



International Civil Aviation Organization

**The Thirteenth Meeting of the Regional Airspace Safety Monitoring
Advisory Group (RASMAG/13)**

Bangkok, Thailand, 02 – 05 August 2010

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

**Safety Monitoring Report from the
Pacific Approvals Registry and Monitoring Organization
May 2009 – April 2010**

(Presented by Pacific Approvals Registry and Monitoring Organization (PARMO))

SUMMARY

This working paper presents the safety monitoring report from the Pacific Approvals Registry and Monitoring Organization (PARMO) for the time period 1 May 2009 to 30 April 2010. This report contains a summary of large height deviation reports received by the PARMO for that time period and an update of the vertical collision risk for Pacific and North East Asia airspace is presented.

1. Introduction

- 1.1 The Pacific Approvals Registry and Monitoring Organization (PARMO) produces a periodic report which is distributed twice annually to Pacific and North East Asia air traffic service (ATS) providers and airspace users. The report presented in this paper fulfils the ICAO emphasis on safety management systems; such reporting for international airspace is a component of safety management systems.

2. Discussion

- 2.1 This working paper contains the PARMO safety monitoring report for the time period 1 May 2009 to 30 April 2010. It contains a summary of large height deviation reports, and estimates of vertical risk for Pacific and North East Asia airspace.

3. Actions by the Meeting

- 3.1 The meeting is invited to note the results of the airspace safety oversight presented in this working paper.

.....

Intentionally Left Blank



PARMO Safety Monitoring Report
May 2009 to April 2010

**Pacific and North East Asia Airspace
RVSM Safety Monitoring Report
May 2009 to April 2010**

Prepared by:
Pacific Approvals Registry and Monitoring Organization (PARMO)

Summary

The purpose of this report is to compare actual performance to safety goals related to continued use of reduced vertical separation minimum (RVSM) in Pacific and North East Asia airspace. This report contains a summary of large height deviation reports received by the PARMO for the most recent reporting period of 1 May 2009 to 30 April 2010. There are a total of 30 reported large height deviations that occurred during this period in Pacific and a portion of North East Asia RVSM airspace. This report also contains an update of the vertical collision risk. The vertical collision risk estimate for Pacific airspace meets the target level of safety (TLS) value of 5.0×10^{-9} fatal accidents per flight hour, a value well within that range agreed internationally as “safe”. The vertical collision risk estimate for a portion North East Asia airspace also meets the TLS value of 5.0×10^{-9} fatal accidents per flight hour.

1. Introduction

1.1. The Pacific Approvals Registry and Monitoring Organization (PARMO), a service provided by the U.S. Federal Aviation Administration’s Technical Center, serves as the regional monitoring agency (RMA) for Pacific and for a portion of North East Asia airspace.

1.2. This report covers the current reporting period 1 May 2009 to 30 April 2010 in the PARMO’s ongoing process of providing periodic updates of information relevant to the continued safe use of the RVSM in Pacific and North East Asia airspace. The PARMO produces two reports each calendar year following the standardize reporting period and format guidelines set forth by the International Civil Aviation Organization’s (ICAO’s) Asia and Pacific Region Regional Airspace Safety Monitoring Advisory Group (RASMAG). These guidelines are stated in reference 1, paragraph 5.34. This report includes information relevant to continued safe use of the RVSM in a portion of North East Asia airspace as well as the Pacific airspace.

1.3. Within this report, the reader will find the large height deviation reports received by the PARMO during the reporting period and the corresponding update to the vertical collision risk estimate. There were a total of 30 such reports submitted to the PARMO during the reporting period. A full description of the data sources used in this report is provided in reference 3.

2. Data Submission

2.1. The most recent annual one-month traffic movement samples for December 2009 were received from the Flight Information Regions (FIRs) listed in Table 1. The PARMO did not receive a December 2009 traffic movement sample for the Tahiti FIR. These traffic movement samples are used to update the vertical risk estimates contained in this safety monitoring report.

