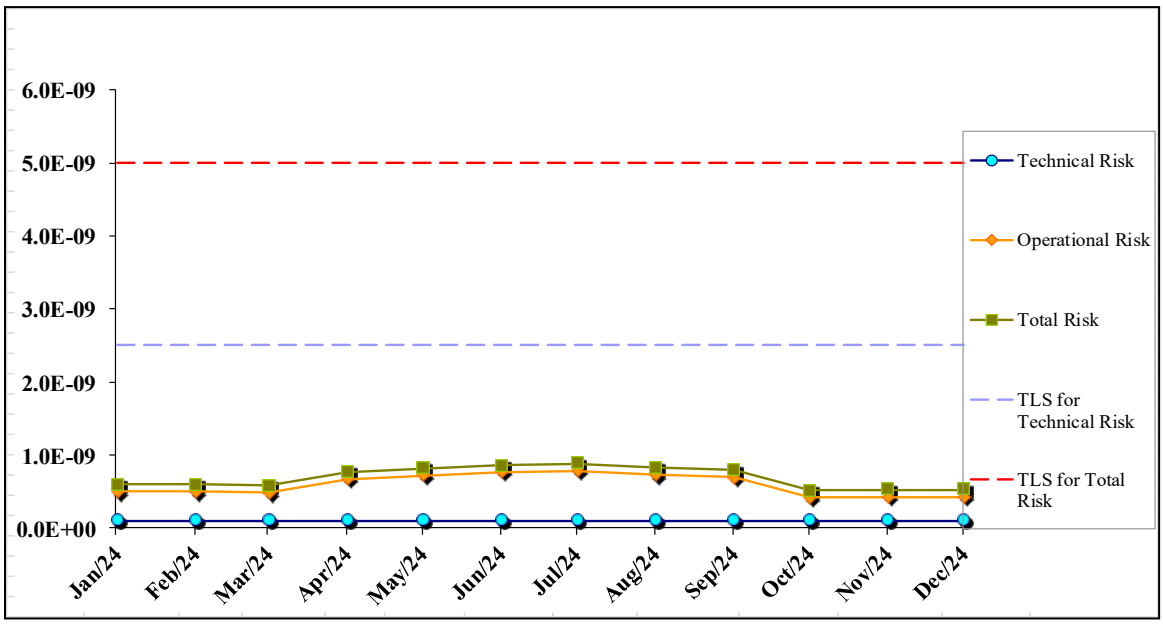

Figure 11. Trends of Risk Estimates for the Airspace of Chinese FIRs

4.5.4. Based on these collision risk estimates, the estimates of both technical risk and total risk from the available TSD and LHD reports satisfy the agreed TLS value of no more than 2.5 x 10^{-9} and 5.0 x 10^{-9} fapfh.

