International Civil Aviation Organization

The Twentieth Meeting of the APANPIRG ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/20)

Singapore, 05 – 09 July 2010

Agenda Item 7: Review Outcome of the Twelfth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/12)

REGIONAL RVSM AND HORIZONTAL SAFETY PERFORMANCE

(Presented by the Secretariat)

SUMMARY

This paper provides a summary of the most up-to-date safety assessments of RVSM operations in the airspaces of the Asia/Pacific Region, as prepared by the Asia/Pacific RVSM Regional Monitoring Agencies (RMAs). This paper also details the horizontal (lateral and longitudinal) safety performance of the South China Sea parallel route structure. All safety assessments were reviewed by the Twelfth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/12, December 2009).

This paper relates to

Strategic Objectives:

A: Safety – Enhance global civil aviation safety

D: Efficiency – Enhance the efficiency of aviation operations

Global Plan Initiatives:

GPI-2 Reduced vertical separation minima

1. INTRODUCTION

1.1 The airspace safety monitoring for all RVSM airspaces of the Asia/Pacific Region is conducted as a regional programme in accordance with the standards of Annex 11 – *Air Traffic Services* (paragraphs 3.3.5.1 & 3.3.5.2), utilizing the specialist expertise of the Asia/Pacific RVSM Regional Monitoring Agencies (RMAs) approved by APANPIRG. RVSM has now been successfully implemented throughout the Asia/Pacific Region, with the exception of the Kabul and the Ulaanbaatar FIRs (scheduled 2012). There are five APANPIRG Approved RMAs providing vertical safety monitoring services in the region:

a) Australian Airspace Monitoring Agency (AAMA), operated by Airservices Australia;

b) China RMA, operated by the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC);

c) JCAB RMA, operated by Japan Civil Aviation Bureau (JCAB);

d) The Monitoring Agency for the Asia Region (MAAR), operated by Aeronautical Radio of Thailand (AEROTHAI); and

e) The Pacific Approvals Registry and Monitoring Organization (PARMO), operated by the United States Federal Aviation Administration.

1.2 To facilitate ongoing vertical safety assessment, the Asia/Pacific RVSM airspaces are broadly divided into the following sub-areas:

a) Brisbane, Melbourne, Nauru and Honiara FIRs (AAMA);
b) Port Moresby FIR (AAMA);
c) Indonesian FIRs (AAMA);
d) Sovereign airspaces of China (China RMA);
e) Fukuoka FIR (JCAB RMA);
f) Bay of Bengal FIRs (MAAR),
g) Western Pacific/South China Sea FIRs (MAAR),
h) Pacific Area (PARMO), and
i) Incheon FIR (PARMO).

1.3 Safety assessments are conducted by the Asia/Pacific RMAs on a periodic basis utilizing data obtained from States that includes Large Height Deviation (LHD) reporting and the annual December traffic sample data (TSD) required by APANPIRG Conclusion 16/4. Safety assessments are submitted by RMAs to RASMAG for review.

1.4 Horizontal (lateral and longitudinal) safety monitoring services for the South China Sea parallel route network are provided by the South East Asia Safety Monitoring Agency (SEASMA), operated by the Civil Aviation Authority of Singapore.

Large Height Deviation

1.5 RASMAG has adopted the following plain language definition of a LHD for regional promulgation:

A RVSM large height deviation (LHD) is defined as any vertical deviation of 90 metres/300 feet or more from the flight level expected to be occupied by the flight.

Technical and Operational Risk

1.6 RMAs consider LHD performance in terms of two components. Technical risk relates to the technical performance of equipment, including altimetry systems. Operational risk relates to human performance error and, in simple terms, relates to errors made by pilots and air traffic controllers.

1.7 In reviewing the reports of the RMAs, it was apparent that performance in terms of technical risk was meeting a good standard throughout all areas of the Asia/Pacific region. In no case had the technical target level of safety (TLS) been exceeded and in general the technical TLS was achieved easily.

1.8 However, in terms of operational risk the TLS was not being achieved in some areas. A consistent theme in the analysis of these errors was that of difficulties in ATC-to-ATC coordination, which accounted for a large proportion of LHDs. RASMAG continues to encourage all States to be aware that this ground-ground communication interface exhibited weaknesses in all the regional examples examined.

2. DISCUSSION

Australian airspace

2.1 Australia presented the results of the safety assessments of the Brisbane and the Melbourne FIRs undertaken by AAMA. The meeting was informed that the assessment covered the 12-month period ending on 30 November 2009, using TSD for December 2008.

2.2 In completing the assessment, the AAMA assessed Large Height Deviations (LHDs) identified through the Airservices Australia Electronic Safety Incident Reporting system or provided by aircraft operators. The total number of minutes calculated for the period from 1 December 2008 to 30 November 2009 was 254 drawn from 57 assessed non-NIL reports. The meeting noted that the calculated risk value continues to trend downwards from that reported to RASMAG/11 at its last meeting. Australia informed the meeting that this was the result of not only high-duration incidents dropping out of the 12 month data sample, but also due to detailed review of specific operational errors and the measures put in place to reduce the likelihood of them being repeated.

2.3 The Australian report identified that the duration of Category E − Coordination Errors increased during November while there was a halving of the duration associated with Category M – Other, reports. The meeting was informed that the assessment for the Australian airspace resulted in an estimation of the total risk as 3.12×10^{-9} fatal accidents per flight hour, which satisfies the agreed TLS values of no more than 2.5×10^{-9} (technical risk) and 5.0×10^{-9} (overall risk) fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 1,000 ft and to all causes, respectively. Australia commented that they were pleased to observe the significant reduction in the risk value given that it had been as high as 10.4×10^{-9} last year. **Table 1** below summarizes the results of the airspace safety oversight in terms of the technical, operational, and total risks for the RVSM implementation in the Australian airspace.

Australian RVSM Airspace – estimated annual flying hours = 445,363.07 hours *(note: estimated hours based on December 2008 traffic sample data)*			
Source of Risk	**Lower Bound Risk Estimation**	**TLS**	**Remarks**
Technical Risk	0.026×10^{-9}	2.5×10^{-9}	Satisfies Technical TLS
Operational Risk	3.09×10^{-9}	-	-
Total Risk	**3.12×10^{-9}**	5.0×10^{-9}	**Satisfies Overall TLS**

Table 1: Risk Estimates for the RVSM Implementation in Australian Airspace

2.4 In addition, **Figure 1** below presents the trends of collision risk estimates for each month using the appropriate cumulative 12-month interval of LHD reports since 1 December 2008.

