INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE TWELFTH MEETING OF THE REGIONAL AIRSPACE SAFETY MONITORING ADVISORY GROUP (RASMAG/12)

BANGKOK, THAILAND, 14 – 17 DECEMBER 2009

The views expressed in this report should be taken as those of the RASMAG and not of the Organization.

Adopted by the RASMAG and
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HISTORY OF THE MEETING

1. Introduction

1.1 The Twelfth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/12) was held in Bangkok, Thailand from 14 to 17 December 2009 at the Kotaite Wing of ICAO Asia/Pacific Office.

2. Attendance

2.1 The meeting was attended by 27 participants from Australia, China, India, Japan, New Zealand, Republic of Korea, Singapore, Thailand, and the United States. A list of participants is at **Appendix A** to this report.

3. Officers & Regional Office

3.1. Mr. Robert Butcher, Operational Analysis Manager, Safety and Environment Group, Airservices Australia, chaired the meeting. Mr. Kyotaro Harano, Regional Officer ATM, ICAO Asia and Pacific Office, was the Secretary for the meeting.

4. Opening of the Meeting

4.1 Mr. Butcher welcomed participants to the meeting and commented that he was pleased to see the number of State participants who were able to attend. He particularly welcomed new representatives from India, Japan, Republic of Korea and Singapore. Mr. Butcher noted that there were some important items that needed to be progressed at this meeting including a review of the draft revised Doc 9574 developed by the Separation and Airspace Safety Panel (SASP) and consideration of drafting a response to the 20th meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/20, September 2009) task for RASMAG to conduct further investigations and attempt to recommend, the types and appropriate locations of monitoring systems to most effectively monitor the Asia/Pacific aircraft population with the least infrastructure investment. Mr Butcher asked all participants for their support in progressing these tasks, particularly in relation to the latter given the implementation timeframe for long-term height monitoring of November 2010.

4.2 On behalf of Mr. Mokhtar A. Awan, Regional Director of ICAO Asia and Pacific Office, Mr. Kyotaro Harano, the Regional Officer ATM, welcomed all the participants to the meeting. He said in regret that the previous secretary of RASMAG, Mr. Andrew Tiede, had left Bangkok to work as the Australian commissioner on the Air Navigation Commission. With his competent capability, and hard work of RASMAG members, RASMAG could finalize a number of items that had been in work, including the EMA Handbook and the Long-Term Height Monitoring impact statement. Also, RVSM operations in the region were satisfying the Target Level of Safety (TLS) and showing an improving trend. This was attributable to RASMAG and Mr. Tiede, which Mr. Harano highly commended. Due to lack of resource, the Regional Office at first intended to defer the meeting until a new Regional Officer is assigned. However, there was strong desire expressed by some States, so that the Chairman agreed to hold the meeting as scheduled. Mr. Harano asked all participants for their support in completing tasks and was confident that the meeting would again provide important outcomes for the Region.

4.3 Mr. Butcher reminded the meeting of the significant dedication to task by Mr. Tiede in his role as the Secretary for RASMAG. His tireless efforts as a champion for safety in Asia Pacific has greatly assisted the work of the group and enabled it to effectively finalise significant safety related activities and material for the Region. The meeting joined in expressing its sincere thanks to Mr. Tiede and asked both Mr. Harano and Mr. Butcher to pass on those thanks directly.

5. Documentation and Working Language

5.1 The working language of the meeting as well as all documentation was in English. Twenty-three working papers and three information papers were considered by the meeting. A list of papers is included at **Appendix B** to this report.

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REPORT ON AGENDA ITEMS

Agenda Item 1: Adoption of Agenda

1.1 The following agenda was adopted by the meeting:

Agenda Item 1: Adoption of Agenda

Agenda Item 2: Review Outcomes of Related Meetings

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

Agenda Item 4: Airspace Safety Monitoring Documentation and Regional Guidance Material

Agenda Item 5: Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific Region

Agenda Item 6: Review and Update of the RASMAG Task List

Agenda Item 7: Any Other Business

Agenda Item 8: Date and Venue of the Next RASMAG Meeting

Agenda Item 2: Review Outcomes of Related Meetings

2.1 The first day of the RASMAG/12 meeting was expected to be conducted as a technical meeting for Asia/Pacific Regional Monitoring Agencies (RMAs). The intent of this meeting was to give the RMAs a collective opportunity to focus discussions on technical issues, identify resolutions to these issues and standardize regional processes. However, concerns were raised by the meeting that this objective was not being fully recognized and that given that all participants in the RASMAG/12 meeting were present for the technical meeting, that the meeting should proceed as a Plenary. The meeting agreed with this proposal and that a review of working papers provided under Agenda Item 2 should continue.

RVSM Manual

2.2 The Chairman presented working paper 11 that informed the meeting of action by the Separation and Airspace Safety Panel (SASP) at its meeting in Montreal in May 2009 (WGWHL/15) to review and update the RVSM Manual (Doc 9574) as it has existed in its current version since 2002 noting that the majority of the content of the document has changed little since it was first published. He noted that advice regarding the SASP's intent to review and update Doc 9574 was provided to the 4th Global RMA Special Coordination Meeting (RMA-SCN/4) held in Canberra in November 2009 and that meeting had endorsed the work by SASP.

2.3 The task of reviewing the document had been assigned to Project Team 2 of SASP that is responsible for vertical separation, and it had been agreed by that team that as in the near future RVSM will be implemented world-wide, the review needed to provide a new focus for the document, changing the primary purpose from one of implementation and maintenance, to one of maintenance only of the vertical standard. The meeting noted the significant work undertaken by SASP members Mr. Butcher (Australia) and Mr. Roberts (South Africa) who, together with input from Mr. Ewels, (Manager of the AFI RMA), have been instrumental in reviewing each chapter and the two

appendices of the document. Additionally, it was noted that the SASP agreed to progress the update to the document with the goal of completing a final draft at its next working group meeting in May 2010. To that end, the Chairman provided a copy of the draft document for RASMAG's review seeking any feedback to be provided to the Chairman by 30 March 2010.

2.4 The meeting thanked the Chairman for providing RASMAG the opportunity to review and comment on the draft document. One suggestion made by the meeting was to include an example of the methodology used by the Asia/Pacific region to assess operational errors and that this could be included in Appendix A to supplement examples already detailed for the NAT and EUR regions. The United States noted that in providing that example, it should be highlighted in the document the importance of this activity for RMAs in terms of establishing scrutiny groups. As a result it was agreed that extra wording should be added to section 6.4.5. The meeting tasked the Chairman to develop the proposed wording and to circulate the material to the RASMAG members for review prior to the end of March 2010. The Chairman would ensure that the wording was included in the revised draft to be presented to SASP in May 2010.

Review of APANPIRG/20

2.5 The Secretary presented Working Paper 13 that provided an overview of the outcome of APANPIRG/20. He informed the meeting that APANPIRG reviewed the consolidated report of the 10th and the 11th meetings of RASMAG (RASMAG/10 and 11, December 2008 and June 2009, respectively) and that it had expressed its appreciation for the many tasks that had been addressed by RASMAG since reporting to APANPIRG/19 (September 2008, Bangkok).

2.6 The meeting noted that APANPIRG had reviewed a consolidated report of the RVSM safety performance across the Asia/Pacific Region and that this report met the metric adopted as the Asia/Pacific Safety Metric *"Percentage of RMA sub-regions achieving the regional Target Level of Safety (TLS) for RVSM operations, as of April each year"*. Additionally APANPIRG had adopted the following Conclusions and Decisions drafted by RASMAG:

Conclusion 20/20 – Adopt RVSM Minimum Monitoring Requirements

That the RVSM Minimum Monitoring Requirements (MMRs) shown in Appendix B to the APANPIRG/20 Report on Agenda Item 3.3 be adopted as the MMRs applicable for the Asia/Pacific Region.

Decision 20/21 – Expand use of safety monitoring data

That the arrangements for annual month of December traffic sample data by all States to satisfy airspace safety monitoring analysis called for by APANPIRG Conclusion 16/4 be expanded to enable this data to also be available for airspace planning and implementation purposes. This will apply only where such data is not otherwise available to regional or State implementing bodies and only with specific written authority of the ICAO Asia/Pacific Regional Office on each occasion.

Conclusion 20/22 − Provide Annual Update of RVSM Approvals to RMAs

That, in addition to the continuous update of RVSM Approvals data called for by Conclusion 19/15 and APANPIRG RMA requirements, States provide an update of RVSM Approvals data in conjunction with the annual December traffic sample data submission required by Conclusion 16/4.

Conclusion 20/23 − Adopt RVSM Monitoring Impact Statement

That the Asia/Pacific Regional Impact Statement – RVSM Global Long Term Height Monitoring Requirements effective from November 2010*, as shown in Appendix C to the APANPIRG/20 report on Agenda Item 3.3, be adopted and circulated as Asia/Pacific regional guidance material.*

Decision 20/24 − En-route Monitoring Agency (EMA)

That the term En-route Monitoring Agency (EMA) be used to describe an organization providing airspace safety assessment, monitoring and implementation services for international airspace in the Asia/Pacific Region to support implementation and operation of reduced horizontal (lateral and longitudinal) separation.

Conclusion 20/25 − Adopt En-route Monitoring Agency (EMA) Handbook

That the Asia/Pacific En-route Monitoring Agency (EMA) Handbook*, as shown in Appendix D to the APANPIRG/20 report on Agenda Item 3.3, be adopted and circulated as Asia/Pacific regional guidance material.*

2.7 The Secretary informed the meeting that APANPIRG had reviewed the *Asia/Pacific Regional Impact Statement – RVSM Global Long Term Height Monitoring Requirements effective from November 2010* submitted by RASMAG, in some detail. The meeting noted APANPIRG's concerns regarding the additional monitoring infrastructure needed for the Asia/Pacific Region and that IATA had raised concerns as to how State plans for such infrastructure will fit into a region wide solution. Given the rapid development of ADS-B in Asia/Pacific Region, IATA believes that the viability of ADS-B as a method for height monitoring must be confirmed before States develop their own plans to implement a network of Height Monitoring Unite (HMUs), in order to avoid an unnecessary proliferation of ground-based monitoring infrastructure throughout the region.

2.8 Taking IATA's and other State's advice into account, APANPIRG agreed that RASMAG would be tasked to conduct further investigations and attempt to recommend the types and appropriate locations of monitoring systems to most effectively monitor the Asia/Pacific aircraft population with the least infrastructure investment.

2.9 The meeting considered how best to proceed in responding to the APANPIRG task. The Monitoring Agency for the Asia Region (MAAR) commented that there was an urgent need to identify the required monitoring system infrastructure for the Asia/Pac region and that they were concerned that traditional ground-based systems may not be practical. In the view of MAAR a system based on ADS-B was the most cost efficient and practical given the planned implementation of ADS-B systems in the Region.

2.10 New Zealand commented that there are two major questions to be resolved namely how do we monitor and where do we monitor. The view was put that GMUs are relatively flexible in where they can be deployed around the Region however the process may not be efficient in time and cost. New Zealand noted that existing ground based height monitoring units are fixed site and if they are to be deployed the locations selected will need careful planning. In New Zealand's view the ADS-B system may be more cost effective, however whatever the final mix of systems proposed, their location should be aligned with major traffic flows. The United States agreed with this view noting that current site selection exercises being conducted for the Aircraft Geometric Height Measurement Elements (AGHMEs) to be located on the United States west coast might provide a level of coverage for those Asia/Pacific aircraft that travel to the United States.

2.11 Australia stated that plans for the use of ADS-B as a height monitoring system were well advanced given the positive results from the joint research activity being conducted with the United States. In the Australian context, ADS-B will provide the most cost efficient system given the extensive network now available and the high numbers of ADS-B equipped aircraft operating in the flight information regions (FIRs). Additionally with the benefit of a mandate for ADS-B equipage in the RVSM height bands, the issue of general aviation type operators and aircraft is resolved. However for other parts of the Asia/Pacific region, while ADS-B systems are being planned, the timing and lack of mandate for ADS-B equipage would mean that other monitoring systems will need to be implemented in the short term.

2.12 Consideration was also given to the use of multi-lateration systems that were currently being installed at a number of airports in the region for surface surveillance but which could be enhanced to provide coverage within the RVSM height bands for height-keeping monitoring. This should be a fourth option to be considered by RASMAG when determining an appropriate mix of systems. The meeting agreed that multi-lateration systems were an option noting that there could be significant issues to be overcome in using an airport surveillance system in an additional height monitoring mode. India questioned whether the existing system in place at the Delhi airport, Advanced Surface Movement Guidance and Control System (A-SMGCS), would be able to provide the same data as the AGHME system for height monitoring. The United States responded that the main issue was that the footprint for A-SMGCS is very small in an airspace sense, possibly only a few miles while that for the AGHME requires a 30 to 40NM footprint.

Long-Term Height Monitoring Infrastructure

2.13 The meeting turned its attention to discussing possible options to develop a proposal to be provided to APANPIRG/21 that would identify possible height monitoring infrastructure required by the Region. Opening the discussion, the Chairman proposed that the traffic flows should provide the basis for the provision of the appropriate infrastructure. It was agreed that the focus should be on those elements of the regional fleet that did not have access to the ground-based height monitoring facilities in Europe and North America. In taking this view, such an analysis, while high-level in nature, would more clearly focus on the required systems to accommodate the regional fleets that do not have access to ground-based monitoring currently.

2.14 Through an analysis of the traffic flows and input from the respective RMAs, the meeting determined that there were five main blocks of airspace within the Asia and Pacific Region that contained the major traffic flows of the fleets that remained essentially within one or more of those five areas. These five areas could be broadly described as South-East Asia, India/Pakistan, China, Japan and Australia including Indonesia, New Zealand and Papua New Guinea (See Diagram 1 below).