Appendix A Detail of LHDs inside Chinese FIRs from January 2024 to December 2024

No	EVENT DATE	SOURCE	LOCATION	DURATION (Min)	FLs TRANSITIONED WITHOUT CLEARANCE	CAUSE	CODE
1	04/01/2024	Beijing ACC	UBDUN	0	1	Pilot not descend/climb the aircraft as cleared	A
2	04/01/2024	PARMO/Incheon	SADLI	0		Backup control automation system error	F
3	07/01/2024	Shenyang ACC	BIDIB	0		Lose RVSM capability due to TCAS failure	M
4	08/01/2024	PARMO/Incheon	SADLI	0		Backup control automation system error	F
5	15/01/2024	Urumqi ACC	RULAD	0	1	Pilot descend/climb the aircraft without ATC	B
6	18/01/2024	Shenyang ACC	ISKEM	0		Lose RVSM capability due to TCAS failure	M
7	23/01/2024	Lanzhou ACC	VIKUP	0		Lose RVSM capability due to TCAS failure	M
8	25/01/2024	Chengdu ACC	WFX	0		Lose RVSM capability due to Navigation System	M
9	26/01/2024	Shanghai ACC	Unknown	0		Lose RVSM capability due to TCAS failure	M
10	27/01/2024	Guangzhou ACC	XEBUL	0		Lose RVSM capability due to TCAS failure	M
11	28/01/2024	Nanning ACC	LBN	0		Lose RVSM capability due to TCAS failure	M
12	30/01/2024	Xi'an ACC	MIZ	0		Lose RVSM capability due to TCAS failure	M
13	04/02/2024	Dalian ACC	DONVO	0	1	Turbulence	I
14	17/02/2024	Nanning ACC	MEPAN	0		Lose RVSM capability	M
15	12/02/2024	Guangzhou ACC	LLC	0		Lose RVSM capability due to TCAS failure	M
16	15/02/2024	Guangzhou ACC	PLT	0		Lose RVSM capability due to TCAS failure	M
17	17/02/2024	Guangzhou ACC	OLMIB	0		Lose RVSM capability due to TCAS failure	M
18	20/02/2024	Kunming ACC	GULOT	0	1	Lose RVSM capability	M
19	18/02/2024	Lanzhou ACC	ATBUG	0	1	Turbulence	I
20	03/02/2024	Shanghai ACC	DALNU	0		Lose RVSM capability due to TCAS failure	M
21	03/02/2024	Shanghai ACC	LAGAL	0		Lose RVSM capability due to TCAS failure	M
22	07/02/2024	Shanghai ACC	OMUDI	0		Lose RVSM capability due to TCAS failure	M
23	20/02/2024	Shanghai ACC	ADGOL	0	1	Turbulence	I
24	20/02/2024	Shanghai ACC	LEGIV	0	1	Turbulence	I
25	21/02/2024	Shanghai ACC	JDZ	0	1	Turbulence	I
26	08/02/2024	Xi'an ACC	ZNX	0		Lose RVSM capability due to TCAS failure	M
27	12/02/2024	Shenyang ACC	KAKAT	0		Lose RVSM capability due to TCAS failure	M

No	EVENT DATE	SOURCE	LOCATION	DURATION (Min)	FLs TRANSITIONED WITHOUT CLEARANCE	CAUSE	CODE
28	07/02/2024	Shenyang ACC	OTABO	0		Lose RVSM capability due to TCAS failure	M
29	17/02/2024	Shenyang ACC	TGO	0		Lose RVSM capability due to TCAS failure	M
30	04/02/2024	Shenyang ACC	NUBKI	0		Lose RVSM capability due to TCAS failure	M
31	31/03/2024	Capital airlines	XEBUL	0	1	Turbulence	I
32	28/03/2024	Guangzhou ACC	OLMIB	0	1	Turbulence	I
33	24/03/2024	Guangzhou ACC	NNX	12		Fail to communicate	M
34	11/03/2024	Urumqi ACC	DUMAN	0	1	Turbulence	I
35	28/03/2024	Guangzhou ACC	LMN	0		Lose RVSM capability	M
36	13/03/2024	Chengdu ACC	BUVUR	0		Lose RVSM capability	M
37	28/03/2024	Chengdu ACC	LOSTA	0		Lose RVSM capability	M
38	05/03/2024	Shenyang ACC	OMDUS	0		Lose RVSM capability due to TCAS failure	M
39	29/03/2024	Guangzhou ACC	GYA	0	1	Turbulence	I
40	31/03/2024	Guangzhou ACC	XEBUL	0	1	Turbulence	I
41	05/03/2024	Lasa ACC	Unknown	0	1	Turbulence	I
42	17/03/2024	Lanzhou ACC	OBMIG	0	1	Turbulence	I
43	01/03/2024	Shanghai ACC	IVPIP	0		Lose RVSM capability due to TCAS failure	M
44	29/03/2024	Shanghai ACC	UNTAN	0		Lose RVSM capability	M
45	22/03/2024	Shanghai ACC	HFE	0		Lose RVSM capability due to TCAS failure	M
46	02/04/2024	Sanya ACC	LENKO	3	1	Other	M
47	08/04/2024	Shanghai ACC	Unknown	0		Lose RVSM capability due to TCAS failure	M
48	10/04/2024	Beijing ACC	ISBOS	0	1	Turbulence	I
49	13/04/2024	Lanzhou ACC	JNQ	0	1	Turbulence	I
50	13/04/2024	Urumqi ACC	NUKTI	0	1	Turbulence	I
51	13/04/2024	Urumqi ACC	BIKNO	0	1	Turbulence	I
52	13/04/2024	Lanzhou ACC	NUKTI	0	1	Turbulence	I
53	16/04/2024	Nanning ACC	VAPNA	0	3	Pilot incorrect operation	C
54	19/04/2024	Chengdu ACC	DUBID	0		Lose RVSM capability due to Navigation System	M
55	19/04/2024	Xi'an ACC	DOVOP	0		Lose RVSM capability due to Navigation System	M