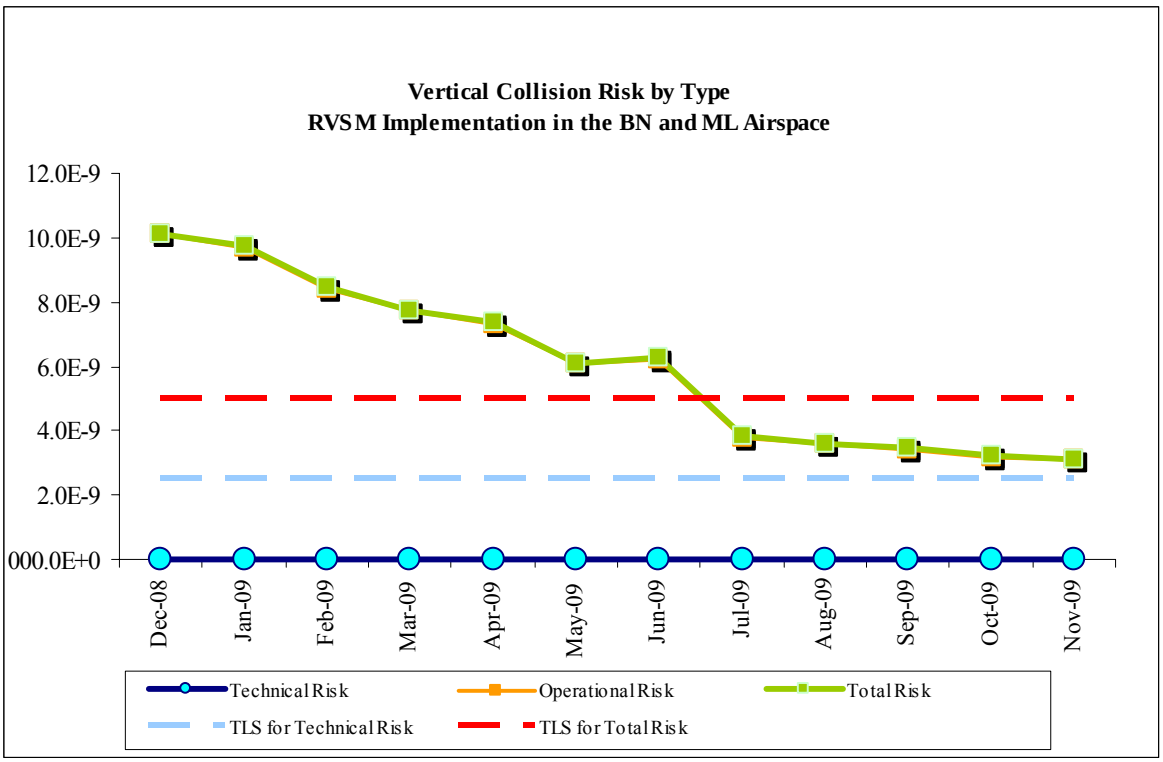

Figure 1: Trends of Risk Estimates for the Australian RVSM Airspace

2.5 The meeting was reminded that the AAMA had been able to establish a monthly risk value that provides a real-time picture of actual risk without the effect from historical high-time errors resident within the 12-month data sample. With this type of monthly assessment, the AAMA had been able to assess RVSM risk by showing individual LHD contribution to the calculated monthly risk as detailed in **Figure 2** below.

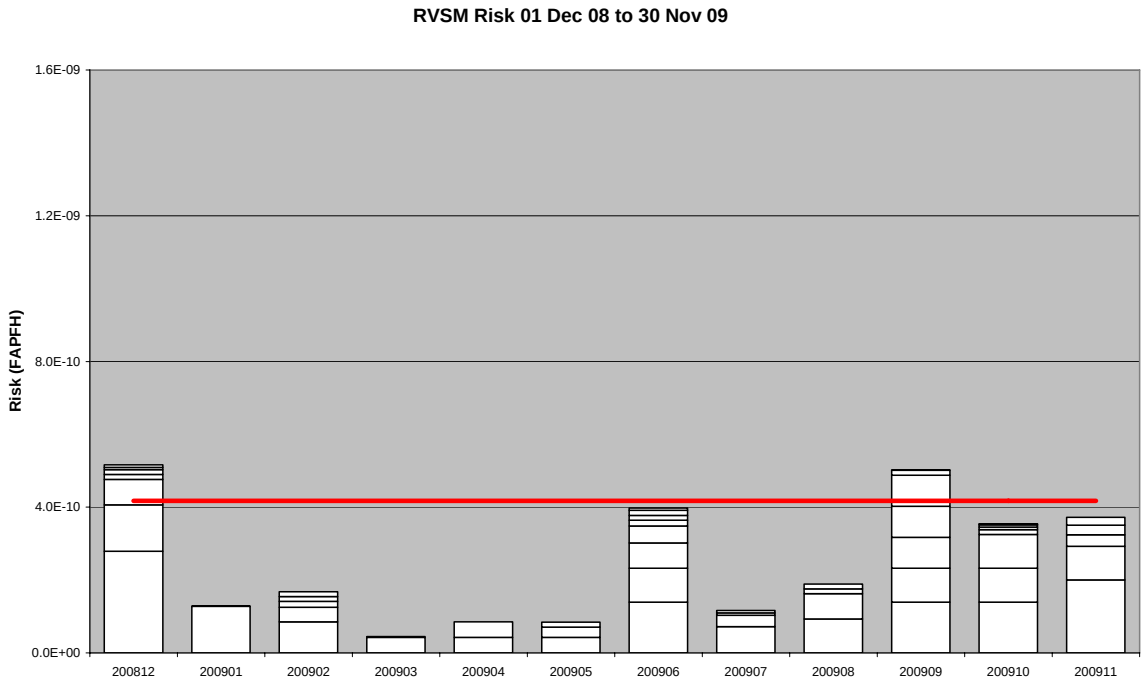

Figure 2: Monthly Risk Estimates for the Australian RVSM Airspace

2.6 The meeting noted the outcome for the Australian airspace in terms of estimated risk noting the continually decreasing trend since December 2008, and was particularly pleased that the TLS had been met since July 2009.

Indonesian Airspace

2.7 Australia presented the results of a safety assessment undertaken by the AAMA for the Jakarta and Ujung Pandang FIRs. Australia informed the meeting that the assessment covered the 12 month period ending on 30 November 2009, using traffic sample data for the month of December 2008.

2.8 The meeting was informed that in undertaking the assessment, the AAMA had received a number of LHD reports from the Indonesian Air Navigation Service Providers. Additionally the AAMA had access to a number of reports provided by Australia that included possible risk bearing LHDs relative to the Jakarta and Ujung Pandang FIRs. Assessment of these reports was made from the perspective of their impact within the Indonesian airspace. In determining the duration of some of these reports, the AAMA had to make some assumptions on likely scenarios and factors within the airspace. To date, some of these assumptions have not been fully validated and therefore there is a small level of uncertainty regarding the final risk value determined for the airspace.