State	FIR Name	Status
Fiji	Nadi	Received
New Zealand	Auckland	Received
Republic of Korea	Incheon	Received
Tahiti	Tahiti	Not Received
United States	Oakland	Received
	Anchorage	Received

Table 1: Summary of December 2009 Traffic Sample Data

2.2. Large Height Deviation (LHD) Data

2.2.1. The table in Appendix A presents the fidelity with which Pacific and North East Asia Flight Information Regions (FIRs) provided large height deviation reports (including ‘NIL reports’) to the PARMO each month during the reporting period. Since April 2010 the PARMO has received LHD reports for each month from all of the FIR’s. The PARMO continues to request that ATS providers forward reports of large height deviations (300-ft magnitude or more) on a monthly basis. The email address for the PARMO is: aparmo@faa.gov. The website address for the PARMO is <http://www.tc.faa.gov/acb300/PARMO/>.

3. Large Height Deviations Report Summary

3.1. An overall reduction in the number of reported events for both Pacific and North East Asia airspace was observed. The previous twelve month PARMO safety monitoring report included details of thirty-three events; the current report includes details of thirty events.

3.2. Tables 2 and 3 summarize the number of LHD occurrences and durations during the time period 1 May 2009 to 30 April 2010 in the Pacific Airspace and a portion of North East Asia airspace respectively.

Month-Year	No. of LHD Occurrences	LHD Duration (Minutes)
May-09	0	0
Jun-09	0	0
Jul-09	2	6
Aug-09	0	0
Sep-09	0	0
Oct-09	1	10
Nov-09	1	5
Dec-09	2	10
Jan-10	2	10
Feb-10	1	6

Mar-10	1	45
Apr-10	0	0
Total	10	92

Table 2. Summary of LHD Occurrences and Durations in Pacific Airspace

Month-Year	No. of LHD Occurrences	LHD Duration (Minutes)
May-09	1	1
Jun-09	0	0
Jul-09	0	0
Aug-09	2	0.166667
Sep-09	0	0
Oct-09	0	0
Nov-09	1	1
Dec-09	0	0
Jan-10	0	0
Feb-10	0	0
Mar-10	0	0
Apr-10	0	0
Total	4	2.166667

Table 3. Summary of LHD Occurrences and Durations in a Portion of North East Asia Airspace

3.3. The large height deviation reports are separated by categories based on the details provided for each deviation. There are three such categories: large deviations contributing to technical risk, large height deviations contributing to operational risk and large height deviations occurring outside of RVSM airspace or airspace for which the PARMO is the responsible RMA.

3.4. Appendix B contains the details of the two large height deviations that relate to technical risk. However, these reports involve aircraft correctly following a ACAS advisory and are considered to be non-risk bearing.

3.5. Details of sixteen large height deviations contributing to operational risk provided to the PARMO during the reporting period are contained in Appendix C. Twelve of these events were reported for Pacific airspace, and four of these events were reported for a portion of North East Asia airspace. Two of the events reported for Pacific airspace had no effect on vertical risk and were not included in the current risk assessment. The following sections contain summaries of some of the LHD data; the events are separated into those which involve errors related to air traffic control and those related to flight procedures.

Errors Related to Air Traffic Control

3.6. Eleven of the fourteen events that contribute to operational risk were related to air traffic control. From all of the eleven events related to air traffic control, seven events occurred in Pacific airspace, and the remaining four events occurred in a portion of North East Asia airspace. It is noted that the cause of eight of the eleven events in Appendix C were related to errors in coordination of control between ATC facilities. All of these eight events were related to human factor issues. Four events related to coordination errors

occurred in Pacific airspace, and four events related to coordination errors occurred in North East Asia airspace.

3.7. One event related to air traffic control was an ATC loop error, this error occurred in Pacific airspace. Another event involved a non-RVSM approved aircraft being provided with RVSM separation.

3.8. The event with the largest duration at incorrect flight level resulted in an estimated 45 minutes of exposure to risk for an aircraft caused by an error in the ATC automation software. ATC had provided a block altitude clearance to an aircraft, however the ATC automation software erroneously removed the clearance and was providing protection for a single altitude.

3.9. The coordination errors occur either due to a lack of coordination or an error in the coordination from one ATC to the next. Although a decrease in the number of these reports has been realized, these errors continue to be the most common type of errors in both the Pacific and North East Asian airspaces.