No	EVENT DATE	SOURCE	LOCATION	DURATION (Min)	FLs TRANSITIONED WITHOUT CLEARANCE	CAUSE	CODE
56	20/04/2024	Shanghai ACC	OVTAN	0		Lose RVSM capability due to TCAS failure	M
57	20/04/2024	Chengdu ACC	DUBID	0	3	Pilot not descend/climb the aircraft as cleared	A
58	21/04/2024	Beijing ACC	Unknown	0	1	Pilot not descend/climb the aircraft as cleared	A
59	25/04/2024	Guangzhou ACC	YIN	0	1	Turbulence	I
60	29/04/2024	Shenzhen Airlines	Unknown	0	0	Turbulence	I
61	30/04/2024	Beijing ACC	Unknown	0	1	TCAS RA and pilot correctly responded	J
62	30/04/2024	Guangzhou ACC	OVGOT	0	1	Turbulence	I
63	03/05/2024	PARMO/Incheon	SADLI	0		No transfer	E
64	03/05/2024	PARMO/Incheon	SADLI	0		No time revision	E
65	05/05/2024	Guangzhou ACC	BIGRO	0		Lose RVSM capability due to TCAS failure	M
66	05/05/2024	Guangzhou ACC	IDPOG	0		Lose RVSM capability due to TCAS failure	M
67	05/05/2024	Xi'an ACC	ZNX	0		Lose RVSM capability	M
68	06/05/2024	Beijing ACC	DUBAG	0		Lose RVSM capability due to TCAS failure	M
69	07/05/2024	PARMO/Incheon	SADLI	0		No FL revision	E
70	08/05/2024	Nanning ACC	WUY	0	1	Turbulence	I
71	09/05/2024	Shenyang ACC	Unknown	0		Lose RVSM capability due to TCAS failure	M
72	09/05/2024	Guangzhou ACC	IKUBA	0		Lose RVSM capability due to TCAS failure	M
73	11/05/2024	Chengdu ACC	SANUK	0		Lose RVSM capability	M
74	11/05/2024	Chengdu ACC	Unknown	0	1	Turbulence	I
75	13/05/2024	PARMO/Incheon	SADLI	0		Late transfer	E
76	14/05/2024	Beijing ACC	TAMIX	0		Lose RVSM capability	M
77	17/05/2024	Beijing ACC	AVBER	0		Lose RVSM capability	M
78	18/05/2024	Shenzhen Airlines	Unknown	0	1	Turbulence	I
79	18/05/2024	Guangzhou ACC	LLC	0	1	TCAS RA and pilot correctly responded	J
80	19/05/2024	Beijing ACC	HUR	0	1	Turbulence	I
81	19/05/2024	Shenyang ACC	LEMOT	0		Lose RVSM capability due to TCAS failure	M
82	19/05/2024	Chengdu ACC	LPS	0	1	Turbulence	I
83	19/05/2024	Chengdu ACC	SANUK	0	1	Other	M