2.9 The meeting was informed that a total of 98.0 minutes duration was assigned to the 19 non-NIL LHDs identified which is a significant decrease in assessed duration compared to that of 370 minutes last reported to RASMAG. The LHDs were summarized as follows:

- In December 2008 there were 5 non-NIL Category E (Coordination errors) LHDs with total assessed time duration of 15 minutes.

- Overall three Category L LHDs were identified with a cumulative total duration of 75 minutes. All of the LHDs concerned Australian registered aircraft operating from Bali into the Australian FIRs, and were the result of the Bali Briefing Office erroneously amending the flight plans of the aircraft to show an RVSM approval when the aircraft were not approved. The AAMA understands that this issue has now been resolved and no similar risk bearing reports have been identified since April 2009

- Eleven Category E – ATC coordination error reports were identified in the 12 month data sample, with six of these being reported by the Air Navigation Service Providers (ANSPs) in December 2008. Nine of these reports related to coordination errors between Jakarta and Makassar Area Control Centres (ACCs). One additional report of this category of LHD was for 3 minutes duration and involved incorrect coordination provided from the Colombo FIR.

2.10 **Table 2** below summarizes the results of the airspace safety oversight in terms of the technical, operational, and total risks for the RVSM implementation in the Indonesian airspace.

Indonesian RVSM Airspace – estimated annual flying hours = 492097.32 hours *(note: estimated hours based on December 2008 traffic sample data)*			
Source of Risk	**Lower Bound Risk Estimation**	**TLS**	**Remarks**
Technical Risk	0.475×10^{-9}	2.5×10^{-9}	Satisfies Technical TLS
Operational Risk	3.95×10^{-9}	-	-
Total Risk	**4.43×10^{-9}**	5.0×10^{-9}	**Satisfies Overall TLS**

Table 2: Risk Estimates for the RVSM Implementation in Indonesian Airspace

2.11 In addition, **Figure 3** below presents the trends of collision risk estimates for each month using the appropriate cumulative 12-month interval of LHD reports since November 2008.

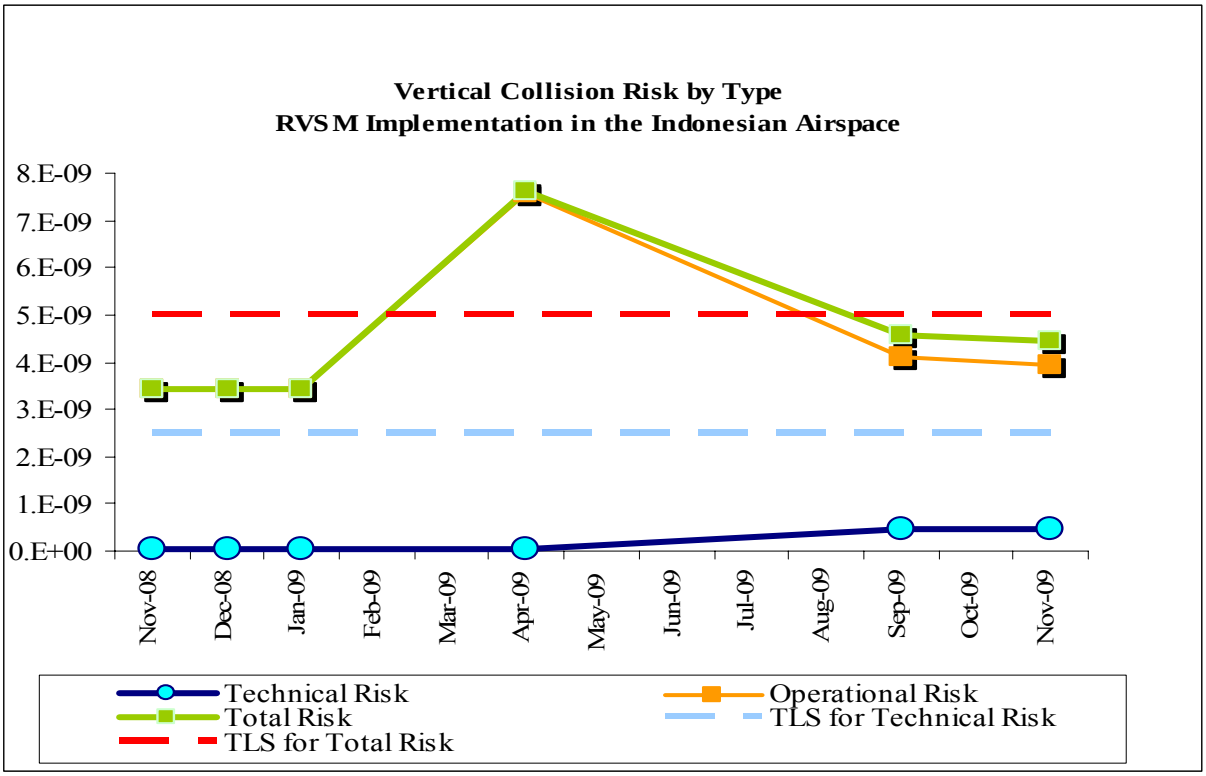

Figure 3: Trends of Collision Risk Estimates for Each Month

2.12 The meeting thanked Australia and particularly the AAMA for its continuing efforts to assess the Indonesian airspace and for its close coordination with Indonesian authorities to enhance the data required for the RMA to undertake its activities.

China RMA's activities

2.13 China RMA briefed the meeting on the outcomes of the most recent safety estimate for the Chinese sovereign airspace. The TSD of December 2008 and the continuous LHD reports in the sovereign Chinese airspace between 1 November 2008 and 31 October 2009 were used to produce the updated risk estimates below. Each monthly estimate was weighted by the factors proportionate to the total number of flight hours in the procedural and radar components of the Chinese RVSM airspace. The LHD reports were grouped by categories based on the details provided for each deviation.

2.14 Accordingly, the LHD occurrences in the China RVSM airspace were summarized as follows:

- Compared to the last 6 monthly assessment, the number of LHD occurrence increased from 28 to 29 occurrences while total LHD duration increased from 19.77 to 48.799 minutes; and

- One LHD of 28.417 minutes, attributable to ATC system loop error, accounted for more than 50% of the total LHD duration.

2.15 **Table 3** below provides the results of the airspace safety oversight, as of October 2009, in terms of the technical, operational, and total risks for the RVSM implementation in the sovereign Chinese RVSM airspace.