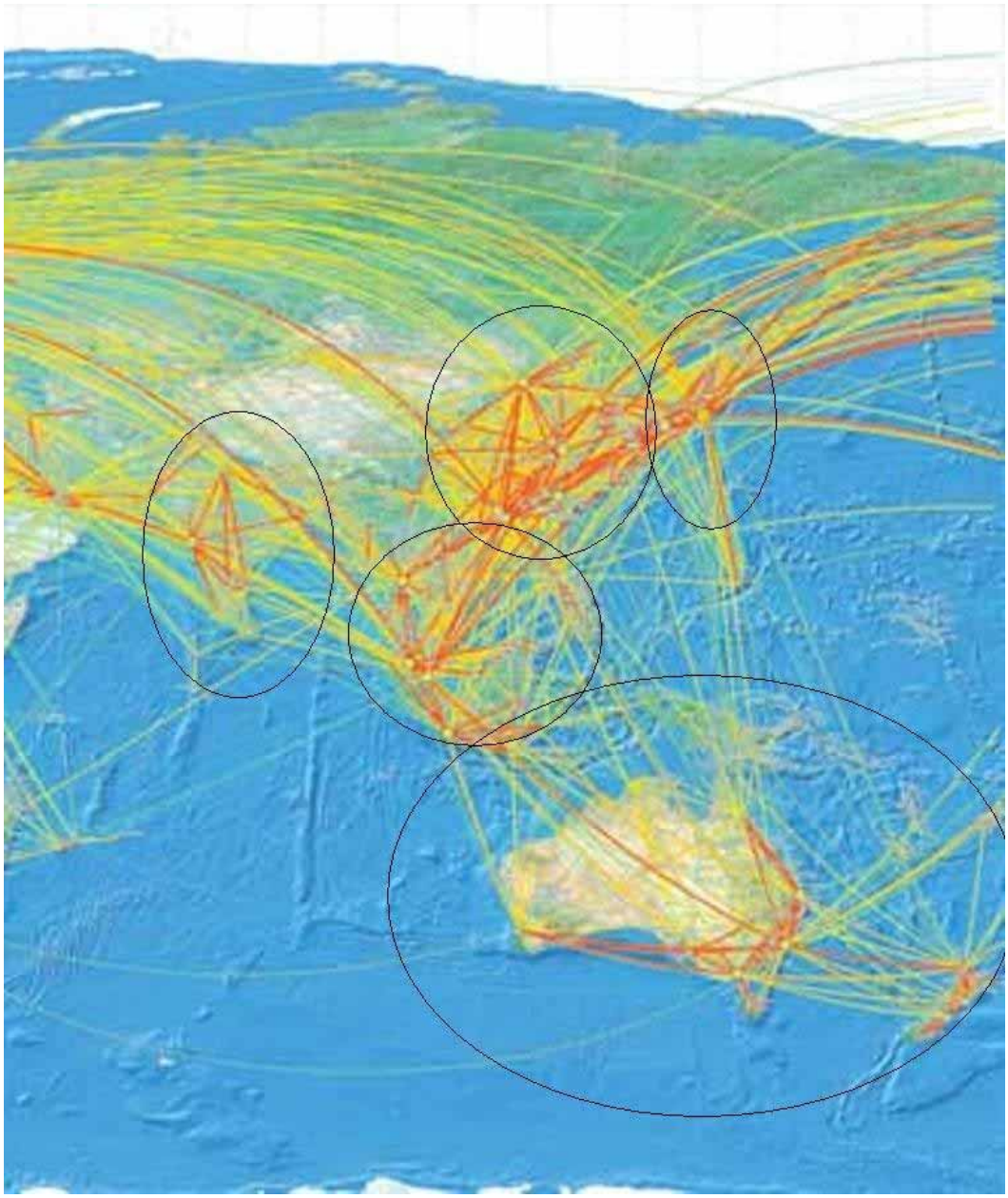

Diagram 1: Main Blocks of Airspace That Contain the Major Traffic Flows of the Fleets

2.15 In assessing the types of monitoring infrastructure required in each of these areas, the meeting agreed with the following:

For the Japanese FIRs, a ground-based HMU to capture the domestic fleet plus those aircraft operating across the North Pacific or between Japan and SE-Asia.

For the China FIRs several ground-based HMU essentially to accommodate the large number of Chinese domestic fleet that operate within those FIRs only, and to be available for other international flights that may operate in that airspace. Additionally, monitoring capability is available by EGMU through the China RMA.

For South-East Asia, given the proposed infrastructure in the other areas, MAAR advised that their assessment is that any required monitoring of the fleet of States in this area can be accommodated by use of available EGMUs.

For the India/Pakistan area, a ground based HMU to cater primarily for the large domestic fleet that operates in that area. The type and location of the HMU is to be determined following a more in-depth analysis by India and Pakistan in coordination with MAAR. In the short term MAAR believes that monitoring could be effectively completed using EGMU.

For the Australian area including Indonesia, New Zealand and Papua New Guinea, the widespread Australian and Indonesian ADS-B network and the proposed ADS-B mandate for Australian airspace effective 2013, will provide significant monitoring capability without the need for other ground based systems. Additionally EGMUs will cover any fleets where ADS-B is not required to be fitted or that does not fly within the Australian or Indonesian FIRs.

2.16 The meeting agreed that this initial analysis should be reviewed by each RMA and State represented at RASMAG to consider further details in the interim before RASMAG/13. Additionally, it was agreed that each of the RMAs would develop an analysis of the States for which they are responsible assuming that the proposed monitoring systems were in place. The analysis should then determine the aircraft numbers and types that would be monitored by those systems. The data is to be presented in tables similar to those used by Australia in WP/20 at this meeting. The data should be collected, analysed and forwarded to MAAR by end of April 2010, and thereafter reported by States to RASMAG/13.

Review of PBN Task Force 5 (PBN/TF/5)

2.17 The fifth meeting of the Performance Based Navigation Task Force (PBN/TF/5, July 2009) was held at ICAO Asia and Pacific Office in Bangkok, Thailand. The Secretariat reported to the meeting that PBN/TF/5 was invited to:

a) Note information in the reports from RASMAG/11 (June 2009, Bangkok) and the 19th meeting of the ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/19, June 2009);

b) Review the draft EMA Handbook;

c) Note the assumption from ATM/AIS/SAR/SG/19 that the appendices of the PBN Regional Plan will be completed prior to presentation to APANPIRG/20;

d) Consider the timing of the PBN/TF meeting schedule; and

e) Identify solutions to the matters in terms of ensuring that adequate horizontal safety assessment and ongoing monitoring capabilities are available for the region.

2.18 In response, PBN/TF/5 noted the information in the reports from RASMAG/11 and ATM/AIS/SAR/SG/19. PBN/TF/5 reviewed the draft EMA Handbook and noted that a final version of the document would be presented to APANPIRG/20 in September 2009. PBN/TF/5 also reviewed the draft APAC Regional PBN Implementation Plan (Interim Edition Version 0.2) that included the two appendices and incorporated the revisions.

2.19 In relation to attempting to improve coordination between the Task force and APANPIRG sub-groups, i.e. ATM/AIS/SAR/SG and RASMAG, PBN/TF/5 noted the approximate schedule of future ATM/AIS/SAR/SG and RASMAG meetings, and agreed to adjust the schedule of PBN/TF meetings as best as possible.

2.20 In order for States to complete the required safety assessments for the implementation of PBN, the Task Force recognized that more guidance would be required from ICAO and there was a need to provide safety assessment training to States. PBN/TF considered, on its current assessment that there was no need for additional monitoring requirements to accommodate PBN-based operations.

2.21 RASMAG noted the outcomes from PBN/TF/5 and looked forward to improved coordination between the groups to ensure effective support was provided to the Task Force as required.

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

AAMA's RMA activities

Australian airspace

3.1 Australia presented the results of the safety assessments of the Brisbane and Melbourne FIRs undertaken by the Australian Airspace Monitoring Agency (AAMA). The meeting was informed that the assessment covered the 12-month period ending on 30 November 2009, using Traffic Sample Data (TSD) for December 2008.

3.2 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.

3.3 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.

3.4 **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

3.5 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.

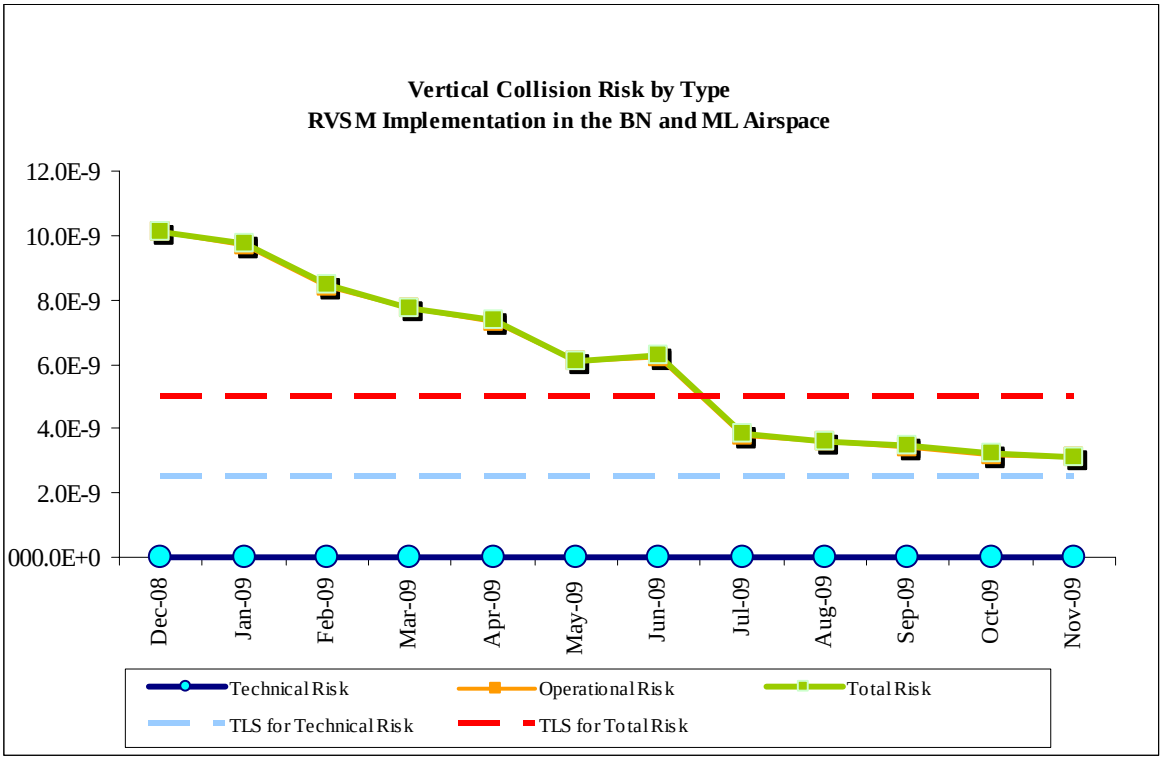

Figure 1: Trends of Risk Estimates for the Australian RVSM Airspace

3.6 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. The data shows that the monthly risk for November 2009 has remained relatively stable in comparison to the previous month and less than an average monthly risk which gives an annual risk of 5.0×10^{-9} defined by the red line in Figure 2.

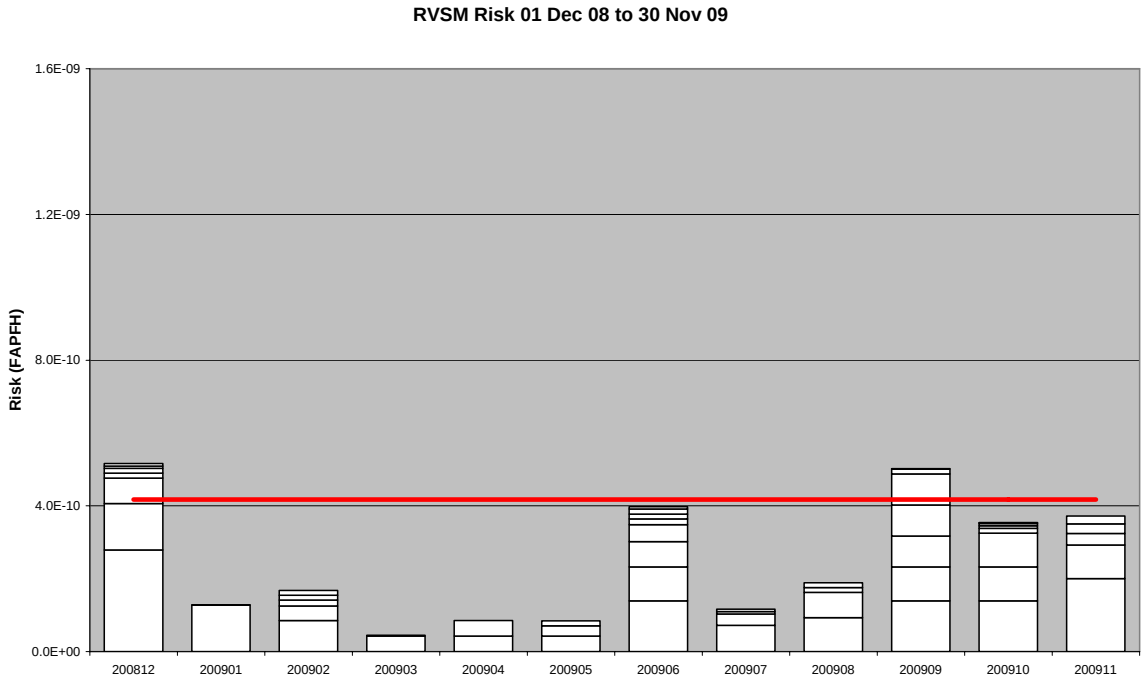

Figure 2: Monthly Risk Estimates for the Australian RVSM Airspace

3.7 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. The meeting thanked the AAMA for its continuing good work in the provision of safety assessments.

Indonesian Airspace

3.8 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.

3.9 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.

3.10 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. Additionally there was one Category L LHD report of 15 minutes assessed duration.

- 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

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- 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. Two other reports related to coordination errors from the Brisbane FIR and had assessed durations of one minute each.

3.11 **Table 2** summarises the number of LHD occurrences and associated LHD duration (in minutes) by LHD category from 1 December 2008 inclusive.