Errors Related to Flight Procedures

3.10. Three events listed in Appendix C were caused by the pilot climbing/descending without clearance, not following the clearance properly, and incorrect altimeter setting. All three of these events occurred in Pacific airspace.

3.11. To identify trends in risk-bearing large height deviations, the causes of each of the fourteen risk-bearing reports contained in Appendix C are summarized in Figures 1 and 2. The large height deviation error codes are defined in Table 4.

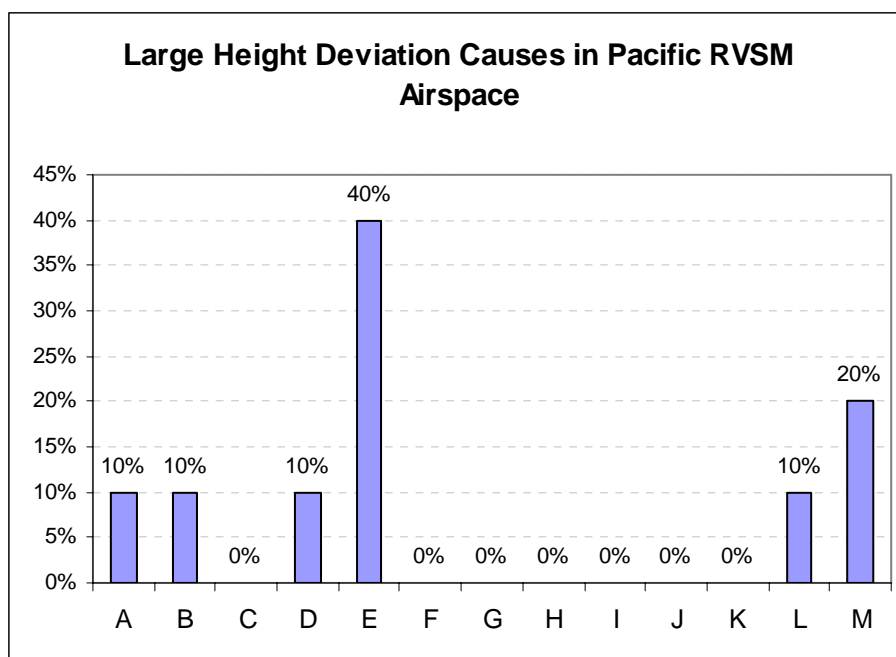


Figure 1. Percent of Large Height Deviations by Category in Pacific Airspace

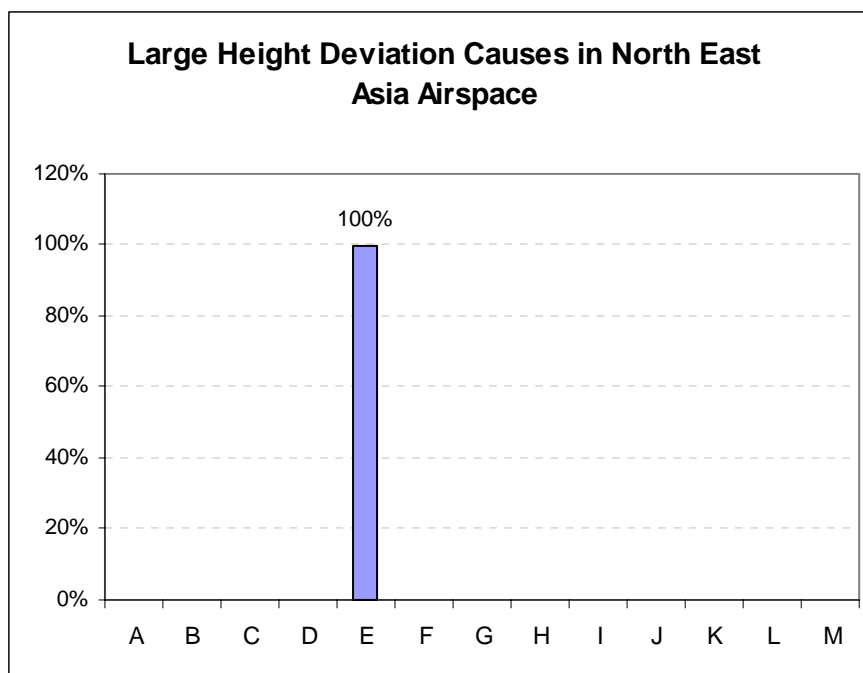


Figure 2. Percent of Large Height Deviations by Category in a Portion of North East Asia Airspace