Chinese sovereign RVSM Airspace – estimated annual flying hours = 1 990 071.8 hours *(Note: estimated hours based on the December 2008 traffic sample data. Estimate represents the sum of total flying hours for Radar and Procedural control area)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Technical Risk	1.681×10^{-10}	2.5×10^{-9}	Satisfies Technical TLS
Operational Risk	2.966×10^{-9}	-	-
Total Risk	**3.134×10^{-9}**	**5.0×10^{-9}**	**Satisfies Overall TLS**

Table 3: Risk Estimates for RVSM implementation in Chinese RVSM airspace

2.16 **Figure 4** below provides the vertical collision risk estimates by type, i.e. technical, operational, and total, for each month during the current reporting period based on recent LHD reports.

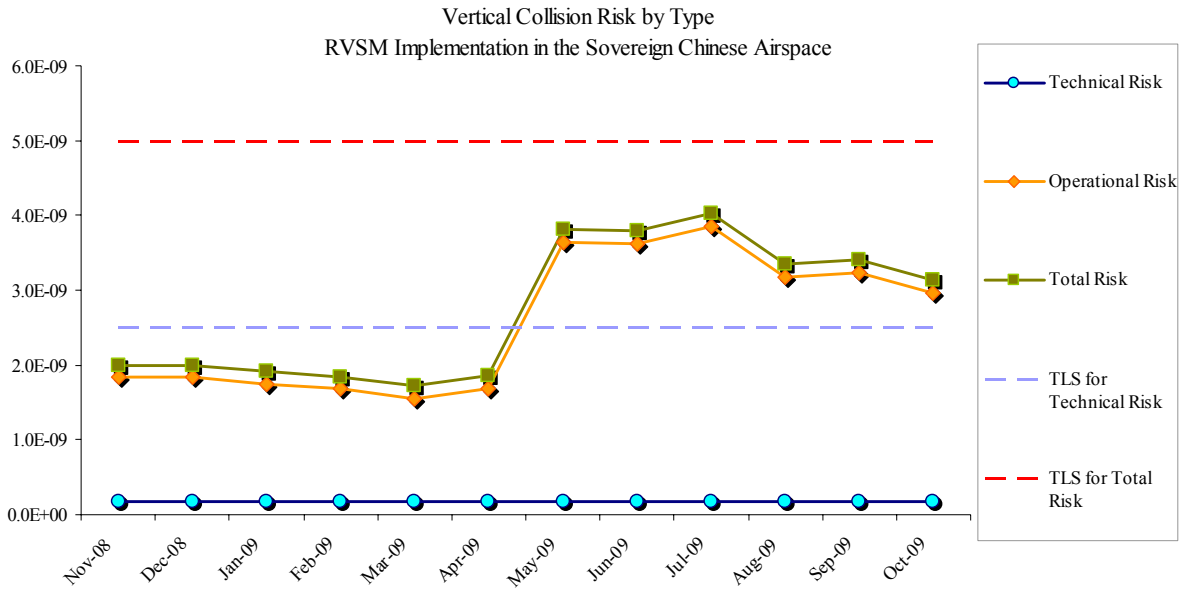

Figure 4: Trends of Risk Estimates for the RVSM Implementation in Sovereign Chinese Airspace

2.17 Therefore, the estimates of both technical and total risks from the available TSD and LHD reports satisfy the agreed TLS value of no more than 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour. The meeting thanked the China RMA for the detailed report, noting the satisfactory value of the risk estimate in relation to the regional TLS.

JCAB's RMA activities

2.18 JCAB RMA presented the meeting with the result of the most recent RVSM airspace safety assessment for the Fukuoka FIR, which was derived from the December 2008 TSD and LHD reports for the period October 2008 to September 2009. The meeting noted that during the assessment period to September 2009, JCAB RMA received 50 LHD reports - of which 36 occurred within the Japanese airspace and were considered in the assessment. Of these 36 reports, 30 LHD occurrences were attributable to operational errors and 6 were attributable to technical errors.

2.19 **Table 4** below summarizes the number of LHD occurrences by the cause of the deviation and the duration of respective LHDs.

LHD Category Code	LHD Category Description	No. of LHD Occurrences	LHD Duration (Min)	No. of flight levels transitioned without clearance
B	Flight crew climbing/descending without ATC clearance	1	10	1
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-clearances etc)	1	1	1
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message)	1	0.2	0
E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues (e.g. late or non-existent coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters)	26	25.3	-
F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues	1	0	-
H	Airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors)	1	0.1	0
I	Turbulence or other weather related causes	2	0.5	0
J	TCAS resolution advisory; flight crew correctly following the resolution Advisory	3	2.5	1

Table 4: Summary of LHD Occurrences and Duration per Cause in the Japanese RVSM Airspace

2.20 **Table 5** below presents the estimates of vertical collision risk in the Japanese airspace.

Japanese RVSM Airspace – estimated annual flying hours = 915 968 hours *(note: estimated hours based on December 2008 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Technical Risk	0.35×10^{-9}	2.5×10^{-9}	Satisfies Technical TLS
Operational Risk	7.21×10^{-9}	-	-
Total Risk	**7.56×10^{-9}**	**5.0×10^{-9}**	**Does Not Satisfy Overall TLS**

Table 5: Risk Estimates for the RVSM implementation in the Japanese airspace

2.21 **Figure 5** below presents the trends of collision risk estimates by type, i.e. technical, operational and total, for each month using the appropriate cumulative 12-month of LHD reports during reporting period.