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	2.0
B	Flight crew climbing/descending without ATC Clearance	0	0.0
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)	0	0.0
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message)	0	0.0
E	Coordination errors in the ATC to ATC transfer or 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)	11	21.0
F	Coordination errors in the ATC to ATC transfer or control responsibility as a result of equipment outage or technical issues	0	0.0
G	Deviation due to aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure)	4	0.0

H	Deviation due to airborne equipment failure leading to unintentional or undetected change of flight level	0	0.0
I	Deviation due to turbulence or other weather related cause	0	0.0
J	Deviation due to TCAS resolution advisory, flight crew correctly following the resolution advisory	0	0.0
K	Deviation due to TCAS resolution advisory, flight crew incorrectly following the resolution advisory	0	0.0
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)	3	75.0
M	Other – this includes situations of flights operating (including climbing/descending) in airspace where flight crews are unable to establish normal air-ground communications with the responsible ATS unit.	0	0.0
	Total (December 08 – November 09)	**19**	**98.0**

Table 2: Summary of LHD Occurrences and Duration by LHD Category

3.12 **Table 3** 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 3: Risk Estimates for the RVSM Implementation in Indonesian Airspace

3.13 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.

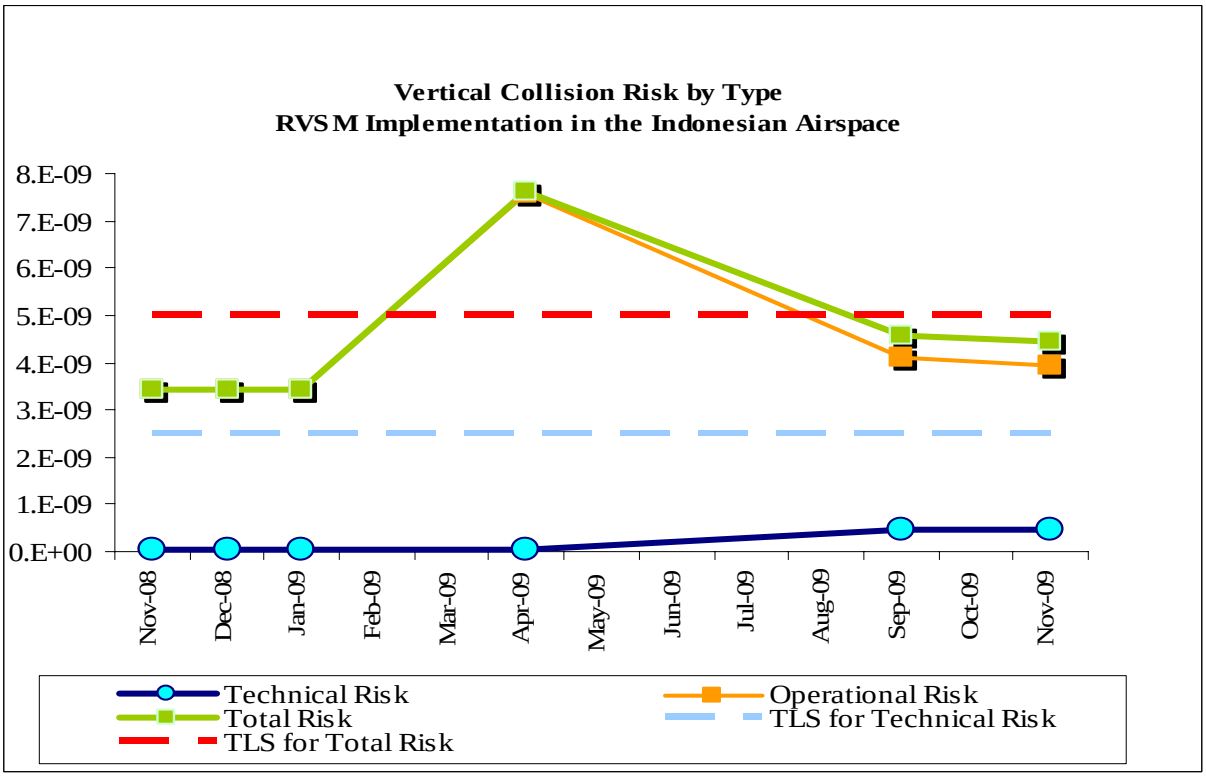

Figure 3: Trends of Collision Risk Estimates for Each Month

3.14 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. The meeting was pleased to note the reduced risk for the airspace.

China RMA's activities

3.15 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.

3.16 The LHD reports were separated by categories based on the details provided for each deviation. **Table 4** 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)	No. of flight levels transitioned without clearance
A	Flight crew failing to climb/descend the aircraft as cleared;	8	1.167	9
B	Flight crew climbing/descending without ATC clearance;	0	0	0

LHD Category Code	LHD Category Description	No. of LHD Occurrences	LHD Duration (Min)	No. of flight levels transitioned without 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-clearances etc);	1	1.35	0
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message);	2	**28.417**	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);	2	0.33	1
G	Aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure);	1	3	0
H	Airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors);	2	8	1
I	Turbulence or other weather related causes;	7	2.499	3
J	TCAS resolution advisory; flight crew correctly following the resolution advisory;	2	0.17	2
M	Other o Deviation due to display error of ATC automatic system	4	3.866	3
Total		**29**	**48.799**	**19**

Table 4: Summary of LHD Causes in Sovereign Chinese Airspace

3.17 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.

3.18 **Table 5** 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 5: Risk Estimates for RVSM implementation in Chinese RVSM airspace

3.19 **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.

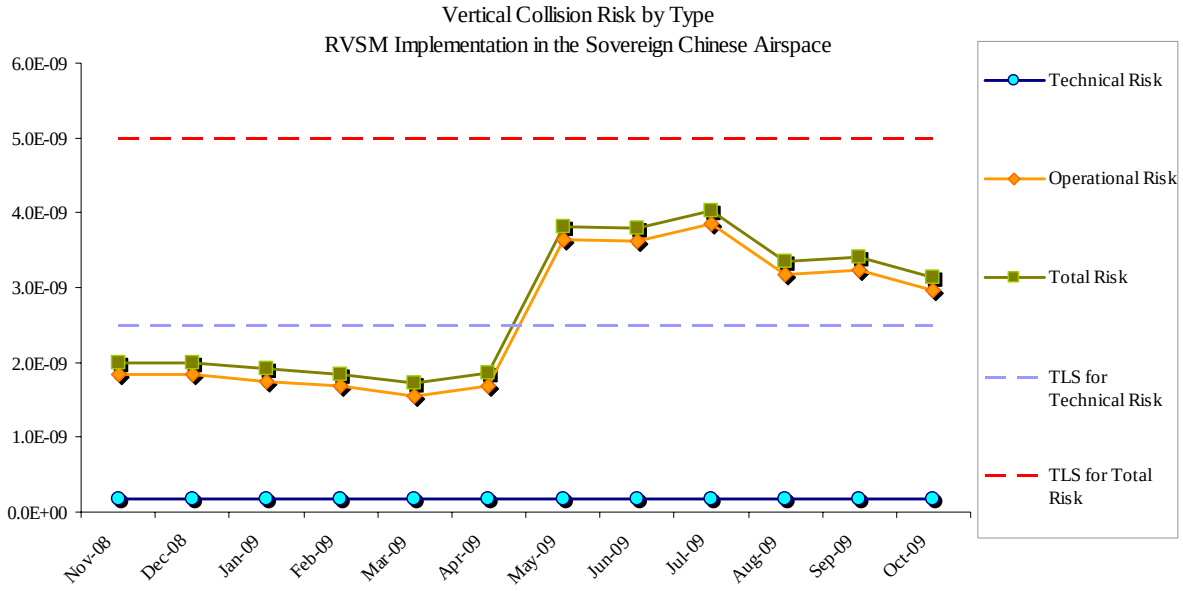

Figure 4: Trends of Risk Estimates for the RVSM Implementation in Sovereign Chinese Airspace

3.20 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

3.21 Japan Civil Aviation Bureau RMA (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, as shown in **Table 6** below.

<table>
<tr><th colspan="4">No. of LHD Occurrences / LHD Duration (min)</th></tr>
<tr><td rowspan="3">Total LHD reported
(50)</td><td rowspan="2">Occurring
within the Japanese airspace
(36 / 39.6min)</td><td>Technical risk
- Appendix A
(6 / 3.1min)</td><td>-</td></tr>
<tr><td rowspan="2">Operational risk
- Appendix B
(30 / 36.5min)</td><td>Coordination error in the ATC-unit-to-ATC-unit transfer of control responsibility
(27 / 25.3min)</td></tr>
<tr><td>Occurring
outside of the Japanese airspace
(14)</td><td>Other
(3 / 11.2min)</td></tr>
<tr><td colspan="2">-</td></tr>
</table>

Table 6: Summary of LHD Occurrences by Categories (technical risk, operational risk, within/outside the Japanese airspace)

3.22 **Table 7** 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 7: Summary of LHD Occurrences and Duration per Cause in the Japanese RVSM Airspace

3.23 **Table 8** 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 8: Risk Estimates for the RVSM implementation in the Japanese airspace

3.24 **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.

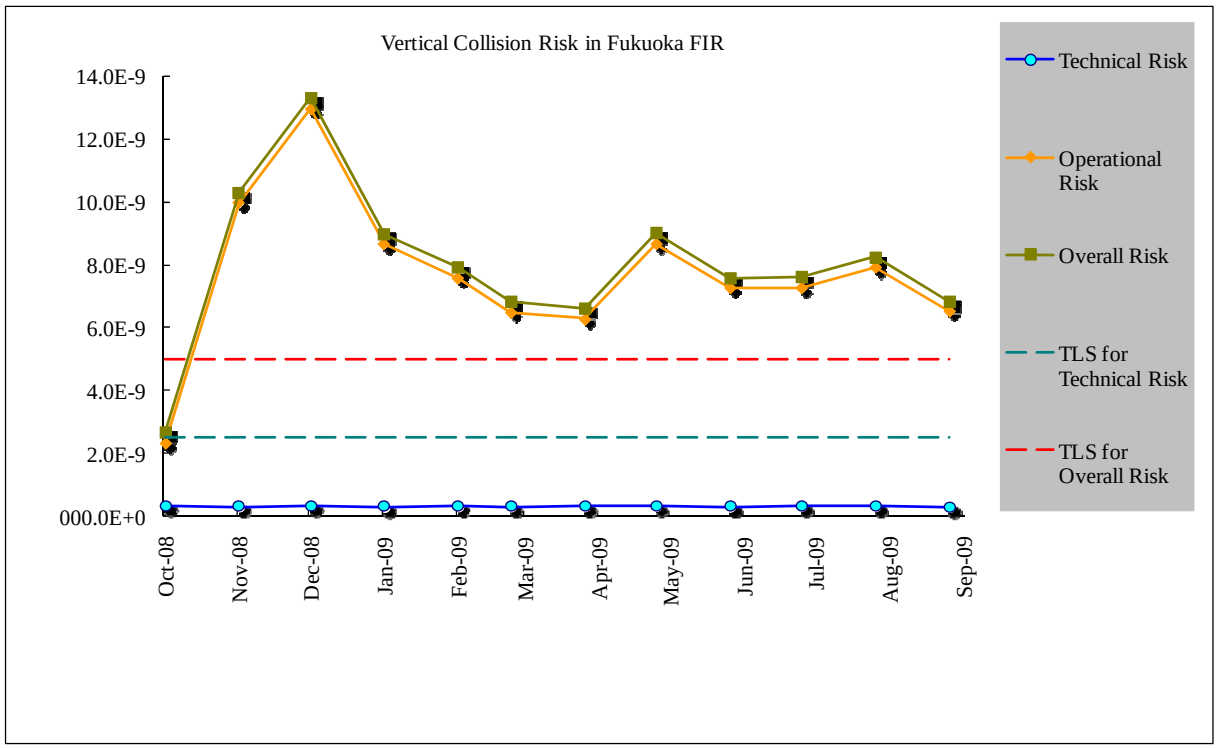

Figure 5: Trends of Risk Estimates for RVSM Implementation in Japanese Airspace

3.25 Eighty-nine minute duration of LHD within the Japanese oceanic airspace on 26 November 2008 was caused by a complex error resulting from the confluence of various factors. This single long duration LHD accounted for the dramatically raised vertical collision risk reported by the JCAB RMA to RASMAG/11. The effects of the 26 November 2008 LHD do not appear in the risk assessment and trend analysis in this report because the JCAB RMA considered that this provided a better picture of recent operational risk.

3.26 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

3.27 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.

3.28 The large height deviation reports are separated by categories based on the details provided for each deviation. **Table 9** 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 9: Summary of LHD Causes in the BOB RVSM Airspace

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

- Compared to the last 6 monthly assessment, the number of LHD occurrences has decreased from 16 to 13 occurrences while total LHD duration reduced from 63 to 30 minutes;
- Average duration of large height deviation occurrence is 2.3 minutes with maximum of 18 minutes;
- The overall large height deviation duration was driven by a significant event in August 2009, which accounted for 18 minutes, i.e. more than 60%; and
- Apart from the event in August 2009, there were very few large height deviation reports submitted by States in this region.

3.30 **Table 10** 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 10: Risk Estimates for the RVSM Implementation in BOB Airspace – April 2009

3.31 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.