No	EVENT DATE	SOURCE	LOCATION	DURATION (Min)	FLs TRANSITIONED WITHOUT CLEARANCE	CAUSE	CODE
84	20/05/2024	Urumqi ACC	PURPA	0	1	Pilot not descend/climb the aircraft as cleared	A
85	24/05/2024	Shanghai ACC	Unknown	0	1	Turbulence	I
86	24/05/2024	Ruili Airlines	Unknown	0		Lose RVSM capability	M
87	25/05/2024	PARMO/Incheon	SADLI	0		No FL revision	E
88	26/05/2024	Shanghai ACC	SADLI	0	1	Pilot misunderstands clearance message	D
89	28/05/2024	Beijing ACC	Unknown	0		Lose RVSM capability	M
90	28/05/2024	Shenyang ACC	TGO	0		Lose RVSM capability	M
91	30/05/2024	Beijing ACC	OC	0		Lose RVSM capability	M
92	01/06/2024	PARMO/Incheon	SADLI	0		No FL revision	E
93	02/06/2024	Guangzhou ACC	Unknown	0		Lose RVSM capability due to TCAS failure	M
94	04/06/2024	Nanning ACC	WUY	0	1	Turbulence	I
95	04/06/2024	Urumqi ACC	PURPA	0		No FL revision	E
96	07/06/2024	Sanya ACC	SYX	0		Lose RVSM capability due to TCAS failure	M
97	07/06/2024	Lanzhou ACC	GOBIN	0	1	Pilot incorrect operation	C
98	08/06/2024	Beijing ACC	NIXAL	0		Lose RVSM capability due to TCAS failure	M
99	11/06/2024	Chengdu ACC	ZYG	1		Fail to establish/maintain a separation standard	M
100	12/06/2024	Guangzhou ACC	QP	0	1	Turbulence	I
101	13/06/2024	Beijing ACC	VERUX	0		Lose RVSM capability	M
102	13/06/2024	Shanghai ACC	LEKUV	0	1	Turbulence	I
103	14/06/2024	Nanning ACC	XOLON	0	1	Turbulence	I
104	14/06/2024	Guangzhou ACC	Unknown	0	1	Turbulence	I
105	15/06/2024	PARMO/Incheon	SADLI	0		No transfer	E
106	18/06/2024	Nanning ACC	LON	0	1	Pilot incorrect operation	C
107	18/06/2024	PARMO/Incheon	SADLI	0		No transfer	E
108	23/06/2024	PARMO/Incheon	SADLI	0		No FL revision	E
109	25/06/2024	LOONGAIR	PLT	0	1	Turbulence	I
110	26/06/2024	Shanghai ACC	PIMOL	0	1	Airborne equipment failure	H
111	28/06/2024	Chengdu ACC	Unknown	0		Lose RVSM capability	M

No	EVENT DATE	SOURCE	LOCATION	DURATION (Min)	FLs TRANSITIONED WITHOUT CLEARANCE	CAUSE	CODE
112	02/07/2024	Shenyang ACC	Unknown	0		Lose RVSM capability	M
113	28/07/2024	Beijing ACC	VINIG	0	1	TCAS RA and pilot correctly responded	J
114	31/07/2024	Beijing ACC	IBARO	0		Lose RVSM capability due to TCAS failure	M
115	06/07/2024	Beijing ACC	SIMLI	0		Lose RVSM capability due to TCAS failure	M
116	28/07/2024	Lasa ACC	OMGEV	0	1	Turbulence	I
117	20/07/2024	Lanzhou ACC	NOGEX	0	1	Turbulence	I
118	06/07/2024	Guangzhou ACC	BEMAG	0		Lose RVSM capability due to TCAS failure	M
119	26/07/2024	Guangzhou ACC	PLT	0	1	Turbulence	I
120	01/07/2024	Guangzhou ACC	GUDRO	0	1	Turbulence	I
121	04/07/2024	Guangzhou ACC	WTM	0	1	Turbulence	I
122	24/07/2024	Guangzhou ACC	BIGVI	0		Lose RVSM capability due to TCAS failure	M
123	07/07/2024	Lanzhou ACC	LENKO	0	0	Turbulence	I
124	04/07/2024	Shanghai ACC	RIBVI	0	1	Pilot incorrect operation	C
125	18/07/2024	Shanghai ACC	TOLAK	0	1	Pilot incorrect operation	C
126	10/07/2024	Beijing ACC	SQ	0		Lose RVSM capability	M
127	12/07/2024	Shenzhen Airlines	ESMEB	0	1	Turbulence	I
128	17/07/2024	Beijing ACC	BIVAT	0		Lose RVSM capability	M
129	23/07/2024	Beijing ACC	VINIG	0		Lose RVSM capability due to TCAS failure	M
130	04/08/2024	Beijing ACC	VIKON	0	1	Bad weather	I
131	06/08/2024	LOONGAIR	ESMEX	0	1	Turbulence	I
132	10/08/2024	Kunming ACC	Unknown	0	1	Turbulence	I
133	13/08/2024	Sanya ACC	NYB	0	1	Turbulence	I
134	15/08/2024	Guangzhou ACC	ODOPI	0	1	Turbulence	I
135	15/08/2024	Lanzhou ACC	GUY	0		Lose RVSM capability due to TCAS failure	M
136	16/08/2024	Guangzhou ACC	XSH	0	1	Turbulence	I
137	17/08/2024	Guangzhou ACC	Unknown	0	1	Turbulence	I
138	17/08/2024	Beijing ACC	Unknown	0		Lose RVSM capability due to TCAS failure	M
139	20/08/2024	Nanning ACC	BHY	0		Lose RVSM capability due to TCAS failure	M