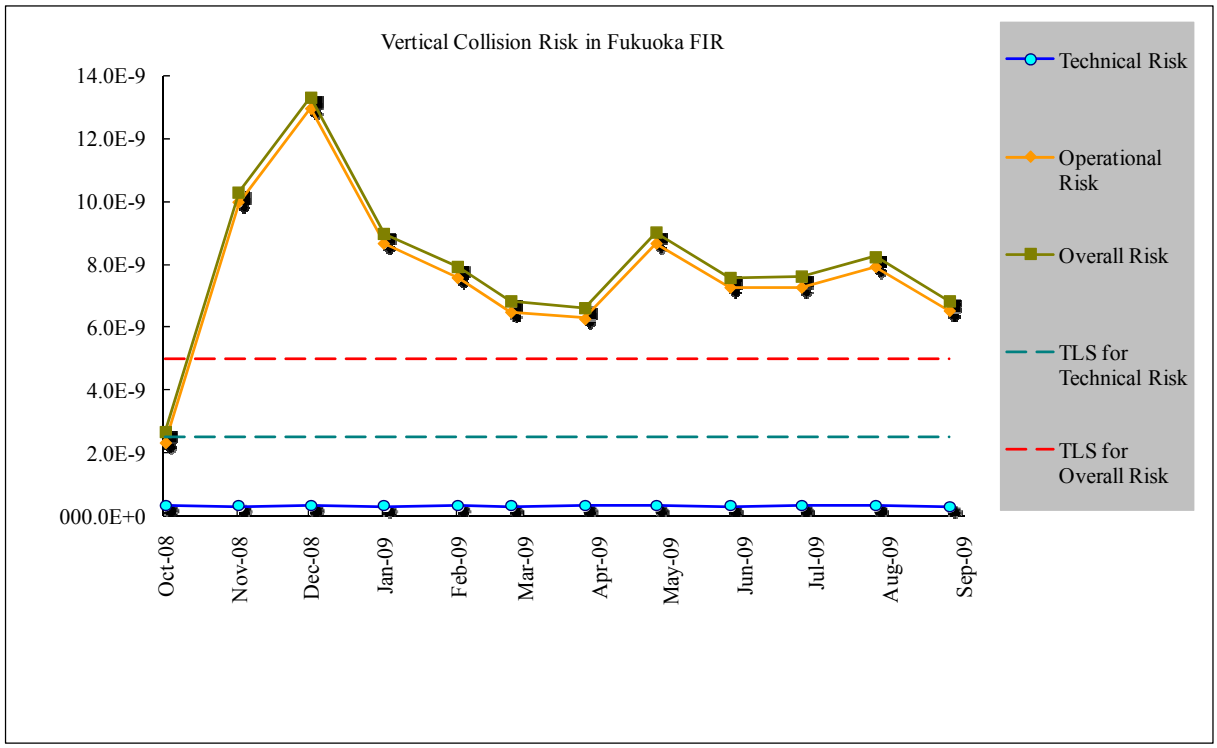

Figure 5: Trends of Risk Estimates for RVSM Implementation in Japanese Airspace

2.22 The meeting thanked the JCAB RMA for the detailed assessment and noted with pleasure that the risk was trending downwards and was anticipated to meet the TLS in the near future.

MAAR's RMA activities

Bay of Bengal Airspace

2.23 MAAR provided a summary of airspace safety oversight for RVSM implementation in the Bay of Bengal (BOB) airspace**.** The RVSM safety oversight had been conducted based on a one-month traffic sample data (TSD) collected in December 2008 and the most recent rolling 12 months of Large Height Deviation (LHD) reports between October 2008 and September 2009 submitted by relevant States in the BOB Region. LHD data provided by the neighbouring RMAs is reviewed and used in the analysis where applicable.

2.24 The large height deviation reports are separated by categories based on the details provided for each deviation. **Table 6** below summarizes the number of LHD occurrences by cause of the deviation.

LHD Category Code	LHD Category Description	No. of LHD Occurrences	LHD Duration (Min)
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message)	3	3

E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues (e.g. late or non existent coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters)	2	19
M	Others	8	8
	Total	**13**	**30**

Table 6: Summary of LHD Causes in the BOB RVSM Airspace

2.25 MAAR advised that LHD occurrences in the BOB RVSM airspace could be summarized as follows:

- Total LHD duration reduced from 63 to 30 minutes;
- Average duration of large height deviation occurrence is 2.3 minutes;
- The overall LHD duration was driven by a significant event in August 2009; and
- Apart from the event in August 2009, there were very few LHD reports.

2.26 **Table 7** below summarizes the results of the airspace safety oversight as of April 2009 in terms of the technical, operational, and total risks for the RVSM implementation in the BOB airspace.

Bay of Bengal RVSM Airspace – estimated annual flying hours = 1 131 465 hours *(note: estimated hours based on December 2008 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Technical Risk	0.61×10^{-9}	2.5×10^{-9}	Satisfies Technical TLS
Operational Risk	0.52×10^{-9}	-	-
Total Risk	**1.13×10^{-9}**	**5.0×10^{-9}**	**Satisfies Overall TLS**

Table 7: Risk Estimates for the RVSM Implementation in BOB Airspace – April 2009

2.27 In addition, **Figure 6** below presents the graphical trends of collision risk estimates for each month using the appropriate cumulative 12-months of LHD reports.

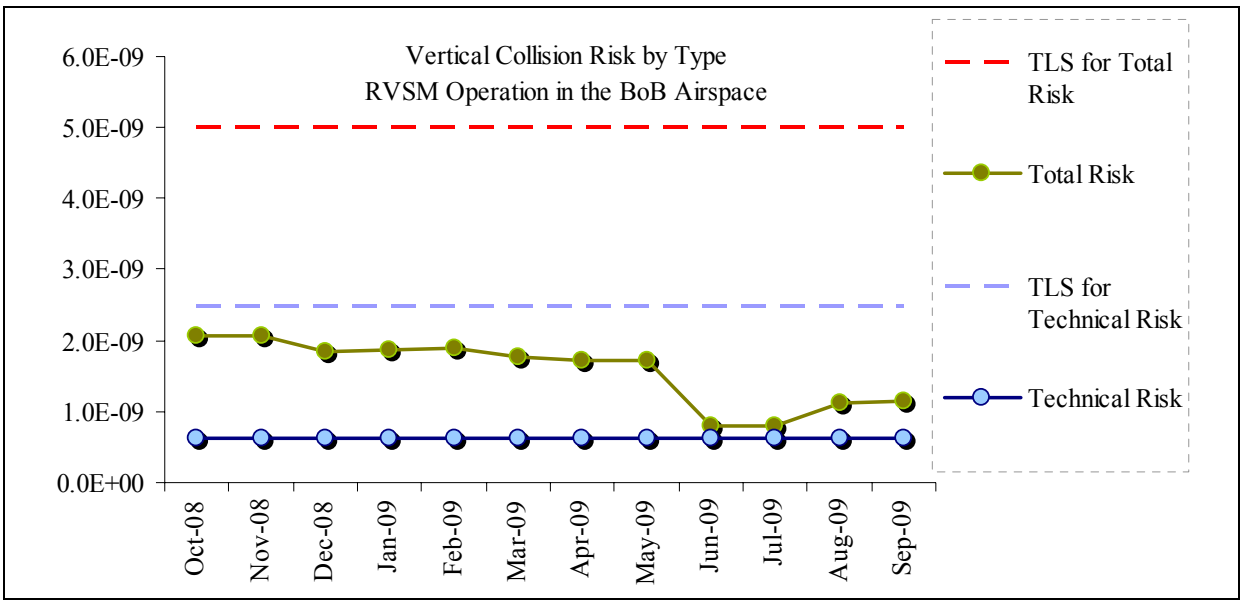

Figure 6: Trends of Risk Estimates for the RVSM Implementation in BOB Airspace

2.28 Based on these collision risk estimates, both technical and total risks for the Bay of Bengal area based on the available TSD and LHD reports, satisfied the agreed TLS value of no more than 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 1,000 ft and to all causes, respectively. However, MAAR continued to report that, based on available data from States and RMAs, it could be inferred that Bay of Bengal States may not entirely comprehend the significance and meaning of LHD occurrences. The meeting strongly recommended that BOB States review the definition and reporting requirements for LHD and faithfully provide relevant information to MAAR in order to facilitate a statistically reliable safety assessment for this area.