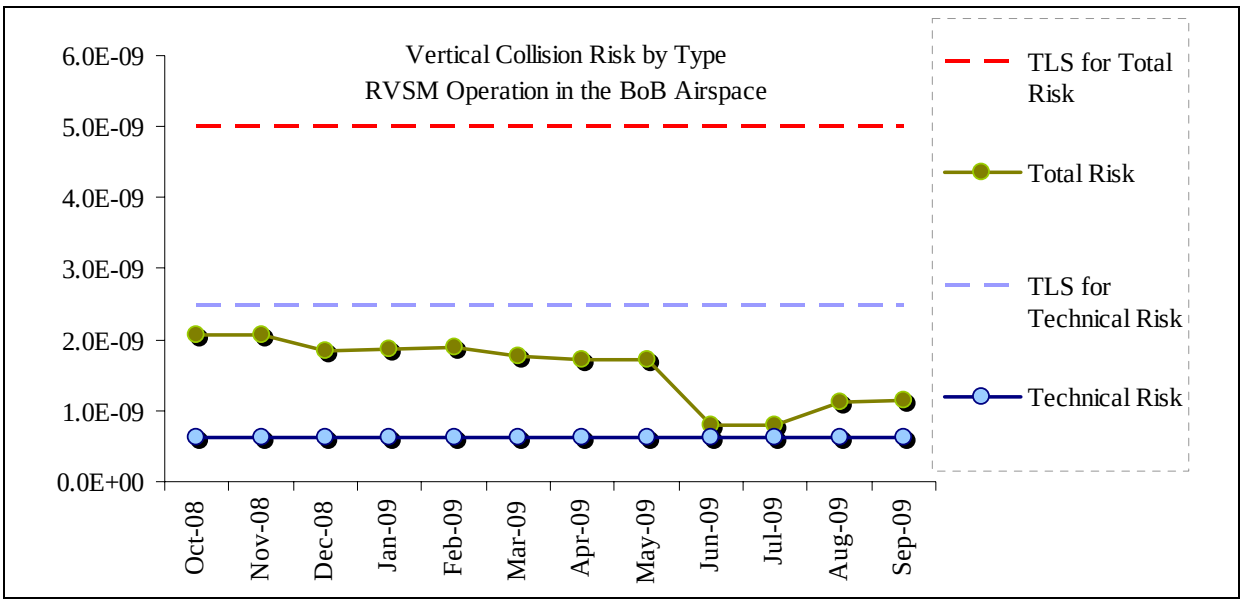

Figure 6: Trends of Risk Estimates for the RVSM Implementation in BOB Airspace

3.32 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 Large Height Deviation occurrences. The meeting strongly recommended that Bay of Bengal States review the definition and reporting requirements for Large Height Deviations 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

3.33 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 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 WPAC/SCS region. LHD data from neighbouring RMAs is also reviewed and used in the analysis where applicable.

3.34 The large height deviation reports are separated by categories based on the details provided for each deviation. **Table 11** 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 11: Number of LHD Occurrences by Cause of the Deviation

3.35 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:

- Compared to the previous 6 monthly assessment, the total LHD duration decreased from 132 minutes to 110 minutes while the number of LHD occurrences reduced from 78 to 68 occurrences;

- Average duration of large height deviation occurrence improved from 1.69 to 1.62 minutes; and

- Significant portion of large height deviation occurrence (56 of 68 occurrences) as well as duration (87 of 110 minutes) is attributable to coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues (Category E).

3.36 **Table 12** 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 12: Risk Estimates for the RVSM Implementation in WPAC/SCS Airspace

3.37 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.

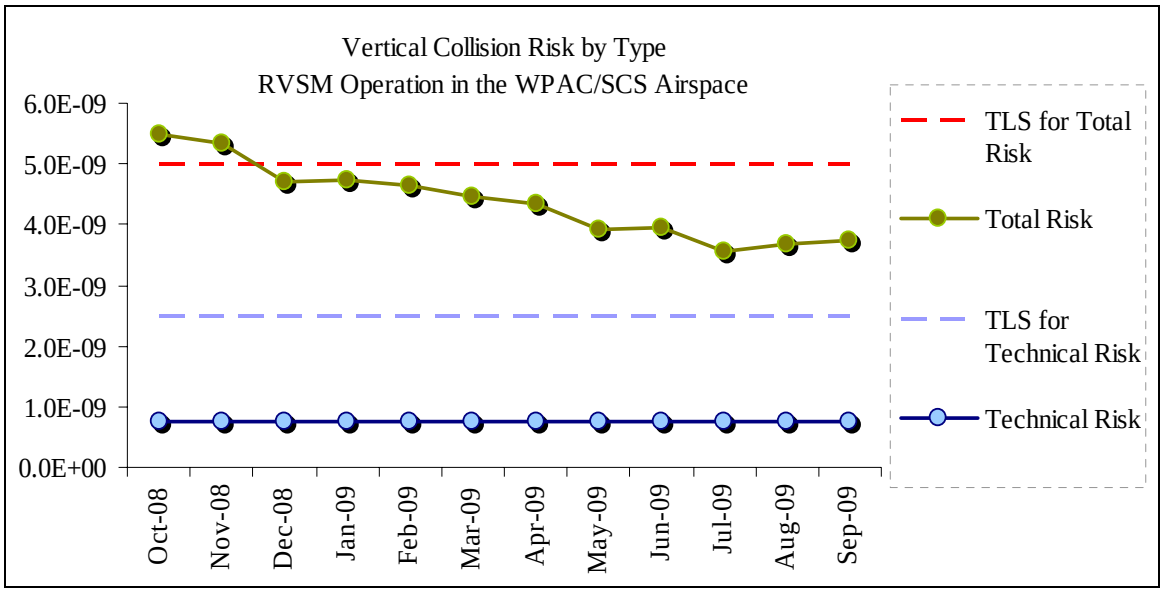

Figure 7: Trends of Risk Estimates for RVSM Implementation in WPAC/SCS Airspace

3.38 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 reduction in LHD occurrences and its duration.

3.39 Nonetheless, the number of LHD occurrences and duration was significant to the risk estimate. As a result, it is strongly recommended that States continue to take any remedial and preventive actions necessary to persistently maintain the number of LHD occurrence as well as duration to a minimum.

3.40 The meeting thanked the MAAR for its continued diligence in developing safety assessments across a number of the Regions FIRs.

PARMO's RMA activities

3.41 The Pacific Approvals Registry and Monitoring Organization (PARMO) provided an update to the meeting including a summary of large height deviation reports, results of traffic data analysis, and an estimate of vertical risk for the airspaces under their responsibility. The report covers

the reporting period from 1 October 2008 through 30 September 2009. The meeting noted that there were twenty-one reported large height deviations occurring within the Pacific and a portion of North East Asia RVSM airspace during the assessment period.

3.42 Reports of twenty-one large height deviations contributing to operational risk were provided to the PARMO with fourteen of these events reported for Pacific airspace and seven for a portion of North East Asia airspace.

3.43 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.

3.44 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.

3.45 **Tables 13 and 14** present a summary of the reported errors by deviation code for Pacific and Northeast 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	2	11	7
B	Flight crew climbing /descending without ATC clearance	2	3	1
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message)	5	86	6
E	Coordination errors in the ATC-ATC transfer of control – human factors	4	20	0
M	Other - incorrect altitude setting by the pilot	1	4	2

Table 13: 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	7	2.75	0

Table 14: Summary Large Height Deviations by Category – Northeast Asia Airspace

Pacific Airspace

3.46 **Table 15** 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 15: Vertical Collision Risk Estimates for Pacific Airspace

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

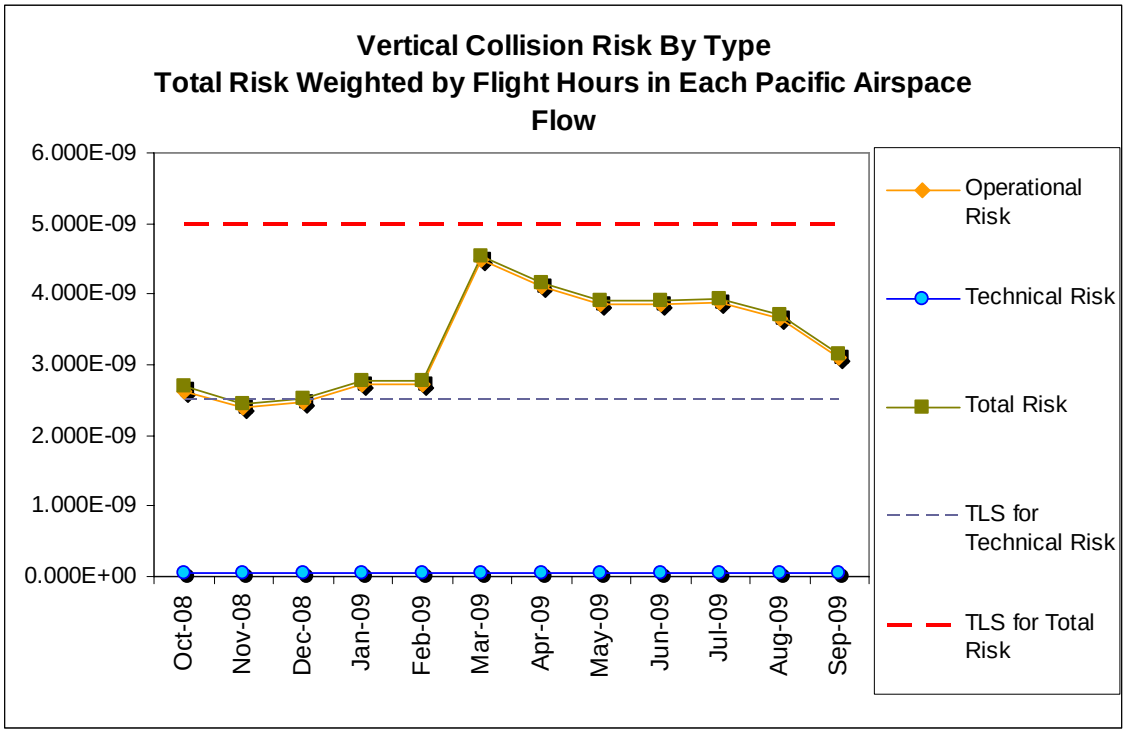

Figure 8: Vertical Collision Risk for Pacific RVSM Airspace

North East Asia Airspace

3.48 **Table 16** 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 16: Vertical Collision Risk Estimates for Northeast Asia Airspace – April 2009

3.49 **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.

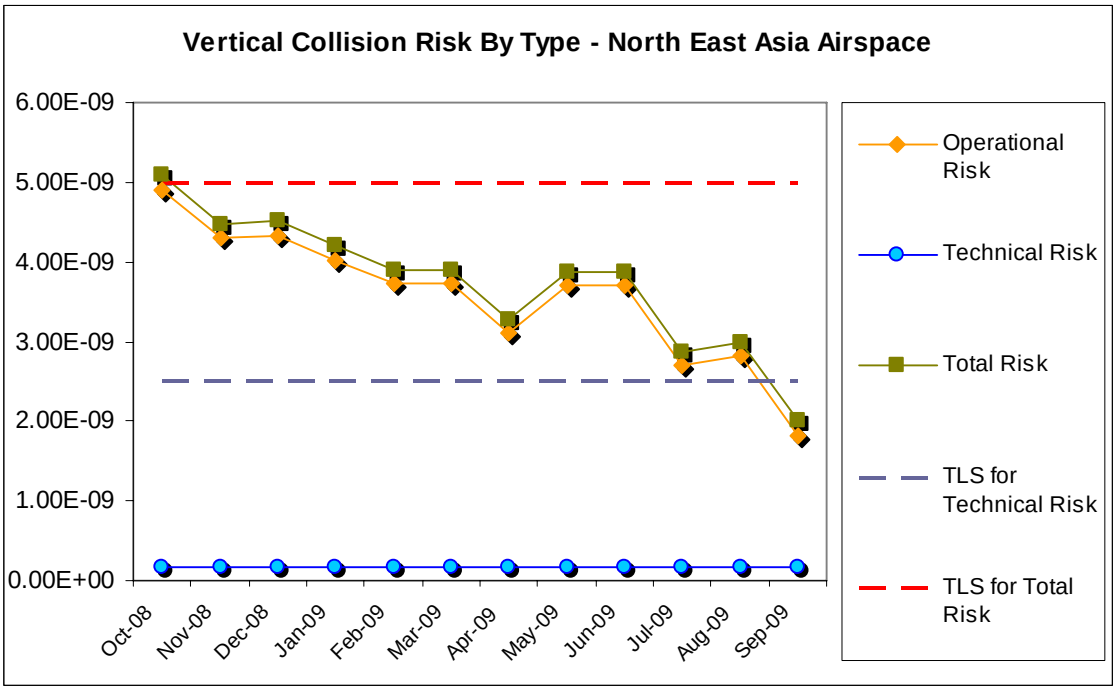

Figure 9: Vertical Collision Risk for North East Asia RVSM Airspace – April 2009

3.50 The meeting thanked the PARMO for the reports provided and for its continuing good work in undertaking RMA activities in Asia/Pacific.

SEASMA's EMA activities

3.51 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 17** 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 17: Total Traffic Counts Reported by Month Transiting All South China Sea Monitoring Fixes

3.52 **Table 18** 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 18: Cumulative Totals of LLDs

3.53 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. In this approach, values for the various risk model parameters are estimated, the risk is calculated and a

conclusion drawn regarding compliance with the lateral TLS depending upon whether the risk estimate is less than or greater than 5 x 10^{-9} fatal accidents per flight hour.

3.54 **Figure 10** presents the results of taking this direct estimation approach for the monitoring period.

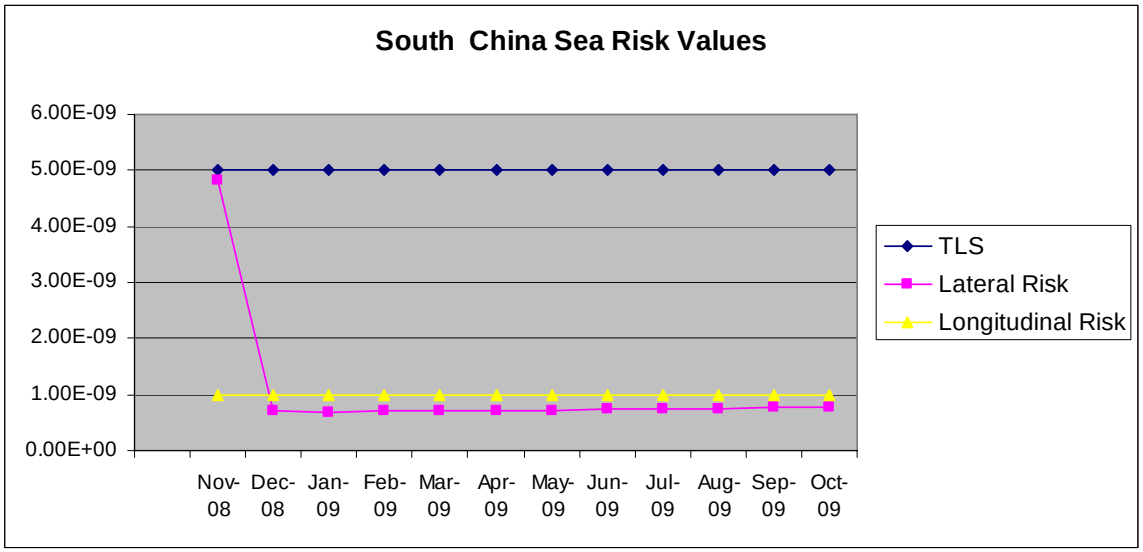

Figure 10: Assessment of Compliance with Lateral and Longitudinal TLS Values Based on Navigational Performance Observed during South China Monitoring Program

3.55 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.