Deviation Code	Cause of Deviation
Operational Errors	
A	Flight crew failing to climb/descend the aircraft as cleared;
B	Flight crew climbing /descending without ATC clearance;
C	Incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance etc.);
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message);
E	Coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility as a result of human factors issues (e.g. late or non-existent coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters);
F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues;
Aircraft Contingency Events	
G	Aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure);
H	Airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors);
Deviation due to Meteorological Condition	
I	Turbulence or other weather related causes;

Deviation Code	Cause of Deviation
Deviation due to TCAS RA	
J	TCAS resolution advisory; flight crew correctly following the resolution advisory;
K	TCAS resolution advisory; flight crew incorrectly following the resolution advisory
Others	
L	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RVSM approval but aircraft not approved, ATC misinterpretation of flight plan);
M	Other

Table 4. Large Height Deviation Code Definitions for Figure 1

3.12. In addition, Tables 5 and 6 present a summary of the reported errors by deviation code for Pacific and North East Asia airspace, respectively.

LHD Category 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;	1	6	0
B	Flight crew climbing /descending without ATC clearance;	1	1	4
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message);	1	5	1
E	Coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility as a result of human factors issues (e.g. late or non-existent coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters);	4	20	0
L	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RVSM approval but aircraft not approved, ATC misinterpretation of flight plan);	1	10	0
M	Other	2	50	4

Table 5. Summary Large Height Deviations by Category – Pacific Airspace

LHD Category Code	LHD Category Description	No of LHD Occurrences	LHD Duration (Min)	No. of Flight Levels Transitioned Without Clearance
E	Coordination errors in the ATC-ATC transfer of control – human factors	4	2.1667	0

Table 6. Summary Large Height Deviations by Category – North East Asia Airspace

3.13. As shown in Figures 1 and 2, a large contributor to risk-bearing large height deviations is coordination error in the ATC-unit-to-ATC-unit transfer of control responsibility as a result of human factors issues. This type of event includes late or non-existent coordination, incorrect time estimate/actual, and flight level and/or ATS route not in accordance with agreed parameters. This is the only type of error reported in North East Asia RVSM airspace.

3.14. Appendix D contains the details of all reported large height deviations occurring outside of RVSM airspace and airspace for which the PARMO is not the responsible RMA. These large height deviations do not affect the risk estimate for Pacific or North East Asia airspace but are presented in this report for completeness. There are twelve such large height deviations. All of these events were related to ATC coordination errors.

4. Estimate of Vertical Collision Risk for Pacific Airspace

4.1. The vertical collision risk was estimated in order to determine whether the target level of safety (TLS) continued to be met in Pacific airspace, thus supporting the ongoing safe application of RVSM.

4.2. The estimate of vertical collision risk has been updated in the same manner used in reference 4. Figure 3 provides the vertical collision risk estimates by type (e.g. technical, operational, and total) for each month during the current reporting period. Each monthly risk estimate was ‘weighted’ by the estimated number of flight hours in each Pacific airspace flow. Table 8 provides the definitions used for each Pacific airspace flow.

4.3. Figure 3 provides the PARMO’s updated risk estimates for Pacific RVSM airspace based on recent reports of large height deviations. The estimated flying hours in the portion of Pacific RVSM airspace for which the PARMO is the responsible RMA is 810,000 flying hours per year.