No	EVENT DATE	SOURCE	LOCATION	DURATION (Min)	FLs TRANSITIONED WITHOUT CLEARANCE	CAUSE	CODE
140	20/08/2024	Beijing ACC	Unknown	0		Lose RVSM capability due to TCAS failure	M
141	22/08/2024	Chengdu ACC	UGUGU	0		Lose RVSM capability due to TCAS failure	M
142	24/08/2024	Xi'an ACC	SADBU	0		Lose RVSM capability due to TCAS failure	M
143	26/08/2024	Shenyang ACC	Unknown	0		Lose RVSM capability due to TCAS failure	M
144	29/08/2024	Guangzhou ACC	GOSMA	0	3	Bad weather	I
145	02/09/2024	Shanghai ACC	TOL	0	1	Turbulence	I
146	02/09/2024	Guangzhou ACC	IGITA	0	1	Turbulence	I
147	04/09/2024	Guangzhou ACC	MAMSI	0		Lose RVSM capability due to TCAS failure	M
148	09/09/2024	Urumqi ACC	OSUPO	0	1	Turbulence	I
149	11/09/2024	Chengdu ACC	MUMGO	0	1	Turbulence	I
150	12/09/2024	Beijing ACC	BASOV	0	3	TCAS RA and pilot correctly responded	J
151	12/09/2024	Lanzhou ACC	JNQ	0		Lose RVSM capability	M
152	14/09/2024	Guangzhou ACC	Unknown	0		Lose RVSM capability due to TCAS failure	M
153	23/09/2024	Guangzhou ACC	OLPOV	0		Lose RVSM capability due to TCAS failure	M
154	26/09/2024	Shanghai ACC	XLN	0	1	Turbulence	I
155	26/09/2024	Guangzhou ACC	SHL	0	1	Airborne equipment failure	H
156	02/10/2024	Sanya ACC	SYX	0	1	Turbulence	I
157	04/10/2024	Beijing ACC	GODON	0		Lose RVSM capability due to TCAS failure	M
158	07/10/2024	Guangzhou ACC	VARDU	0		Lose RVSM capability	M
159	09/10/2024	Shenyang ACC	CHG	0		Lose RVSM capability	M
160	10/10/2024	PARMO/Incheon	SADLI	0		flight level change violated LOA	E
161	11/10/2024	Shanghai ACC	BIPIM	0		Lose RVSM capability due to TCAS failure	M
162	11/10/2024	Sanya ACC	Unknown	0	1	Pilot incorrect operation	C
163	15/10/2024	Beijing ACC	ZHO	0	1	TCAS RA and pilot correctly responded	J
164	19/10/2024	Xi'an ACC	ZNX	0		Lose RVSM capability due to TCAS failure	M
165	21/10/2024	Beijing ACC	Unknown	0		Lose RVSM capability due to TCAS failure	M
166	27/10/2024	Guangzhou ACC	PONEP	0		Lose RVSM capability due to TCAS failure	M
167	28/10/2024	PARMO/Incheon	SADLI	0		No FL revision	E