China RMA action to improve coordination and assist the collection of LHD

3.56 The meeting was informed by the China RMA that following the initial introduction of RVSM into the domestic Chinese airspace in November 2007, it has continued efforts to standardise the work flow and enhancing its ability to undertake its duties on behalf of ICAO. China RMA advised that to enhance the means to detect, report and investigate the occurrence of large height deviations, it had established a reporting mechanism for Large Height Deviation (LHD) events from all the domestic Chinese operators since June 2009.

3.57 As part of this work, China RMA has drafted and published an Aviation Procedure to further clarify and regulate the work flow for RVSM Traffic Sample Data collection, large height deviation reporting, RVSM approval registration, airspace safety assessment and aircraft monitoring. Additionally the China RMA indicated that they have held meetings this year to further educate the involved civil aviation management department and airspace users to clarify their duties and responsibilities defined in the regulation to achieve a long-term harmonized cooperation. It noted that the intention is to hold these meetings annually.

3.58 The meeting was informed that the China RMA has a robust mechanism in place to obtain LHD reports from ATC units but has identified the need to obtain similar information from the pilot to assist in the investigation of LHD reports. To assist with this, the China RMA established in

June 2009 a LHD data collection mechanism from domestic Chinese operators. Since the start of this program, the operators have become more cooperative in terms of the provision of information to assist in the investigation of LHDs.

3.59 The meeting congratulated China RMA on its initiatives to improve the efficiency of its operations and obtain the support of the Chinese domestic operators as well as regulatory organisations within the Chinese aviation system. Australia commented that they were having similar problems as China RMA in not receiving LHD reports from airlines even though the requirement to report is clearly detailed within the Australian Aeronautical Information Publication (AIP). As a result, following discussions with the Australian Transport Safety Bureau (ATSB), pilot reports to the mandatory incident reporting system maintained by that organisation, and which fit the criteria for an LHD are now passed to the AAMA on a monthly basis. The United States stated that they considered the work that China is doing in this regard to assist reporting from operators is an activity of importance however can be difficult as it is realistically an ongoing process due to staff changeovers, new operators entering the airspace and other factors.

Large Height Deviation (LHD) between Japan and Republic of Korea

3.60 Japan reported that AIDC had been implemented among ACCs of the two countries (three ACCs of Japan and an ACC of ROK) since 15 June 2009. The record of LHD caused by ATC-unit to ATC-unit coordination errors which occurred to aircraft crossing the Fukuoka-Incheon FIR boundary via B576 was reviewed.

3.61 Four LHDs had been reported since the implementation of AIDC as shown in **Table 19** below. It was evident that the LHD on 15 November 2009 falls under the Category E LHD. At first, JCAB RMA considered the rest of three LHDs as Category F LHDs, which occurred by the coordination errors in the ATC-to-ATC transfer of control responsibility as a result of **technical** issues. But actually the source of information was only Naha ACC in Japan, and JCAB RMA has not yet asked Incheon ACC or PARMO whether the reason of non-existent coordination were attributed to technical issues of AIDC or human factor issues.

3.62 Comparing five-month records of LHDs before and after the implementation of AIDC shows the LHD occurrences decreasing. Nine LHDs occurred between 15 January 2009 and 15 June 2009 (AIDC implementation anniversary), whereas four LHDs occurred between 15 June 2009 and 15 November 2009. JCAB concluded that AIDC is effective in reducing human errors but not perfect.

Event date	Source	Location of deviation	Duration of LHD (min)	Cause	code
21 Jul 09	Naha ACC	ATOTI (B576)	1	Non- existent coordination by AIDC from Incheon ACC to Naha ACC	E or F
21 Sep 09	Naha ACC	ATOTI (B576)	0	Non- existent coordination by AIDC from Incheon ACC to Naha ACC	E or F-
1 Oct 09	Naha ACC	ATOTI (B576)	0.75	Non- existent coordination by AIDC from Incheon ACC to Naha ACC	E or F-
15 Nov 09	Naha ACC	ATOTI (B576)	0.75	Non- existent coordination by AIDC from Naha ACC to Incheon ACC (Naha ACC controller did not find AIDC SEND ERROR message on CRT)	E

Table 19: LHDs on B576 Reported after the Implementation of AIDC between Japan and ROK

3.63 The meeting thanked Japan for the report which provided a good outcome for the coordination issues being experienced on that particular air route. New Zealand suggested that possibly Japan could bring a further update of the analysis. The Chairman commented that Australia could also provide a similar analysis given that AIDC was expected to become operational between Australia and Indonesia in the near future. As a result, the meeting agreed to task the RMAs that could provide data and analysis in relation to the effect of AIDC on Category E LHDs, to do so.

3.64 Additionally the Republic of Korea noted that the Japanese report included a number of LHDs they were unaware of. As a result they requested JCAB RMA to provide such information directly to the Incheon ACC. Thereafter the meeting discussed the correct process for this and agreed that an RMA not responsible for a particular State, would forward details of any LHDs to the responsible RMA who would then pass the information to the relevant State authority or ANSP.

Agenda Item 4: Airspace Safety Monitoring Documentation and Regional Guidance Material

RASMAG List of Competent Airspace Safety Monitoring Organizations

4.1 RASMAG is required by its terms of reference to recommend and facilitate the implementation of airspace safety monitoring and performance assessment services and to review and recommend on the competency and compatibility of monitoring organizations. Accordingly, the meeting reviewed and updated the *"RASMAG List of Competent Airspace Safety Monitoring Organizations"* (shown at **Appendix C** to this report) for use by States requiring airspace safety monitoring services.

Agenda Item 5: Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific Region

EMA Handbook PBN Approvals Database Format

5.1 New Zealand drew to the attention of the meeting that the format for the databases of PBN approvals shown in the EMA Handbook did not adequately cover the wide range of possible approvals for an individual aircraft. It was recalled that RASMAG/11 considered that EMAs would, initially at least, only conduct safety assessments for en-route traffic. However, if the EMA databases were designed to include a set of PBN approval fields that covers all PBN approval types, they would be future-proofed against changes in the scope of the tasks of the EMAs.

5.2 A format had been developed that specifically includes all current PBN and data link approval types, as shown at **Appendix D** to this report. New Zealand had proposed combining the RVSM, PBN and data link approvals databases, and so, in anticipation, the proposed format also allows for RVSM approvals. While Appendix D shows a proposed database record format, the same structure could be used as the form for States to report additions and changes to their approvals.

5.3 APANPIRG Conclusion 20/22 requested States to provide an annual update of their RVSM approvals to their RMA in conjunction with the annual traffic sample data. New Zealand suggested that the format at Appendix D could also be converted into spreadsheet format in anticipation that a similar request will eventually be made in respect of PBN and data link approvals.

5.4 The meeting thanked New Zealand for the revised proposal and discussed issues associated with the format. The meeting endorsed the format at Appendix D and tasked the Secretary to amend the EMA Manual accordingly. The meeting noted that Appendix C to WP/3 identified a

number of other fields contained in the data base format and agreed to retain fields 1 and 3 but delete field 2.

Unified Approvals Database

5.5 New Zealand reported that in discussing the notion of a Regional PBN Approvals database, RASMAG/11 had agreed not to pursue the regional database at the present time but had requested States to consider the proposal and how to best provide data for inclusion when it was eventually established. The number of PBN approvals that an aircraft may hold requires a more complex database than for RVSM approvals. There are a number of navigation specifications that must be allowed for; the approvals are not hierarchical and may be airspace-dependent. For example, an aircraft's navigation equipment may qualify it to hold an RNP 1 approval but not an RNP 4 approval, and that RNP 1 approval may only apply in airspace where the required navigation infrastructure is in place.

5.6 Both RVSM and PBN databases contain the same basic data on the aircraft, its operator and its state of registry. The PBN approvals database format suggested in the EMA Handbook is similar to that for the RVSM approvals, but also includes data link approvals. However, it is recognised that the PBN approvals field in this format is inadequate, and New Zealand proposed changes to the format.

5.7 Where an organisation provides both RMA and EMA functions it would be feasible to combine the RVSM, PBN and data link approvals databases. This would provide a single record for each aircraft and would avoid the duplication of the nine or more fields of common data for that aircraft, such as aircraft type, operator and state of registry. A combined RVSM, PBN and data link approvals database would allow States to provide approvals data to a single Monitoring Agency; the data will be distributed to other agencies through Monitoring Agency internal data exchange mechanism. Sending data to a single agency is considered to be a significant benefit in reducing overhead activities and minimizing the risks of errors.

5.8 Occurrences of non-approved aircraft indicating RVSM approved on flight plans have led some ANSPs to express a need for rapid access to approvals databases to ascertain the approval status of specific aircraft. This would not involve automatic checking of the approvals status of every aircraft, but would allow ANSPs to request a check and receive a response within a few minutes when a specific aircraft's approval status was in some doubt. Combined approvals databases would make such a process, if agreed to, simpler to establish and operate.

5.9 The meeting thanked New Zealand for the paper and some States commented that a number of RMAs already make the approvals data available to ANSPs and that as a result possibly this was an issue that only affected New Zealand. However, the meeting agreed to review the proposal to collect the additional data and to bring comments on the proposal to RASMAG/13 for further consideration.

PBN Approvals Information on Flight Plans

5.10 Singapore presented the need to include all PBN approval types into the flight plan for all flights so as to facilitate future implementation of reduced horizontal separation; this would also greatly assist in the airspace monitoring duties of the En-route Monitoring Agency. Information about the PBN readiness of airline fleets is crucial to the timely execution of the Asia and Pacific Regional PBN Implementation Plan. However, this information is not readily available in the current flight plan, and the new ICAO Flight Plan, with requirements for PBN approval data, will not be implemented until 2012.

5.11 In order to ease this difficulty, airlines can make use of the flight plan form Field 18 "Other Information" to include all type of PBN approvals pertaining to that aircraft when filing a flight plan even if the PBN approval is not required in that segment(s), route(s) and/or area concerned. This information should also be captured in the December TSD submitted by States. The inclusion of PBN approvals of aircraft for segments, routes and areas that do not currently require any PBN approvals will provide information on airline fleet readiness when considering that airspace for reduced horizontal separation minima. This will be a proactive route to achieving the short and medium term goals of the Regional PBN Implementation Plan.

5.12 The meeting discussed the need to include all PBN approval types in the flight plan and to make use of the flight plan form Field 18 as the means to include the PBN approval types. Australia noted that the entry of PBN approvals information in Field 18 was published in the Australia AIP as a requirement in Australia, and understood that other States, such as the United States had also made such a requirement. The meeting endorsed the proposal to use Field 18 of the flight plan on a regional basis to identify an aircraft's PBN approvals. The Secretary was tasked with coordinating this proposal to the Flight Plan Task Force and to the ATM/AIS/SAR Sub-Group.

China as RMA for the Oceanic Airspace of the Sanya FIR

5.13 China reported that in 2002 when RVSM was implemented partially in the Sanya FIR, RVSM had not been introduced in domestic Chinese airspace. MAAR kindly took on the duties and responsibilities of the RMA for the Asia Region including the oceanic airspace of Sanya. RVSM was implemented in Beijing, Guangzhou, Kunming, Lanzhou, Shanghai, Shenyang, Urumqi and Wuhan FIRs and Sector AR01 (island airspace) of the Sanya CTA from 1600UTC on 21 November 2007.

5.14 Considering the complexity of the air route structure and the extensive area, the General Administration of Civil Aviation of China (CAAC) determined to establish its own regional monitoring agency. China RMA received authorization from APANPIRG in 2008 in Conclusion 19/14. CAAC realized that it was important to enhance the management of domestic RVSM airspace and have a thorough knowledge of the risk for the entire Chinese airspace. So China RMA was willing to take over the responsibility for the oceanic airspace of Sanya FIR from MAAR. It was agreed that China RMA would provide monthly LHD reports and the December TSD for the oceanic airspace to MAAR for the safety assessment of the South China Sea airspace.

5.15 The meeting noted the intention of China, and endorsed the proposed action. In Conclusion 19/14**,** APANPIRG had explicitly authorised China as the RMA for China's sovereign airspace. It was also noted that RASMAG/11 had endorsed China RMA's taking over from MAAR as the RMA for the Pyongyang FIR. The meeting therefore drafted the following draft Conclusion for submission to APANPIRG/21 in September 2010

Draft Conclusion 21/XX

That, the China RMA be approved as an APANPIRG Asia/Pacific RVSM Regional Monitoring Agency with responsibility for all RVSM airspaces in China FIRs, and the Pyongyang FIR.

Aircraft Height-keeping Performance Monitoring in China

5.16 China RMA reported on its work in promoting and implementing the Long-Term Height Monitoring program. The report showed 42 aircraft were monitored from January to

November 2009 and all the monitored aircraft were compliant except for one aircraft. The result of ASE for this aircraft is **Aberrant**[1], and an investigation was requested for the operator.

5.17 However, China RMA reported that its progress was behind schedule. In November 2009, China RMA had signed agreements with both China Eastern Airlines and China Southern Airlines, and 30 aircraft would be monitored in the near future. China RMA would strengthen its communication with operators and State CAAs to ensure the progress of the LTHM program. In November 2009, China RMA requested the Democratic People's Republic of Korea to commence initial monitoring as soon as possible and not later than 6 months after the RVSM implementation in Pyongyang FIR.