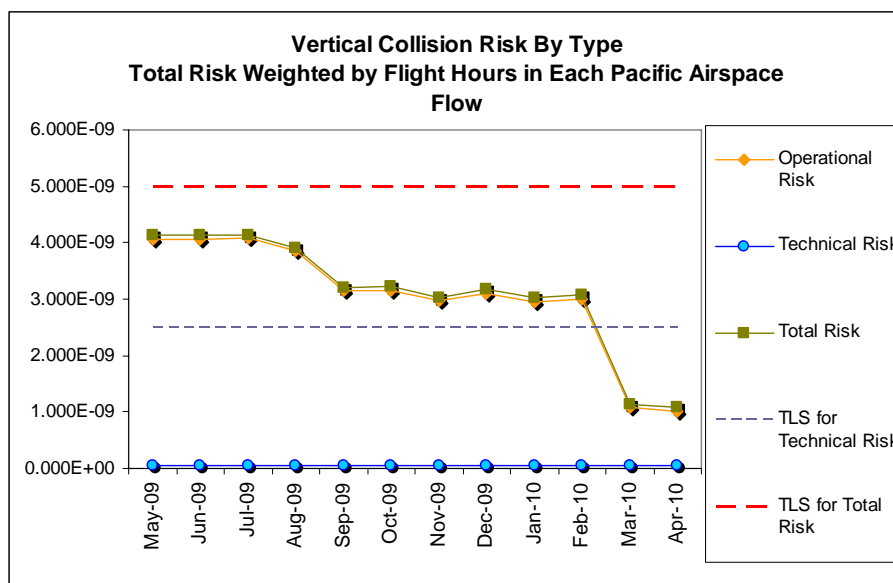


Figure 3. Vertical Collision Risk for Pacific RVSM Airspace

Sub-Region of Pacific	Flow	Description of Flow
North Pacific	NOPAC	North America west to Japan/Korea/beyond plus Japan/Korea to and from Alaska and beyond
	Central Pacific (CENPAC)	Japan/Korea/other Asian origins east to North America
	Central East Pacific (CEP)	North American mainland to and from Hawaii
	Hawaii/Japan	Japan/Korea to and from Hawaii
	Japan/Guam	Japan/Korea to and from Guam/Saipan/other proximate destinations
	Other	All other North Pacific flights not covered above
South Pacific and Pacific trans-equatorial	Australia/New Zealand/South Pacific States	Australia to and from New Zealand; Australia to and from South Pacific island states; New Zealand to and from South Pacific states
	Nadi	Fiji to and from all airports except those in Australia or New Zealand
	Australia-New Zealand/Japan	Australia to and from Japan/Korea; New Zealand to and from Japan/Korea
	SOPAC	Australia to and from airports in northern hemisphere; New Zealand to and from airports in northern hemisphere

Table 8. Traffic Flows Used in Pacific Vertical Collision Risk Estimate

4.4. Table 9 presents the estimates of vertical collision risk for Pacific airspace. The technical risk is estimated to be 0.062×10^{-9} fatal accidents per flight hour. The operational risk estimate is 1.019×10^{-9} fatal accidents per flight hour. The estimate of the overall vertical collision risk is 1.080×10^{-9} fatal accidents per flight hour. This estimate meets the regionally agreed TLS value of 5.0×10^{-9} fatal accidents per flight hour. This new estimate is based on the most recent 12 months of large height deviation reporting and recently updated collision risk parameters based on the December 2009 traffic samples collected.

Source of Risk	Lower Bound Risk Estimation	TLS	Remarks
Technical Risk	0.062×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	1.019×10^{-9}	-	
Total Risk	1.080×10^{-9}	5.0×10^{-9}	Below Overall TLS

Table 9. Vertical Collision Risk Estimates for Pacific Airspace

5. Estimate of Vertical Collision Risk for North East Asia Airspace

5.1. The vertical collision risk was estimated in order to determine whether the target level of safety (TLS) is met in a portion of North East Asia airspace. Table 10 presents the estimates of vertical collision risk for a portion of North East Asia airspace. The technical risk is estimated to be 1.786×10^{-9} fatal accidents per flight hour. The operational risk estimate is 2.284×10^{-9} fatal accidents per flight hour. The estimate of the overall vertical collision risk is 4.070×10^{-9} fatal accidents per flight hour. This estimate meets the regionally agreed TLS value of 5.0×10^{-9} fatal accidents per flight hour. This new estimate was based on the most recent 12 months of large height deviation reporting and the traffic sample received in December 2009. The estimated annual flying hours for this portion of North East Asia airspace is 133,399 flying hours per year. Table 11 presents the current collision risk model (CRM) parameters used in the vertical safety assessment for the Incheon FIR.