Western Pacific/South China Sea Airspace

2.29 MAAR also provided a summary of airspace safety oversight for RVSM implementation in the Western Pacific/ South China Sea (WPAC/SCS) area. The RVSM safety oversight had been conducted based on a one-month TSD collected in December 2008 and the most recent rolling 12 months of LHD reports between October 2008 and September 2009 submitted by relevant States in the WPAC/SCS region. LHD data from neighbouring RMAs is also reviewed and used in the analysis where applicable.

2.30 The large height deviation reports are separated by categories based on the details provided for each deviation. **Table 8** below summarizes the number of LHD occurrences by cause of the deviation.

LHD Category Code	LHD Category Description	No. of LHD Occurrences	LHD Duration (Min)
A	Flight crew failing to climb/descend the aircraft as cleared	1	10
B	Flight crew climbing/descending without ATC clearance	3	3
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message)	1	3
E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues (e.g. late or non existent coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters)	56	87
J	TCAS resolution advisory; flight crew correctly following the resolution Advisory	1	0
M	Other	6	7
Total		**68**	**110**

Table 8: Number of LHD Occurrences by Cause of the Deviation

2.31 The meeting was informed that annual flight hours, calculated based on the December 2008 TSD, were 917 128 hours for the WPAC/SCS airspace, and that LHD occurrences in the WPAC/SCS RVSM airspace could be summarized as follows:

- Total LHD duration decreased from 132 minutes to 110 minutes;
- Average duration of LHD occurrence improved from 1.69 to 1.62 minutes; and
- Significant portion of LHD duration is attributable to coordination errors.

2.32 **Table 9** below summarizes the results of the airspace safety oversight, as of April 2009, in terms of the technical, operational, and total risks for the RVSM implementation in the WPAC/SCS airspace.

Western Pacific/South China Sea RVSM Airspace – estimated annual flying hours = 917 128 hours *(note: estimated hours based on December 2008 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Technical Risk	0.77×10^{-9}	2.5×10^{-9}	Satisfies Technical TLS
Operational Risk	2.98×10^{-9}	-	-
Total Risk	**3.75×10^{-9}**	**5.0×10^{-9}**	**Satisfies Overall TLS**

Table 9: Risk Estimates for the RVSM Implementation in WPAC/SCS Airspace

2.33 In addition, **Figure 7** below presents the trends of collision risk estimates for each month using the appropriate cumulative 12-month of LHD reports since October 2008.

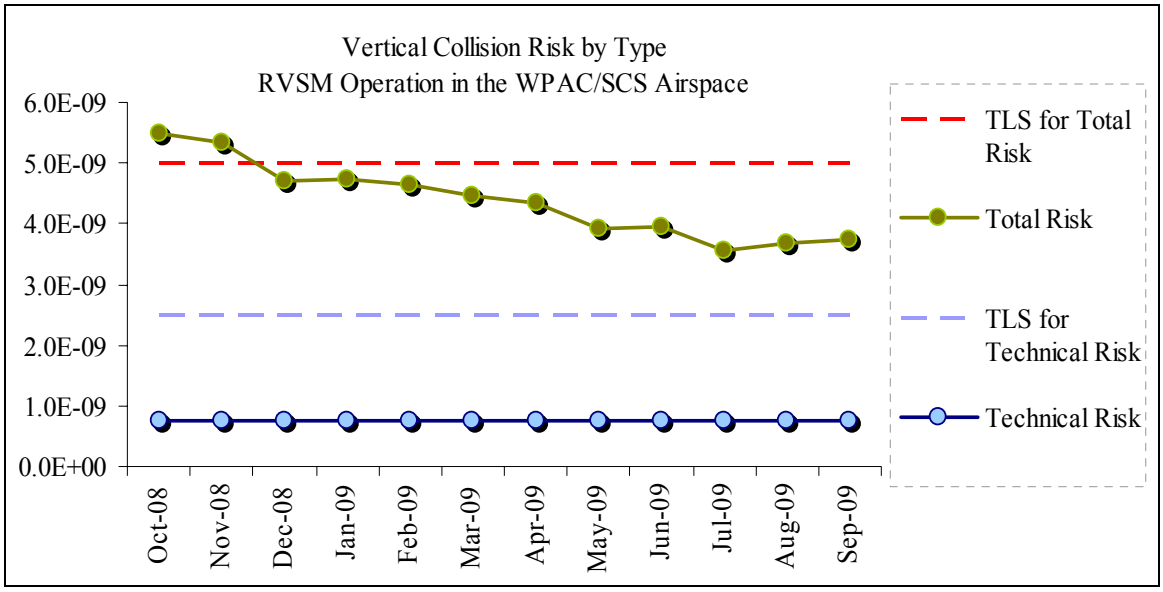

Figure 7: Trends of Risk Estimates for RVSM Implementation in WPAC/SCS Airspace

2.34 These collision risk estimates, both technical and total risks for the WPAC/SCS area based on the available TSD and LHD reports, satisfied the agreed TLS value of no more than 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 1,000 ft and to all causes, respectively. The overall improvement was contributable to a reduction in LHD occurrences and its duration. The meeting thanked the MAAR for its continued diligence in developing safety assessments across a number of the Regions FIRs.

PARMO's RMA activities

2.35 PARMO provided an update to the meeting including a summary of LHD reports, results of traffic data analysis, and an estimate of vertical risk for the airspaces under their responsibility. The report covered the reporting period from 1 October 2008 through 30 September 2009. The meeting noted that there were 21 reported LHD occurring within the Pacific and a portion of Northeast Asia RVSM airspace during the assessment period. Reports of 21 LHD contributing to operational risk were provided to the PARMO with 14 of these events reported for Pacific airspace and 7 for a portion of North East Asia airspace.

2.36 Sixteen of the 21 events that contribute to operational risk were related to air traffic control, nine of which occurred in the Pacific airspace and seven in the portion of North East Asia airspace. The cause of eleven of the twenty-one events were related to errors in coordination of control between ATC facilities, either due to a lack of coordination or an error in the coordination from one ATC to the next. Four events related to coordination errors occurred in Pacific airspace, and seven events related to coordination errors occurred in North East Asia airspace. Five events related to air traffic control were ATC loop errors, these errors occurred in Pacific airspace. One of these events led to an LHD duration of 60 minutes.