Ground-based Monitoring System for China RMA

5.18 At RASMAG/11, it was suggested that China establish a ground-based monitoring system to support the long-term height monitoring requirement. At the fourth Global RMA Special Coordination Meeting (RMASCM/4), PARMO submitted a working paper to provide a brief description of the monitoring systems currently available as well as the advantages and disadvantages of each system. The purpose of the paper was to suggest that a complete monitoring programme, from the standpoint of a RMA, should include a combination of ground-based and airborne monitoring systems.

5.19 China RMA's two EGMUs will be barely enough to meet the minimum monitoring requirement in the long-run and cannot be used to examine the performance for the aircraft type group. So, a ground-based monitoring system is a necessity for China. However, to establish a ground-based monitoring system is a very significant project for which China RMA would need strong financial support from CAAC.

5.20 The meeting endorsed China's request that the Regional Office would send a State letter to China requesting them to provide China RMA with the necessary support for the establishment of a ground-based monitoring system. The Secretary agreed to ensure this would be completed after coordination with China.

RVSM Non - Approved Operators Using RVSM Airspace

5.21 The meeting recalled that APANPIRG had previously expressed serious concern in relation to flights that were apparently using RVSM airspace when they did not have the State approvals to do so. In agreeing that this issue ultimately required regulatory intervention, APANPIRG had requested RASMAG to continue its investigations in this regard**.** In this respect, China presented an assessment of RVSM non-approved operators using the Chinese RVSM airspace.

5.22 **Table 20** below contains a summary of the global aircraft RVSM approval database used in the approval status check undertaken by the China RMA.

RVSM Approval Data Source (RMA/State)	Update Time
AAMA	Nov. 2009
ARMA	Sep. 2009
CARSAMMA	Nov. 2009
Canada	Nov. 2009
China RMA	Nov. 2009

[1] In China RMA, the critical value for the **Aberrant** result is 180ft, the value used by EURO RMA..

RVSM Approval Data Source (RMA/State)	Update Time
DPR Korea	Apr. 2009
Eurocontrol RMA	Nov. 2009
JCAB RMA	Nov. 2009
MAAR	Nov. 2009
MID RMA	**Sep. 2006**
NAT CMA	**Mar. 2008**
PARMO	Nov. 2009
Russia	Jun. 2009
US MASPS	Nov. 2009

Table 20: Summary of RVSM Approval Data Source[2]

5.23 China RMA stated that an analysis of the traffic sample data revealed that there are some errors and NULL values for the aircraft's registration numbers which are further used to correlate the RVSM approval database. In the following process of the assessment, these records where the registration number were missing or not correct (about 4% of the total number of records) were excluded from the TSD.

5.24 The assessment undertaken showed that the total number of aircraft in the RVSM airspace without an RVSM approval was 2335 which accounts for 1.944% of the total flights. Figure 11 below illustrates the distribution of RVSM non-approved aircraft by State and Figure 12 illustrates the distribution by Operator.

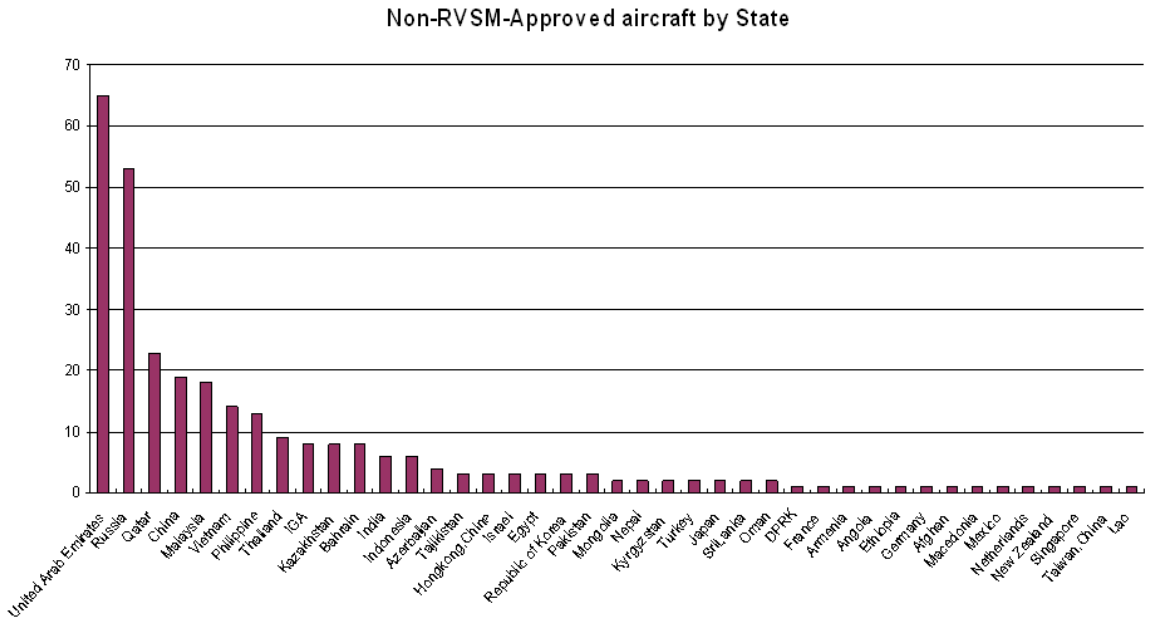

Figure 11: RVSM Non-Approved Aircraft by States

[2] The last updated approval data for MID RMA and NAT CMR were forwarded from PARMO

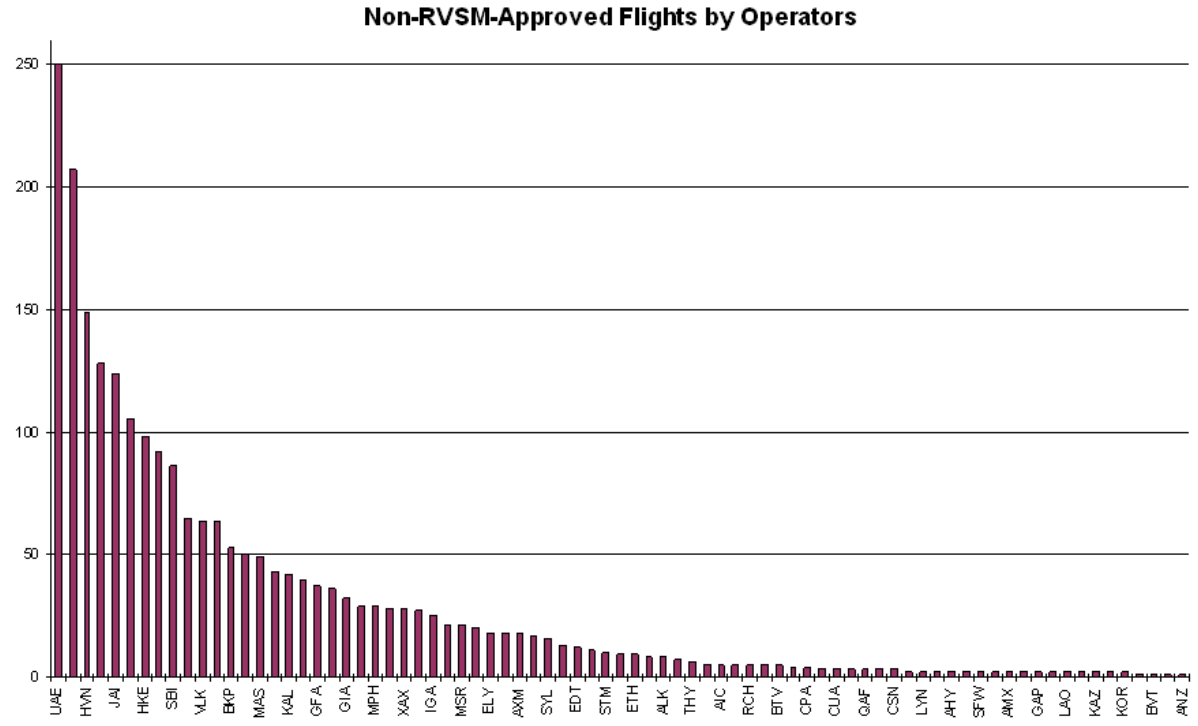

Figure 12: RVSM Non-Approved Flights by Operators

5.25 China RMA advised the meeting that in Chinese RVSM airspace, air traffic controllers were required to check the item 10 of the flight plan ("/W" or "/Q" for the aircraft RVSM approval). In practice, some operators were simply filing a flight plan indicating that RVSM approval has already been issued and flying at RVSM levels while in fact the operator is identified as operating a non-approved aircraft. To assist in resolving these types of issues and to provide better oversight for controllers, China RMA has a plan to establish a system to identify non-approved aircraft using Chinese airspace and provided full details on this system to the fourth Global Regional Monitoring Agency Special Coordination Meeting (RMASCM/4) in November 2009.

5.26 Australia also provided an analysis of 'rogue' aircraft operations within the Australian RVSM airspace. The meeting was informed that the presence of non-approved aircraft was closely monitored in Australian airspace to ensure the risk is adequately controlled so that aircraft are not separated with less than the required minimum in situations where one aircraft in a separation pair is not RVSM approved. Australia stated that the AAMA commenced a scheduled review of all flight plan data on a monthly basis to identify Australian registered 'rogue' aircraft operating within the Australian FIRs. Figure 13 shows the number of 'rogue' airframes identified in the period from January to November 2009. The overwhelming majority of those aircraft were general aviation operated airframes.

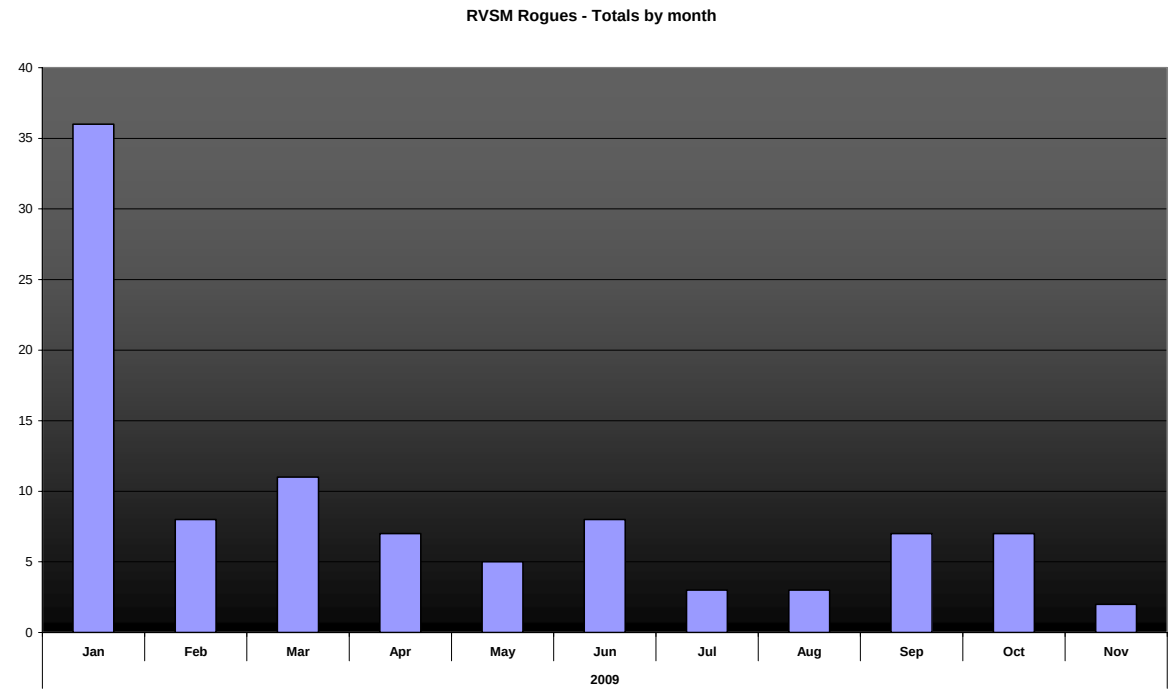

Figure 13: RVSM Rogues – Totals by Months

5.27 Australia explained that checks in January 2009 while identifying a number of 'rogue' aircraft, also revealed a number of issues related to the approvals database held by the State authority due in part to delays in having that data base updated following the issuing of approvals to operators. Pro-active discussions between the AAMA and the State authority saw these data base issues effectively resolved as evidenced in the significant reduction in the number of rogues identified in subsequent months. Additionally, the State authority now responds quickly to resolve issues with the operators concerned with the result being a significant improvement in instances of recurring incorrect flight plans by the same operators.

5.28 Australia informed the meeting that the AAMA was now confident that the issue of rogue airframes operating in RVSM airspace within the Australian FIRs was being effectively controlled through close cooperation with the State authority. The AAMA was now working to undertake monthly flight plan cross-checks for non-Australian registered airframes and will report the results of this activity to RASMAG/13.

5.29 The meeting thanked both China and Australia for their significant work in monitoring non-RVSM approved aircraft and encouraged all RMAs to continue this work and report results to RASMAG/13 so that further advice regarding this issue can be provided to APANPIRG/21. The United States commented on the outdated data set provided by the MID RMA and relied on by China in their analysis. China stated that they now have relevant points of contact within the MID RMA and expects the accuracy of the data base to be improved in the short term. Australia sought clarification on whether China RMA was intending to follow up the occurrences involving International General Aviation aircraft identified in the analysis. General discussion took place among the RMAs as to the process required to undertake this activity. The meeting agreed that in circumstances where the identified aircraft were not registered in a State within the responsibility of the assessing RMA, then that RMA would pass the information on to the RMA who is responsible for the relevant state of the operators identified, and the latter RMA would then provide the information to the relevant State authorities for resolution.

ADS-B Height Monitoring Research

5.30 Australia and the United States jointly informed the meeting that the FAA and Airservices Australia presented WP/24 to SASP-WG/WHL/16 that provided details on the cooperative research agreement to further progress the investigation on the use of aircraft geometric height data derived from ADS-B sources for estimating aircraft ASE. Work under this agreement commenced during the week of 31 August 2009 in Canberra, Australia where the group successfully processed a week's worth of ADS-B data using the AGHME processing software. The paper also provided some initial results of the ASE estimates from the various ADS-B ground stations in Australia.