Source of Risk	Lower Bound Risk Estimation	TLS	Remarks
Technical Risk	1.786×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	2.284×10^{-9}	-	
Total Risk	4.070×10^{-9}	5.0×10^{-9}	Below Overall TLS

Table 10. Vertical Collision Risk Estimates for North East Asia Airspace

Parameter Symbol	Parameter Definition	Parameter Value	Source for Value
$ \overline{\Delta V} $	Average relative along-track speed between aircraft on same direction routes	38.3 knots	Estimated from TSD in 2005
$ \overline{V} $	Average absolute aircraft ground speed	480 knots	Conservative value used in NAT and Pacific vertical safety assessments
$ \overline{y} $	Average absolute relative cross track speed for an aircraft pair nominally on the same track	5 knots	Estimated from processing GMU-collected GPS-derived positions of aircraft monitored in connection with Pacific RVSM
$ \overline{z} $	Average absolute relative vertical speed of an aircraft pair that have lost all vertical separation	1.5 knots	Conservative value used in NAT vertical safety assessment

Parameter Symbol	Parameter Definition	Parameter Value	Source for Value
$\dot{h}(\theta)$	Average relative horizontal speed during horizontal overlap for aircraft pairs on routes with crossing angle θ ($\theta=45^\circ$)	367.4 knots	Value used in Western Pacific/South China Sea safety assessment (corresponds to an average aircraft speed of 480 knots)
λ_x	Average aircraft length	0.0308 nm	Estimated from 2008 TSD
λ_y	Average aircraft wingspan	0.0274 nm	Estimated from 2008 TSD
λ_z	Average aircraft height	0.0085 nm	Estimated from 2008 TSD
$E_z(same)$	Same direction vertical occupancy value	0.0021	Estimated from 2009 TSD
$E_z(opposite)$	Opposite direction vertical occupancy value	0.2220	Estimated from 2009 TSD

Table 11. CRM Parameters used in the vertical risk estimate for the Incheon FIR

5.2. Figure 4 provides the PARMO’s updated risk estimates for a portion of North East Asia RVSM airspace based on recent reports of large height deviations.

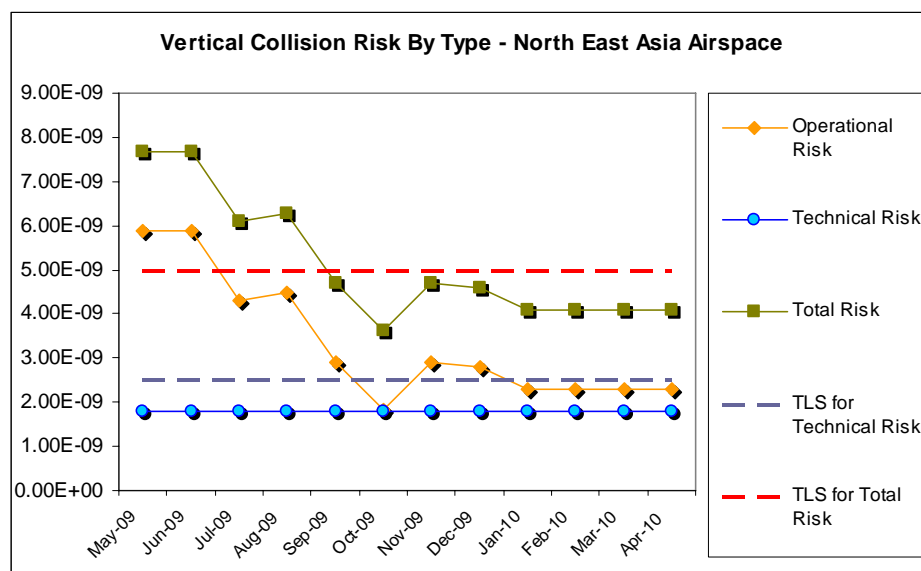


Figure 4. Vertical Collision Risk for North East Asia RVSM Airspace

6. Summary and Conclusions

6.1. This report has presented an update of the vertical collision risk for Pacific and a portion of North East Asia airspace, and a summary of large height deviation reports received by the PARMO for the current reporting period, 1 May 2009 to 30 April 2010.