2.37 The coordination errors occur either due to a lack of coordination or an error in the coordination from one ATC to the next. These errors are by far the most common type of errors in both the Pacific and North East Asian airspaces.

Pacific Airspace

2.38 **Table 10** below summarizes the results of the airspace safety oversight, as of September 2009, in terms of the technical, operational and total risks for the Pacific RVSM airspace.

Pacific RVSM Airspace – estimated annual flying hours = 840 000 hours *(note: estimated hours based on December 2008 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Technical Risk	0.060×10^{-9}	2.5×10^{-9}	Satisfies Technical TLS
Operational Risk	3.096×10^{-9}	-	
Total Risk	3.157×10^{-9}	**5.0×10^{-9}**	**Satisfies Overall TLS**

Table 10: Vertical Collision Risk Estimates for Pacific Airspace

2.39 **Figure 8** below provides a graphical representation of the updated risk estimates for Pacific RVSM airspace based on the recent 12 months of LHDs.

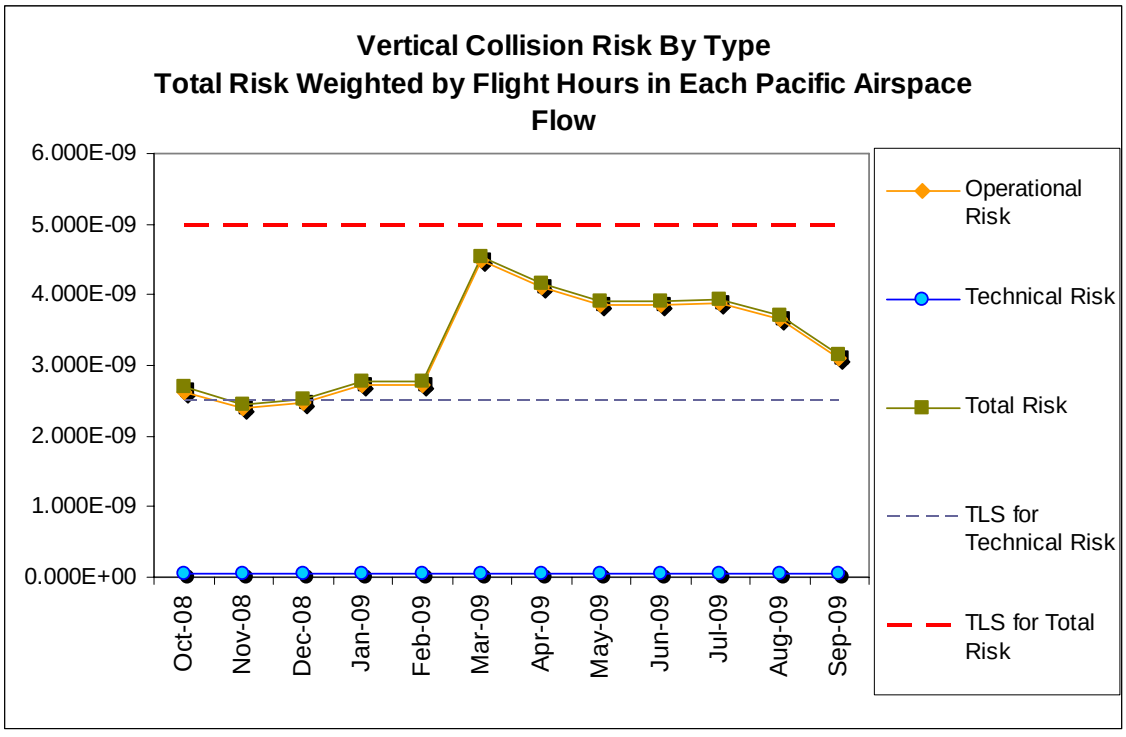

Figure 8: Vertical Collision Risk for Pacific RVSM Airspace

North East Asia Airspace

2.40 **Table 11** below summarizes the results of the airspace safety oversight, as of September 2009, in terms of the technical, operational and total risks for the Northeast RVSM airspace.

Portion of NE Asia RVSM Airspace – estimated annual flying hours = 112 000 hours *(note: estimated hours based on December 2008 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
Technical Risk	0.177×10^{-9}	2.5×10^{-9}	Satisfies Technical TLS
Operational Risk	1.820×10^{-9}	-	
Total Risk	1.997×10^{-9}	**5.0×10^{-9}**	**Satisfies Overall TLS**

Table 11: Vertical Collision Risk Estimates for Northeast Asia Airspace – April 2009

2.41 **Figure 9** below provides a graphical representation of the updated risk estimates for Northeast Asia RVSM airspace based on the recent 12 months reports of LHDs.