5.31 The initial ASE estimates vary by location of the ADS-B ground station. There are many factors to be considered to determine the exact cause or causes for these differences including the different mix of aircraft type passing over each ground station. The ADS-B ground stations themselves are unlikely to cause the difference since their role is to simply relay the available data. However a bias may be introduced into the results due to the available meteorological information for the airspace covered by the ADS-B ground station. The group is investigating the cause of the observed bias in the ASE estimates by ADS-B ground station. In addition, the group will be revisiting the assumptions related to ground height and the WGS-84 spheroid model used in the ASE software.

5.32 The meeting noted the information provided, and endorse the continued exploration of ADS-B derived geometric height as a data source for aircraft height-keeping performance monitoring.

RVSM Approved Aircraft ADS-B Equipage in Australia

5.33 Given the extensive coverage of ADS-B within the RVSM flight levels in Australia, the AAMA has been undertaking an analysis to determine which operators and aircraft type have the potential to be monitored using ADS-B surveillance system in the short-term. In doing this work, the AAMA was cognizant of the fact that after 12 December 2013, all aircraft operating over Australian territory above FL290 must be ADS-B equipped. This paper provides some details of that analysis.

5.34 In a parallel activity to that being undertaken in terms of the joint research project with the FAA, which is validating the use of ADS-B for height-keeping monitoring, the AAMA has commenced an analysis of aircraft operating within the Australian FIRs that could potentially be monitored using this system. Particularly the AAMA is interested in identifying the number of aircraft types by operator that can be monitored using ADS-B in the period from December 2010 to 12 December 2013, the latter being the currently scheduled time-frame for the introduction of an ADS-B equipage mandate in Australia. By undertaking this analysis the AAMA will be able to better identify the likely mix of monitoring systems needed post December 2010 to accommodate long-term monitoring requirements.

5.35 Importantly, the AAMA was intent in assessing not only Australian operators, but also foreign operators that were present in the Australian FIRs and who could potentially have a portion of their fleet type monitored using ADS-B while in that airspace. Having an understanding of the potential proportion of the current Asia/Pacific fleet that could be monitored in this way in the short-term would be important data for RASMAG to review when making recommendations to APANPIRG in relation to the required type and location of the monitoring infrastructure for the region.

5.36 Table 21 below summarises the main Australian operators that flight planned within the RVSM airspace during May 2009 and whether they have aircraft that are ADS-B equipped that would enable height-keeping monitoring using that system.

Australian Operator	Aircraft Type	ADS-B equipped
Qantas	A330	yes
	A380	yes
	B737CL	no
	B737NX	yes
	B747CL	no
	B744	yes
	B767CL	no
Virgin Blue	B737NX	yes
	E170-190	no
Jetstar Australia	A320	yes
	A330	yes
V Australia	B773	yes
National Jet Systems Group	B712	no
	AVRO	no
Alliance Airlines	F100	no
SkyWest Airlines	F100	yes
Tiger Airways Australia	A320	yes
Strategic Airlines	A320	yes
	A330	no
Pel-Air	LJ35/6	no
	IAI1124	no
Airnorth	E170-190	no

Table 21: Australian Operators That Flight Planned within the RVSM Airspace during May 2009

5.37 Australia informed the meeting that in an additional part of the analysis, there were a total of 12 different aircraft type groups identified with aircraft equipped with ADS-B that were operated into Australia by 29 international operators. Of the international operators identified, 22 are based in Asia/Pacific region States. The data suggests that a significant portion of the major airline fleets and specific type groups based in this region already have the potential for being height-monitored using ADS-B within the Australian airspace alone.

5.38 The analysis undertaken by the AAMA showed that currently a significant number of RVSM approved aircraft operating within the Australia FIRs were equipped with ADS-B. This fact and the expectation of increased fitment in the next few years due to new aircraft purchases and the Australian FIR mandate for fitment scheduled for December 2013, demonstrates the short-term ability of the AAMA to use ADS-B to provide initial and long term monitoring for a number of Asia/Pacific based operators and aircraft types that are already equipped with ADS-B. Primarily these will be airline operators.

5.39 Additionally, the AAMA was keen to progress discussions with Indonesian authorities with a view to obtaining ADS-B data for RVSM monitoring purposes from the extensive ADS-B network available in that State.

5.40 The meeting thanked Australia for the detailed analysis and asked for further updates to be provided at RASMAG/13. The meeting reviewed and discussed the information provided by Australia, and considered the broader opportunity for the use of ADS-B as a height-keeping monitoring system in the Asia/Pacific region.

Data Link Performance

5.41 New Zealand noted a report to the Informal South Pacific ATS Coordination Group (ISPACG) FANS Interoperability Team (FIT) Central Reporting Agency (CRA) that an A345 fleet had displayed a downward trend in data link performance in terms of both ADS-C and CPDLC round-trip times. This was thought to be due to increasing use of on-board passenger facilities for the Internet access and in-flight telephone connectivity via satellite. The performance of this fleet had degraded below that required by the Oceanic SPR. The New Zealand ANSP had, as a result, curtailed reduced distance-based separation for that A345 fleet that required compliance with the Oceanic SPR communications performance standards. It was understood that a software upgrade to the ground earth station would resolve the problem, and that this upgrade had been approved.

5.42 The meeting thanked New Zealand for brining this issue to its attention and asked that it be kept appraised of any further developments. The Chairman stated that in his view and as initially proposed when RASMAG was established, that the group should be provided with meeting outcomes and data analysis presented at CRA and FIT meetings so that RASMAG can maintain a high-level overview of issues that may impact safety in the region. This was agreed by the meeting and the Secretary was tasked to write formally to the Chairs of the relevant groups asking for such material to be provided to RASMAG on an on-going basis.

Agenda Item 6: Review and Update RASMAG Task List

6.1 The meeting agreed that the updated task list included as **Appendix E** to this report accurately reflected the work programme of RASMAG.

Agenda Item 7: Any Other Business

7.1 The Chairman raised the issue regarding the continued need for two RASMAG meetings per year given that the RMAs will be attending the annual Global RMA Coordination Group meeting and that other APANPIRG Sub-Groups meet once per year. The meeting discussed this issue in detail, and agreed that while RMA activities may to some extent be facilitated through the RMA Coordination Group, the work of the EMAs and other activities of RASMAG suggested two meetings per year was still required for the time being. This will be reviewed as required at future meetings.

7.2 As a result of a number of enquiries from Japanese operators, JCAB RMA requested if RASMAG could provide a list of available sources of height monitoring globally. In discussing this request, the RMAs present identified the following:

a. Asia/Pacific – No ground-based monitoring systems are currently deployed. Height monitoring using EGMUs is available from the AAMA, China RMA, MAAR and PARMO.

b. North America – Six ground based AGHME systems are deployed, with two in Canada. A seventh site is to be deployed shortly on the West Coast. Requests for monitoring using these systems should be made to NAARMO. EGMU monitoring is also available through NAARMO.

c. South America – Monitoring using EGMUs is available through CARSAMMA in Brazil.

d. Europe – Three ground based height monitoring systems are available, one at Strumble in Wales managed by NAT CMA, and 2 in Europe at Linz in Austria and Nattenheim in Germany, managed by Eurocontrol RMA. EGMU monitoring is also available.

e. Middle East – no height monitoring systems are currently available.

f. Africa – EGMU monitoring is available through AFI RMA.

7.3 Singapore identified that the MMR included as part of the LTHM Impact Statement was not current and that this might be misleading to operators in the region. In discussing this issue, the meeting requested that the Secretary would distribute the current ASIA/PAC MMR by a State letter noting that this should amend the LTHM Impact Statement.

Agenda Item 8: Date and Venue of the Next RASMAG Meeting

8.1 With regards to the scheduling of the next meeting, it was agreed that RASMAG/13 would be held from 12-15 July 2010, at the Regional Office premises.

8.2 The Secretariat would make appropriate arrangements and issue meeting invitations in due course.

9. Closing of the meeting

9.1 The Chairman, Mr. Butcher, thanked the meeting participants for their significant work during a busy meeting program. He particularly thanked the RMAs and SEASMA for the dedicated work they undertaken to provide detailed safety assessments for the region. He also thanked participants for their input to the initial high-level development of proposals for the height monitoring infrastructure for the region to accommodate long term monitoring requirements.

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	24.	Mr. Aumphol Tuatulanon	Aircraft Engineer, Avionics System Group Technical Department Thai Airways International Public Company Limited 333/2 M. 1 Nongprue, Bangphli Samutprakarn 10540, Thailand	Tel: +66-2-137 6210 Fax: +66-2-137 6940 E-mail: aumphol.t@thaiairways.com

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9.	**UNITED STATES (2)**			
	26.	Ms. Christine Falk	Separation Standards Group FAA Air Traffic Organization William J. Hughes Technical Center Atlantic City, NJ 08405 U.S.A.	Tel: +1-609-485 6877 E-mail: christine.falk@faa.gov
	27.	Mr. Dan Hanlon	ATO Senior Representative, Asia Pacific Group FAA Air Traffic Organization US Embassy Singapore 27 Napier Road Singapore 258508	Tel: +65-6476 9462 E-mail: dan.hanlon@faa.gov
10.	**ICAO**			
	28.	Mr. Kyotaro Harano	Regional Officer, ATM ICAO Asia & Pacific Office 252/1 Vibhavadi Rangsit Road Ladyao, Chatuchak Bangkok 10900 Thailand	Tel: 66-2-5378189 ext 159 Fax: 66-2-5378199 E-mail: kharano@bangkok.icao.int

LIST OF WORKING PAPERS AND INFORMATION PAPERS

WORKING PAPERS

NUMBER	AGENDA	TITLE	PRESENTED BY
WP/1	1	Provisional Agenda	Secretariat
WP/2	5	PBN and RVSM Approvals Databases	New Zealand
WP/3	4,5	PBN Approvals Databases	New Zealand
WP/4	5	Provision of Regional Monitoring Agency Services for Oceanic Airspace of Sanya Flight Information Region	China RMA
WP/5	3	Safety Monitoring Report from China Regional Monitoring Agency November 2008 – October 2009	China RMA
WP/6	3	China RMA Standardization Construction and Establishment of Large Height Deviation Data Collection Mechanism from Domestic Chinese Operators	China RMA
WP/7	5	Long Term Monitoring Issues of China RMA	China RMA
WP/8	3	Safety Monitoring Report from the Pacific Approvals Registry and Monitoring Organization October 2008 – September 2009	PARMO
WP/9	3	Safety Assessment of RVSM within the Australian Flight Information Regions	Australia
WP/10	5	Trial-Use of the Automatic Dependent Surveillance – Broadcast Data for Estimating Aircraft Altimetry System Error	United States Australia
WP/11	2	Development of a Revised Version of Doc 9574 Manual on Implementation of A 300 M (1 000 Ft) Vertical Separation Minimum between Fl 290 And Fl 410 Inclusive	Australia
WP/12	3	Safety Assessment of RVSM within the Indonesian Flight Information Regions	Australia
WP/13	2	APANPIRG Activities – Outcomes of APANPIRG/20	Secretariat
WP/14	6	Review of RASMAG Task List	Secretariat
WP/15	5	Inclusion of all PBN Approval Types in the Flight Plan for all Flights	Singapore
WP/16	5	RVSM Rogue Airframes in the Australian FIRs	Australia
WP/17	3	Safety Assessment Of Rvsm Within The Fukuoka Flight Information Region	Japan
WP/18	4	Review of RASMAG List of Competent Airspace Safety Monitoring Organizations	Secretariat
WP/19	3	Report from the South East Asia Safety Monitoring Agency: November 2008 – October 2009	Singapore

NUMBER	AGENDA	TITLE	PRESENTED BY
WP/20	5	Initial Analysis of RVSM Approved Aircraft Equipage of ADS-B and its potential for use as a Height-Keeping Monitoring System in the Australian FIRs	Australia
WP/21	3	Large Height Deviation (LHD) between Japan and Republic of Korea	Japan
WP/22	3	Assessment of Non-RVSM-Approved Aircraft Using Chinese RVSM Airspace	China RMA
WP/23	3	Summary of the Airspace Safety Review for the RVSM Operation in Asia Region	MAAR

INFORMATION PAPERS

NUMBER	AGENDA	TITLE	PRESENTED BY
IP/1	-	List of Working Papers (WPs) and Information Papers (IPs)	Secretariat
IP/2	5	A340 Fleet Datalink Performance Issues	New Zealand
IP/3	2	Outcomes of the Fifth Meeting of the PBN Task Force	Secretariat

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APANPIRG Asia/Pacific Airspace Safety Monitoring

RASMAG LIST OF COMPETENT AIRSPACE SAFETY MONITORING ORGANIZATIONS

The Regional Airspace Safety Monitoring Advisory Group of APANPIRG (RASMAG) is required by its terms of reference to recommend and facilitate the implementation of airspace safety monitoring and performance assessment services and to review and recommend on the competency and compatibility of airspace monitoring organizations. In order to assist in addressing these requirements, RASMAG updates and distributes the following list of competent airspace safety monitoring organizations for use by States requiring airspace safety monitoring services. In the context of the list, abbreviations have meanings as follows:

- RMA – Regional Monitoring Agency – safety assessment and monitoring in the vertical plane (i.e. RVSM);
- EMA – En-route Monitoring Agency – safety assessment and monitoring in the horizontal plane (i.e. RHSM, RNAV10, RNP4);
- CRA – Central Reporting Agency – technical performance of data link systems (i.e. ADS/CPDLC); and
- FIT – FANS 1/A Interoperability/Implementation Team – parent body to a CRA.

(Last updated ~~12 June~~ 17 December 2009)

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
Australian Airspace Monitoring Agency (AAMA) - Airservices Australia http://www.airservicesaustralia.com/organisations/aama/default.asp Mr. Robert Butcher, Operational Analysis Manager, Safety and Environment Group email: robert.butcher@airservicesaustralia.com or aama@airservicesaustralia.com	Australia	APANPIRG RMA	Current	Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby and Ujung Pandang FIRs.
		EMA	Current	Brisbane, Melbourne FIRs.