6.2. The update of the vertical collision risk was performed to determine whether the TLS continued to be met in support of the ongoing safe use of RVSM in Pacific airspace. The estimate of the overall vertical collision risk, 1.080×10^{-9} fatal accidents per flight hour, is

below the TLS value of 5.0×10^{-9} fatal accidents per flight hour. This new estimate reflects the most-recent reports of large height deviations.

6.3. The update of the vertical collision risk was performed to determine whether the TLS is met in support of the ongoing safe use of RVSM in a portion of North East Asia airspace. The estimate of the overall vertical collision risk, 4.070×10^{-9} fatal accidents per flight hour meets the TLS value of 5.0×10^{-9} fatal accidents per flight hour. This new estimate reflects the most-recent reports of large height deviations.

6.4. There were thirty reported large height deviations occurring within Pacific and North East Asia RVSM airspace during the reporting period. Fourteen events contributed to the operational risk in Pacific and North East Asia RVSM airspace. A large contributor to risk-bearing large height deviations errors was errors in ATC-unit to ATC-unit transition of control responsibility in both Pacific and North East Asia airspace. Details of all deviations were provided in this report and its appendices.

6.5. ATS providers should continue to forward reports of height deviations of 300 ft or more in magnitude to the PARMO on a monthly basis. A ‘NIL report’ (where applicable) is as valuable as a report containing actual incidents. Therefore, if zero large-height-deviation events occur during a calendar month, the PARMO requests that a ‘NIL report’ be submitted. The email address for the PARMO is: aparmo@faa.gov. The website address for the PARMO is <http://www.tc.faa.gov/acb300/PARMO/>.

References

1. “Report of the Eighth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/8),” International Civil Aviation Organization, Bangkok, Thailand, December 2007.
2. *Handbook for a Regional Monitoring Agency Supporting Implementation and Continued Safe Use of the Reduced Vertical Separation Minimum: RMA Handbook*, International Civil Aviation Organization, August 2003 Edition.
3. “Pacific Airspace RVSM Safety Monitoring Report October – December 2004,” Draft Version 1.0, Prepared by the PARMO, February 2004.
4. “Update of Pacific Reduced Vertical Separation Minimum (RVSM) Safety Assessment,” WP/3, Tenth Meeting of the ICAO Reduced Vertical Separation Minimum (RVSM) Implementation Task Force (RVSM TF/10), Honolulu 29-30 January 2001.

Appendix A
Monthly Large Height Deviations Reports Received by the PARMO

STATE	FIJI	NEW ZEALAND	REPUBLIC OF KOREA	TAHITI	UNITED STATES	
	<i>Nadi</i>	<i>Auckland</i>	<i>Incheon</i>	<i>Tahiti</i>	<i>Anchorage</i>	<i>Oakland</i>
FIR						
May-09	X	X	X	X	X	X
Jun-09	X	X	X	X	X	X
Jul-09	X	X	X	X	X	X
Aug-09	X	X	X	X	X	X
Sep-09	X	X	X	X	X	X
Oct-09	X	X	X	X	X	X
Nov-09	X	X	X	X	X	X
Dec-09	X	X	X	X	X	X
Jan-10	X	X	X	X	X	X
Feb-10	X	X	X	X	X	X
Mar-10	X	X	X	X	X	X
Apr-10	X	X	X	X	X	X

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

Appendix B

Height Deviations Contributing to Technical Risk in the Pacific and a Portion of North East Asia Airspace Reported to the PARMO during the Reporting Period

Event date	Source	Assigned FL	Observed / Reported FL	Duration at incorrect FL	Cause	Other traffic
15-Aug-09	ATS 4	FL300	FL303	20 sec	Non risk report - TCAS resolution advisory; flight crew correctly following the resolution advisory	1
29-Dec-09	ATS 5	FL360	FL365	50 sec	Non risk report - TCAS resolution advisory; flight crew correctly following the resolution advisory	1

Appendix C
Height Deviations Contributing to Operational Risk in the Pacific and a Portion of North East Asia Airspace
Reported to the PARMO during the Reporting Period