No	EVENT DATE	SOURCE	LOCATION	DURATION (Min)	FLs TRANSITIONED WITHOUT CLEARANCE	CAUSE	CODE
168	29/10/2024	LOONGAIR	VIBUB	0	1	Turbulence	I
169	29/10/2024	PARMO/Incheon	SADLI	0		Backup control automation system error	F
170	29/10/2024	PARMO/Incheon	SADLI	0		No FL revision	E
171	29/10/2024	Urumqi ACC	HTN	0	1	TCAS RA and pilot correctly responded	J
172	02/11/2024	Beijing ACC	LYA	0		Lose RVSM capability	M
173	05/11/2024	Sanya ACC	SYX	0	1	Turbulence	I
174	06/11/2024	Urumqi ACC	EXURU	0	1	TCAS RA and pilot correctly responded	J
175	08/11/2024	Beijing ACC	VADMO	0		Lose RVSM capability due to TCAS failure	M
176	09/11/2024	Lanzhou ACC	SUNUV	0		Lose RVSM capability due to TCAS failure	M
177	14/11/2024	Guangzhou ACC	PATVO	0		Lose RVSM capability	M
178	15/11/2024	Beijing ACC	ZHO	0		Lose RVSM capability	M
179	19/11/2024	Sanya ACC	ASSAD	0	1	Pilot misunderstands clearance message	D
180	20/11/2024	Shenyang ACC	LEMOT	0		Lose RVSM capability	M
181	25/11/2024	Beijing ACC	OLRED	0		Lose RVSM capability due to TCAS failure	M
182	28/11/2024	Beijing ACC	Unknown	0		Lose RVSM capability	M
183	29/11/2024	Xi'an ACC	ZNX	0		Lose RVSM capability due to TCAS failure	M
184	07/12/2024	Urumqi ACC	DAKPA	0	2	TCAS RA and pilot correctly responded	J
185	11/12/2024	Xi'an ACC	ANRUG	0		Lose RVSM capability	M
186	15/12/2024	Shanghai ACC	LAMEN	0		Lose RVSM capability	M
187	21/12/2024	Shanghai ACC	VILID	0		Lose RVSM capability	M
188	22/12/2024	Lanzhou ACC	NIXUK	0		Lose RVSM capability	M
189	24/12/2024	Urumqi ACC	ESDEX	0		Lose RVSM capability due to Navigation System	M
190	26/12/2024	PARMO/Incheon	SADLI	0		No time revision	E

Appendix C Geographic Location of Risk-Bearing LHD within airspace of Chinese FIRs from January to December 2024

Figure 12 provides the geographic location of risk-bearing LHD reports within Chinese FIRs during the reporting period.

Figure 12. Geographic Location of Risk-Bearing LHD Reports in the Region

ATTACHMENT B

AIRSPACE SAFETY REVIEW FOR THE RVSM OPERATION IN THE AIRSPACE OF PYONGYANG FLIGHT INFORMATION REGION JANUARY 2024 -DECEMBER 2024

Presented by

中国地区监控组织
CHINA REGIONAL MONITORING AGENCY

July 2025

SUMMARY

This report presents the airspace safety oversight from China Regional Monitoring Agency (China RMA) for the airspace of Democratic People's Republic of Korea (DPR Korea) for the time January 2024 -December 2024. This report also contains an update of the vertical collision risk. The vertical collision risk estimate for the airspace of Pyongyang FIR is 0 in 2024.

1. Introduction

1.1 China Regional Monitoring Agency (China RMA) serves as the regional monitoring agency (RMA) for Pyongyang FIR.

1.2 The report covers the reporting period from January to December 2024 in Pyongyang FIR. Each year, China RMA produces one report requested by the Regional Airspace Safety Monitoring Advisory Group (RASMAG) on the FIR.

2. Data Submission

2.1. China RMA requests an annual one-month traffic movement sample and monthly Large Height Deviation (LHD) reports from the General Administration of Civil Aviation, DPR Korea.

2.2 According to the email response from ATMB of DPR Korea, there were no LHD events (NIL report) and flying hours in in Pyongyang FIR in 2024.

3. Estimate of Vertical Collision Risk for DPR Korea's RVSM Airspace

3.1 **Table 1** presents the estimates of vertical collision risk for the airspace of Pyongyang in terms of the technical, operational, and total risks. All of them are 0.

RVSM Airspace of DPR Korea – estimated annual flying hours = 0 hours			
Source of Risk	**Lower Bound Risk Estimation**	**TLS**	**Remarks**
Technical Risk	0	2.5×10^{-9}	Below Technical TLS
Operational Risk	0	-	-

RVSM Airspace of DPR Korea – estimated annual flying hours = 0 hours			
Source of Risk	**Lower Bound Risk Estimation**	**TLS**	**Remarks**
Total Risk	**0**	**5.0×10^{-9}**	**Below Overall TLS**

Table 1. Risk Estimates for the RVSM Implementation in the Airspace of DPR Korea

— END —