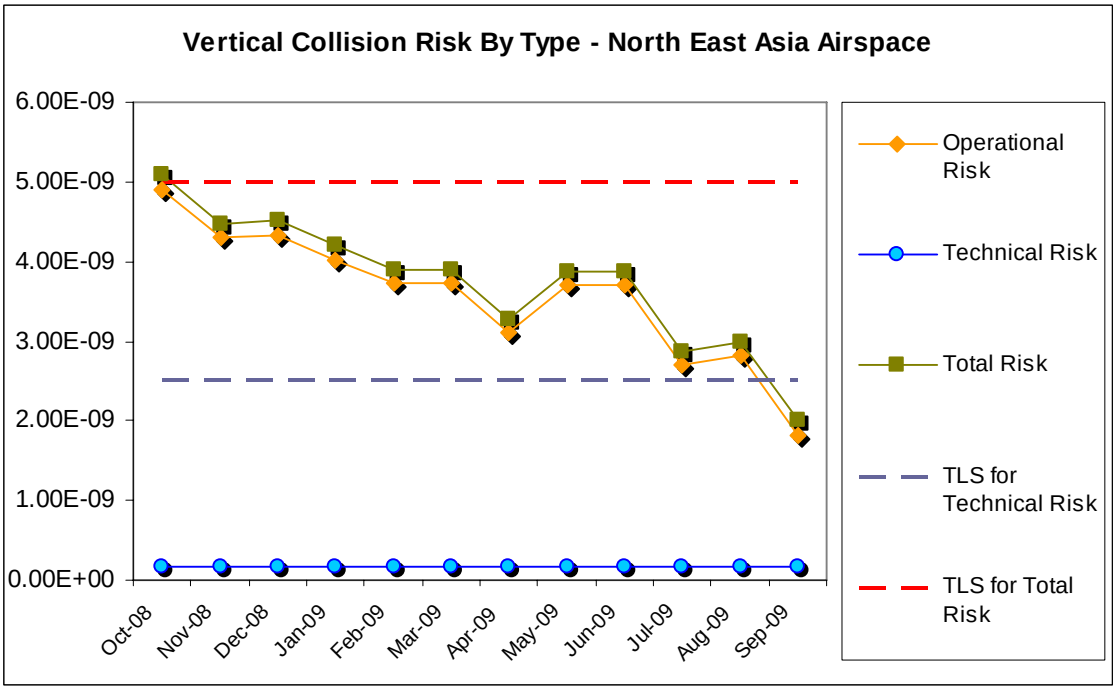

Figure 9: Vertical Collision Risk for North East Asia RVSM Airspace – April 2009

SEASMA's EMA activities

2.42 South East Asia Safety Monitoring Agency (SEASMA), provided a report on operations on the six major air traffic service routes in South China Sea airspace in order to determine compliance with Asia and Pacific Region safety goals for the established lateral and longitudinal separation standards. The report covers the period November 2008 through October 2009 and uses analysis techniques developed in conformance with internationally applied collision risk methodology. The risk assessment employed data collected from the ongoing program to monitor navigational performance on the routes and takes into account the 2 July 2008 reduction in the lateral

and longitudinal separation minima applied to two of the routes, L642 and M771. **Table 12** presents the total traffic counts reported by month transiting all South China Sea monitoring fixes.

Monitoring Month	Total Monthly Traffic Count Reported Over Monitored Fixes	Cumulative 12-Month Count of Traffic Reported Over Monitored Fixes Through Monitoring Month
November 2008	6576	89457
December 2008	6665	89597
January 2009	7244	90880
February 2009	6380	89434
March 2009	7016	88438
April 2009	6603	87307
May 2009	6962	86146
June 2009	6856	85259
July 2009	6789	83625
August 2009	6849	82906
September 2009	6145	81758
October 2009	6567	80652

Table 12: Total Traffic Counts Reported by Month Transiting All South China Sea Monitoring Fixes

2.43 **Table 13** presents the cumulative totals of Large Lateral Deviations (LLDs) in a manner similar to the traffic counts of table 1.

Monitoring Month	Cumulative 12-Month Count of LLDs Reported Over Monitored Fixes Through Monitoring Month
November 2008	1
December 2008	0
January 2009	0
February 2009	0
March 2009	0
April 2009	0
May 2009	0
June 2009	0
July 2009	0
August 2009	0
September 2009	0
October 2009	0

Table 13: Cumulative Totals of LLDs

2.44 There were no reported LLDs during the period November 2008 through October 2009, and additionally no ANSP reported an LLE during the monitoring period. The direct estimation of lateral collision risk using the lateral collision risk model is used in the risk assessment. **Figure 10** presents the results of taking this direct estimation approach for the monitoring period.

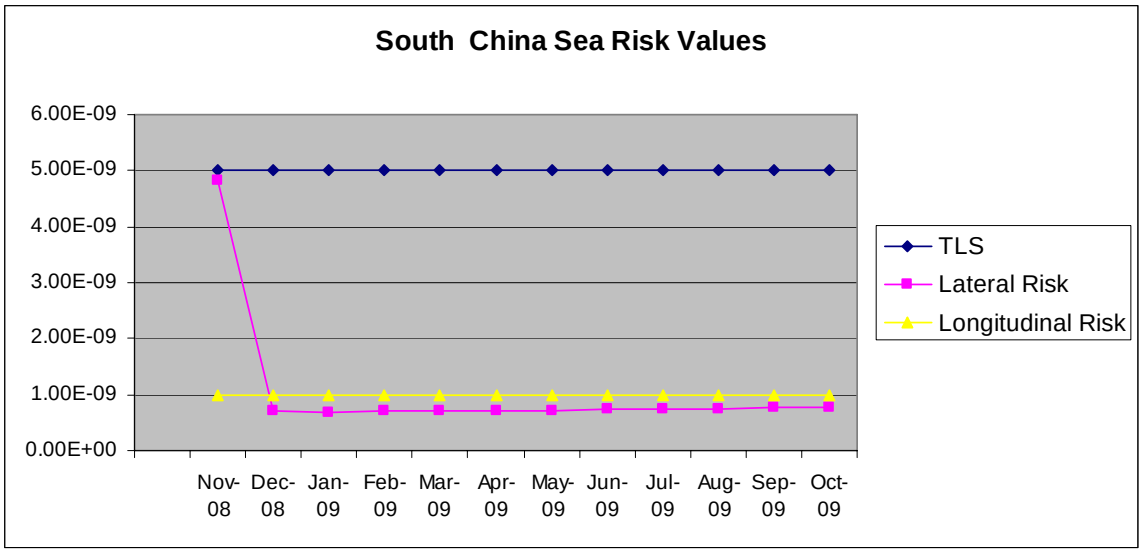

Figure 10: Assessment of Compliance with Lateral and Longitudinal TLS Values Based on Navigational Performance Observed during South China Monitoring Program

2.45 Both the estimates of lateral and longitudinal risk showed compliance with the respective TLS value during all months of the monitoring period. Since the assessment of compliance with the lateral TLS used traffic counts and LLDs reported for all six RNAV routes, it can be concluded that a 50 NM lateral separation standard between any two of the routes would be satisfy the lateral TLS.

3. SUMMARY OF SIGNIFICANT POINTS

1) With the exception of the Kabul and the Ulaanbaatar FIRs, RVSM has been implemented throughout Asia/Pacific Region. Pyongyang implemented RVSM on 26 October 2009, and Kabul and Ulaanbaatar are scheduled in 2012;

2) Safety monitoring for RVSM operations in the Asia/Pacific is undertaken by five APANPIRG Approved RMAs – AAMA, China RMA, JCAB RMA, MAAR and PARMO;

3) Horizontal safety monitoring of the South China Sea parallel route structure is undertaken by SEASMA;

4) RVSM safety monitoring in Asia/Pacific is undertaken as a regional programme in accordance with Annex 11 requirements;

5) In general terms, the TLS for RVSM operations is being widely satisfied across the Asia/Pacific Region;

6) The regional TLS is not being satisfied in the Fukuoka FIR. Investigation and remediation by Japan is ongoing;

7) For the South China Sea parallel route structure the horizontal TLS (lateral and longitudinal) is being satisfied; and

8) The single biggest issue leading to LHD in the Asia/Pacific RVSM operational environment is that of errors in the ATC Unit-to-ATC Unit coordination interface.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) note the information in this paper,

b) note that the vertical TLS is not being satisfied in the Fukuoka FIR. This is directly attributable to a single long duration (89 minutes) Large Height Deviation which has been investigated and remediated; and

c) identify and discuss other matters arising from the report of regional RVSM and Horizontal safety performance.

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