Event date	Source	Assigned FL	Observed / Reported FL	Duration at incorrect FL	Cause
21-May-09	ATS 4	FL360	FL295	-	Non-risk report - aircraft descended and diverted left of track due to severe turbulence
31-May-09	ATS 3	FL370	FL350	1 minute	Coordination errors in the ATC-ATC transfer of control – human factors
12-Jul-09	ATS 2	FL360	FL360	-	Non-risk report for vertical; Loss of longitudinal separation between 2 aircraft - affects longitudinal risk not vertical
13-Jul-09	ATS 4	FL300	FL320/FL340 block	1 minute	Flight crew climbing /descending without ATC clearance - aircraft experienced severe turbulence & requested to ascend – aircraft climbed before response was received – did not follow contingency procedures
20-Jul-09	ATS 2	FL360	FL388	< 5 minutes	Other - incorrect altitude setting by the pilot
19-Aug-09	ATS 5	FL270	FL330	5 seconds	Coordination errors in the ATC-ATC transfer of control – human factors
23-Aug-09	ATS 5	FL350	FL330	5 seconds	Coordination errors in the ATC-ATC transfer of control – human factors
25-Oct-09	ATS 2	FL350	FL350	10 minutes	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RVSM approval but aircraft not approved, ATC misinterpretation of flight plan);
7-Nov-09	ATS 2	FL380	FL370	Unknown	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message)
15-Nov-09	ATS 3	None	FL350	Unknown	Coordination errors in the ATC-ATC transfer of control – human factors
9-Dec-09	ATS 2	Unknown	FL380	Unknown	Coordination errors in the ATC-ATC transfer of control – human factors

Event date	Source	Assigned FL	Observed / Reported FL	Duration at incorrect FL	Cause
30-Dec-09	ATS 8	FL280	FL300	5 minutes	Coordination errors in the ATC-ATC transfer of control – human factors
25-Jan-10	ATS 4	FL360	FL320	Unknown	Coordination errors in the ATC-ATC transfer of control – human factors
30-Jan-10	ATS 4	FL340	FL360	Unknown	Coordination errors in the ATC-ATC transfer of control – human factors
13-Feb-10	ATS 4	FL380	FL360	6 minutes	Flight crew failing to climb/descend the aircraft as cleared
31-Mar-10	ATS 4	FL320	Block FL320-FL340	45 minutes	Other – Error in ATC automation software (block altitudes were erroneously removed, ATC provided block altitude clearance but was only protecting FL320)

Appendix D

Height Deviation Incidents Occurring Outside of Exclusionary RVSM Airspace and/or Airspace for which the PARMO is the Responsible RMA

Event date	Source	Assigned FL	Observed / Reported FL	Duration at incorrect FL	Cause	Other traffic
25-May-09	ATS 3	FL360	FL380	0 minutes	Coordination errors in the ATC-ATC transfer of control – human factors	Nil
9-Jun-09	ATS 3	FL320	FL340	0 minutes	Coordination errors in the ATC-ATC transfer of control – human factors	Nil
21-Jul-09	ATS 3	None	FL360	1 minute	Coordination errors in the ATC-ATC transfer of control – human factors	Nil
19-Sept 2009	ATS 7	9600M	10600M	5 minutes	Coordination errors in the ATC-ATC transfer of control – technical factors	Nil
21-Sep-09	ATS 3	None	FL400	0 minutes	Coordination errors in the ATC-ATC transfer of control – human factors	Nil
1-Oct-09	ATS 3	None	FL360	45 sec	Coordination errors in the ATC-ATC transfer of control – human factors	Nil
7-Dec-09	ATS 3	None	FL380	0 minutes	Coordination errors in the ATC-ATC transfer of control – human factors	Nil
23-Dec-09	ATS 7	None	FL360	Unknown	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	Nil
21-Jan-10	ATS 3	None	FL340	0 minutes	Coordination errors in the ATC-ATC transfer of control – human factors	Nil
26-Jan-10	ATS 3	None	FL320	0 minutes	Coordination errors in the ATC-ATC transfer of control – human factors	Nil
6-Feb-10	ATS 8	None	FL 390	Unknown	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	Nil
7-Feb-10	ATS 7	None	10600M	Unknown	Coordination errors in the ATC-ATC transfer of control – human factors	Nil