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
China RMA - **Air Traffic Management Bureau, (ATMB) of Civil Aviation Administration of China (CAAC)** http://www.chinarma.cn (secure site) Mr. Tang Jinxiang, Engineer of Safety and Monitoring Technical Group, ATMB email: tangjx@adcc.com.cn	China	APANPIRG RMA	Current	Beijing, Guangzhou, Kunming, Lanzhou, Shanghai, Shenyang, Urumqi Wuhan Sanya and Pyongyang FIR.
JCAB RMA - **Japan Civil Aviation Bureau** Mr. Noritoshi Suzuki, Special Assistant to the Director, Flight Procedures and Airspace Program Office, email: suzuki-n248@mlit.go.jp	Japan	APANPIRG RMA	Current	Fukuoka FIR
		EMA	Available fourth quarter – 2009	Fukuoka FIR
Monitoring Agency for the Asia Region (MAAR) – **Aeronautical Radio of Thailand LTD** http://www.aerothai.co.th/maar Mr. Nuttakajorn Yanpirat, Executive Officer, Systems Engineering,Aeronautical Radio of Thailand Ltd. email: nuttakajorn.ya@aerothai.co.th or maar@aerothail.co.th	Thailand	APANPIRG RMA	Current	Bangkok, Kolkatta, Chennai, Colombo, Delhi, Dhaka, Hanoi, Ho Chi Minh, Hong Kong, Karachi, Kathmandu, Kota Kinabalu, Kuala Lumpur, Lahore, Male, Manila, Mumbai, Phnom Penh, Singapore, Taibei, Ulaan Bataar, Vientiane, Yangon FIRs

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
Pacific Approvals Registry and Monitoring Organization (PARMO) – Federal Aviation Administration (US FAA) http://www.tc.faa.gov/acb300/parmo Mr. Dale Livingston, Manager, Separation Standards Analysis Team, FAA, email: dale.livingston@faa.gov or aparmo@faa.gov	USA	APANPIRG RMA	Current	Anchorage Oceanic, Auckland Oceanic, Incheon, Nadi, Oakland Oceanic, Tahiti FIRs
		EMA	Current	Anchorage Oceanic, Oakland Oceanic
South East Asia Safety Monitoring Agency (SEASMA) - Civil Aviation Authority of Singapore (CAAS) Mr. Kuah Kong Beng, Chief Air Traffic Control Officer, email: KUAH_Kong_Beng@caas.gov.sg	Singapore	EMA for South China Sea	Current	Hong Kong, Ho Chi Minh, Kota Kinabalu, Kuala Lumpur, Manila, Sanya and Singapore FIRs
FIT - SEA (ICAO Regional Office email icao_apac@bangkok.icao.int & **CRA Japan** Mr. Mitsuo Hayasaka, Deputy Director, Air Traffic Control Association Japan, email:hayasaka@atcaj.or.jp	ICAO Regional Office & CRA Japan	FIT & CRA	Current	South China Sea FIRs

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
IPACG/FIT Mr. Takahiro Morishima, JCAB Co-Chair email: morishima-t2zg@mlit.go.jp & Mr. Reed Sladen, FAA Co-Chair, email: reed.b.sladen@faa.gov	Japan & USA	FIT & CRA	Current	North & Central Pacific (Oceanic airspace within Fukuoka FIR, and Anchorage & Oakland FIRs)
CRA Japan Mr. Mitsuo Hayasaka, Deputy Director, Air Traffic Control Association Japan, email: hayasaka@atcaj.or.jp	Japan	CRA	Current	Fukuoka FIR for IPACG/FIT Ho Chi Minh, Manila, Singapore FIRs for FIT-SEA
FIT - BOB ICAO Regional Office email icao_apac@bangkok.icao.int & Mr. Bradley Cornell, Boeing Engineering email: Bradley.D.Cornell@Boeing.Com	ICAO Regional Office & Boeing USA	FIT & CRA	Current	Bay of Bengal FIRs, Ujung Pandang and Jakarta FIRs, provides assistance to the members of the Arabian Sea/Indian Ocean ATS Coordination Group (ASIOACG)
ISPACG/FIT Mr. Bradley Cornell, Boeing Engineering email: Bradley.D.Cornell@Boeing.Com	Boeing USA	FIT & CRA	Current	South Pacific FIRs and members of the Informal South Pacific ATS Coordination Group (ISPACG)

PROPOSED APPROVALS DATABASE RECORD FORMAT

Aircraft & Operator Details	
Registration No	
State of Registry	
Registration Date	
Name of Operator	
State of Operator	
Operator Identifier	
Operator Type	*[CIV/MIL]*
Aircraft Type	
Aircraft Series	
Manufacturers Serial No	
Mode S Address Code	

Approval	Airworthiness Approval *(State)*	Primary Sensor Type *(DME-DME/ INS/IRS/GNSS)*	Time Limit *(hrs)*	Vertical Guidance *(APV/LPV)*	RF Leg Capable *(Yes/No)*	Limitations *(text)*	Date	Operational Approval *(State)*	Date	Expiry date	Approval withdrawn *(date)*	Information provided by State authority	Regional approval
RNAV10													
RNAV5													
RNAV2													
RNAV1													
RNP4													
RNP2													
Basic RNP1													
Advanced RNP1													
RNP APCH													
RNP AR APCH													
RVSM													
VDL													
Mode S													
SATCOM													
HF													
Remarks													

RASMAG — TASK LIST

(last updated ~~12 June~~16 December 2009)

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
8/6	Take action to implement Long-Term Height Monitoring (LTHM) Actions ~~1 6~~1, 5 and 6 as described in RASMAG/8 report. In particular, ensure arrangements for regional cooperation between RMAs.	~~RASMAG/12~~ RASMAG/13	Asia/Pacific RMAs	Open	RASMAG LTHM Actions promulgated by State Letter AP018/8 of 31 January 2008. RASMAG/9 informed no progress made due to priority workloads for all RMAs and Regional Office. RASMAG/10 informed of actions taken so far, update RASMAG/11 about progress RASMAG/12 agreed: LTHM Action 1 Open LTHM Action 2 Completed LTHM Action 3 Completed LTHM Action 4 Completed LTHM Action 5 Open LTHM Action 6 Open
~~9/4~~	~~Japan to attempt to capture and analyse data in relation to implementation of AIDC with Republic of Korea during 2009 Attempt to show Category E LHD performance before and after implementation of AIDC~~	~~RASMAG/12~~	~~JCAB RMA~~	~~Open~~ Completed	~~AIDC trials commenced May 2009, implementation scheduled June 2009, JCAB RMA will update RASMAG/12~~
~~10/1~~	~~Standardise annual December TSD data collection template across all RMAs for regional application. Noting intention to expand use of December TSD to EMA and general planning and implementation, ensure collection of "En route PBN Approvals Status" (e.g. RNP 4) and ATS route parameters.~~	~~RASMAG/11~~	~~Asia/Pacific RMAs, EMAs~~	~~Open~~ Completed	~~Lead RMA is PARMO. RMAs to work by correspondence, present final template to RASMAG/11 for adoption~~ ~~RASMAG/11 adopted standardised temp[late with new columns for aircraft registration and en route PBn capability~~

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
10/2	Undertake studies to quantify the magnitude of the problem of RVSM non-approved flights operating in RVSM airspace. Identify solutions.	~~RASMAG/12~~ RASMAG/13	Asia/Pacific RMAs,	Open	Lead RMA is PARMO. RMAs to work by correspondence, present adequate information to RASMAG/11 to compile briefing for APANPIRG PARMO provided update report to RASMAG/11, further development required before reporting to APANPIRG RMAs will provide RASMAG/13 with activity reports on solutions.
~~10/3~~	~~Recognising delays in RMA manual, Annex 6 monitoring requirements not implemented until Nov 2010, encourage APANPIRG to adopt MAAR MMRs as recommended by RASMAG.~~	~~RASMAG/12~~	~~RASMAG, Regional Office~~	~~Open~~ Completed	~~RASMAG/10 prepared draft APANPIRG Conclusion for consideration by APANPIRG in September 2009.~~ ~~RASMAG/11 updated MMRs to include E170, E190 & A388.~~
10/7	Prepare Taxonomy of RMA related terms with objective of clarifying and standardising reporting of LHD by States and limiting under reporting. Consider inclusion of taxonomy as appendix to Regional Monitoring Impact Statement	~~RASMAG/12~~ RASMAG/13	Asia/Pacific RMAs	Open	Lead RMA is AAMA. RMAs to work by correspondence, present final version to RASMAG/11 for inclusion in impact statement
~~10/8~~	~~Prepare final version of EMA Handbook for recommendation by RASMAG/11 to APANPIRG for adoption as regional guidance material~~	~~RASMAG/12~~	~~Small drafting Group (SEMAHRT members)~~	~~Open~~ Completed	~~Present final version to RASMAG/11 for Recommendation~~ ~~RASMAG/11 adopted advanced draft and continued small drafting group to prepare a submission to APANIRG/20 in September 2009.~~

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
~~10/9~~	~~Write advanced draft of Regional Impact Statement for long term height monitoring as required by APANPIRG Conclusion 18/4~~	~~RASMAG/12~~	~~Small drafting Group (Mr Butcher, Mr Tang Jinxiang, Mr Yanpirat, Mr Oseto, Ms Falk, Mr Farmer and RASMAG Secretary)~~	~~Open~~ Completed	~~Present advanced version to RASMAG/11 as basis for APANPIRG briefing~~ ~~RASMAG/11 adopted advanced draft and continued small drafting group to prepare a submission to APANIRG/20 in September 2009. RMAs to populate monitoring burden tables and send to Regional Office by 31 July.~~
10/11	Standardise methodology of assessing duration of LHDs in application of the CRM	~~RASMAG/12~~ RASMAG/13	Asia/Pacific RMAs	Open	Lead RMA is AAMA. RMAs to work by correspondence, present updated information to RASMAG/11. PARMO presented information to RASMAG/11 on durations for crossing flight levels, further study and update to RASMAG/12. PARMO will present updated information to RASMAG/13 on durations for crossing flight levels.
~~11/1~~	~~RMAs agreed to amend wording on LHD submission template to read to read "*Were the Supervisors of the transferring and receiving ACCs advised of this LHD occurrence?*"~~	~~RASMAG/12~~	~~Asia/Pacific RMAs~~	~~Open~~ Completed	

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
11/2	Prepare RASMAG template letter for use by RMAs in resolving difficulties with States. Such a letter would specify that the request has been made on behalf of RASMAG which has specific empowerment from APANPIRG. RASMAG/11 paragraph 2.8 refers.	~~RASMAG/12~~ RASMAG/13	Asia/Pacific RMAs, Secretariat	Open	RMAs to work by correspondence and present a draft template letter to RASMAG/13.
~~11/3~~	~~Include aircraft identification and en route PBN approval type in RMA TSD templates to encourage inclusion of this data in Annual December TSD~~	~~RASMAG/12~~	~~Asia/Pacific RMAs~~	~~Open~~ Completed	
12/1	The Chairman to develop proposed wording for the RVSM Manual (Doc 9574) as detailed in para 2.4 of RASMAG/12 report and to circulate the material to the RASMAG members for review prior to the end of March 2010. The Chairman to ensure that the wording was included in the revised draft to be presented to SASP in May 2010.	31 March 2010	Chairman	Open	Australia presented the draft amendment to RASMAG/12. Experience of Western Pacific/South China Sea (WPAC/SCS) RVSM Scrutiny Group could be included.
12/2	Initial analysis of LTHM infrastructure developed at RASMAG/12 detailed in para 2.15 of the report, should be reviewed by each RMA and State represented at RASMAG to consider further details in the interim before RASMAG/13. Additionally each of the RMAs to develop an analysis of the States for which they are responsible assuming that the proposed monitoring systems were in place. The analysis should determine the aircraft numbers and types that would be monitored by those systems. The data is to be presented in tables similar to those used by Australia in WP/20 at RASMAG/12. The data should be collected, analysed and forwarded to MAAR by end of April 2010, and thereafter reported by States to RASMAG/13.	1/ End of April 2010 2/ RASMAG/13	All RMAs	Open	APANPIRG/20 (September 2009, Bangkok) was of view that more information was needed on which to base any decision and agreed that RASMAG would be tasked.
12/3	Expand coordination with FANS Implementation/Interoperability Teams (FIT) and/or Central Reporting Agencies (CRA) to obtain updated information on data link system performance	RASMAG/13	Regional Office	Open	Regional Office will send a State letter to Chairpersons of FIT and/or CRAs to have the holistic view of the data link application problems

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
12/4	Provide analysis of AIDC implementation and the effect of those implementations of the level of Category E LHD reports.	RASMAG/13	Asia/Pacific RMAs	Open	Japan captured and analysed data in relation to implementation of AIDC. RMAs will attempt to show Category E LHD performance before and after implementation of AIDC.
12/5	EMA Manual to be amended by Appendix D PROPOSED APPROVALS DATABASE RECORD FORMAT to the RASMAG/12 report.	RASMAG/13	Secretary	Open	Para 5.4 of the RASMAG/12 report
12/6	Review the proposal contained in WP/2 of RASMAG/12 and bring comments on the proposal to RASMAG/13 for further consideration.	RASMAG/13	ALL	Open	RASMAG/12 was presented by New Zealand on a common approvals database.
12/7	Coordinate the proposal to use Field 18 of the flight plan on a regional basis to identify an aircraft's PBN approvals, to the Flight Plan & ATS Message Task Force and to the ATM/AIS/SAR Sub-Group	February 2010	Secretary and Singapore	Open	RASMAG/12 Report para 5.12
12/8	State letter to be sent from Regional Office to China requesting them to provide China RMA with the necessary support for the establishment of a ground-based monitoring system.	Following coordination of draft letter	Secretary and China RMA	Open	RASMAG/12 report para 5.20
12/9	Continue joint research activity to explore ADS-B derived geometric height as a data source for aircraft height-keeping performance monitoring	RASMAG/13	Australia and United States	Open	

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