INTERNATIONAL CIVIL AVIATION ORGANIZATION

TWENTY-SECOND MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/22)

Bangkok, Thailand, 5-9 September 2011

Agenda Item 3: **Performance Framework for Regional Air Navigation Planning and Implementation (3.3 RASMAG)**

RASMAG OUTCOMES

(Presented by the Secretariat)

SUMMARY

This paper presents a summary of the RASMAG/14 (21-25 February 2011, Bangkok, Thailand) and RASMAG/15 (1-5 August 2011, Bangkok) meetings.

This paper relates to –

Strategic Objectives:

*A: **Safety** – Enhance global civil aviation safety*

*C: **Environmental Protection and Sustainable Development of Air Transport** – Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-2 Reduced vertical separation minima
GPI-8 Collaborative airspace design and management
GPI-9 Situational awareness
GPI-16 Decision support systems and alerting systems
GPI-21 Navigation systems
GPI-22 Communication infrastructure

1. INTRODUCTION

1.1 The Fourteenth and Fifteenth Meetings of the Regional Airspace Safety Monitoring Advisory Group (RASMAG) were held in Bangkok, Thailand from 21 to 25 February and 1 to 4 August 2011 respectively at the ICAO Asia and Pacific Regional Office.

1.2 Mr. Robert Butcher, Operational Analysis Manager, Safety and Assurance Group, Airservices Australia, chaired the meetings. Mr. Len Wicks, Regional Officer ATM, ICAO Asia and Pacific Office, was the Secretary for the meetings.

1.3 RASMAG/14 and RASMAG/15 formulated three draft Conclusions and three draft Decisions as follows for consideration by APANPIRG/22. A copy of the full reports of the meetings is available on the website of ICAO Asia and Pacific Office at http://www.bangkok.icao.int/.

List of Draft Conclusions

Draft Conclusion 14/1 - Provision of Datalink Performance Data to CRA

Noting the pre- and post-implementation system performance monitoring required by Annex 11[1], the Global Operational Data Link Document (GOLD) and the Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service Data Link Systems in the Asia/Pacific Region, States are urged to ensure that the appropriate data link performance monitoring is undertaken and reported to CRAs/FITs, as required, in a timely manner.

Draft Conclusion RASMAG 15/1 – RVSM Approvals

That, the States are urged to:

a) ensure that they provide point of contact details and complete RVSM approval data to the appropriate RMA in a timely manner; and

b) encourage their ANSP to provide details to their RMA, on a monthly basis, of all flight plans filed showing RVSM approval; and

c) take appropriate action regarding non-compliant aircraft, on the basis of the data provided by their RMA.

Draft Conclusion RASMAG 15/2 − Minimum Monitoring Requirements Amendment

That, the updated Minimum Monitoring Requirements (MMR) Table attached in **Appendix C** be endorsed for Regional application.

List of Draft Decisions

Draft Decision RASMAG 15/3 − Datalink Performance Monitoring Body

That, the FANS Implementation Team - Bay of Bengal (FIT-BOB) and Southeast Asia (FIT-SEA) be combined as a new body (FIT-Asia), reporting to RASMAG, in accordance with the Terms of Reference appended in **Appendix A.**

Draft Decision RASMAG 15/4 − Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) Endorsement

That, the Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) be endorsed as an En-Route Monitoring Agency (EMA).

Draft Decision RASMAG 15/5 − Japan Airspace Safety Monitoring Agency (JASMA) Endorsement

That, the Japan Airspace Safety Monitoring Agency (JASMA) be endorsed as an En-Route Monitoring Agency (EMA), which will also undertake the current Japan Regional Monitoring Agency (RMA) functions.

(Decision RASMAG 15/6 – Distribution of RVSM Approvals Data)

[1] – *Air Traffic Service* (Para 2.26.5)

2. DISCUSSION

Agenda Item 2: Review Outcomes of Related Meetings

ATM/AIS/SAR/SG/21

2.1 The meeting reviewed the outcomes of the Air Traffic Management/Aeronautical Information Services/Search and Rescue Sub-Group of APANPIRG (ATM/AIS/SAR/SG/21), which was held in Bangkok, Thailand from 27 June to 01 July 2011.

2.2 The meeting was presented with the draft APAC Concept of Operations (ATM/AIS/SAR SG Draft Conclusion SG 21/8), which provided a future state that ANSPs and airlines could plan towards. In regards to the application of new PBN navigation specifications, the Chairman (also Chairman of the Separation and Airspace Panel, SASP) noted that SASP had provided input into the draft RNP2 navigation specification to ensure there were no implementation limitations by the specification catering for all TSO 129 capable aircraft and above, and it was not just for 'high end' operators. Moreover, the Chairman noted that SASP was continuing to validate actual navigation performance data to develop new methodologies to derive separation standards for RNP, rather than using theoretical PBN containment.

FANS Implementation Teams

2.3 The Thirteenth Meeting of the FANS Implementation Team for the Bay of Bengal (FIT-BOB/13, Bangkok, 07 to 08 February 2011) recognised that BOB and FIT-SEA (Southeast Asia) could be combined in order to include more experts, enable lessons learnt in one sub-region to assist other areas, and to reduce meeting costs. The ATM/AIS/SAR/SG discussed this and agreed to refer the matter to RASMAG after discussion with the FIT-SEA Chairman (there was no FIT-BOB Chair).

2.4 The ATM/AIS/SAR SG noted that there had been a lack of Problem Reports (PRs) provided to the FITs, which should be encouraged as these were a vital part of the safety oversight of data link operations. RASMAG itself had raised concerns in previous meetings about the piece-meal nature of datalink performance data that had been made available to RASMAG.

2.5 Japan agreed with the combining of the two FIT meetings to strengthen the expertise and data assessment, and a change of reporting to RASMAG. Japan wanted clarification about the geographical scope of the new body. This was suggested by the Secretariat as being within the Asian Region, with the exception of any FIR that was being currently serviced by another FIT.

2.6 New Zealand suggested that the FIT should mean FANS Interoperability Team (as opposed to Implementation), as this was the current emphasis. New Zealand also suggested that the combined Terms of Reference (TOR) of the current FITs should take into account the established template. The meeting agreed with this approach and a draft TOR was developed on this basis.

2.7 Viet Nam supported the combination of the FITs, suggesting that the name FIT-Asia better reflected the datalink oversight process.

2.8 A Draft Decision was developed as follows:

Draft Decision RASMAG 15/3 − Datalink Performance Monitoring Body

That, the FANS Implementation Team - Bay of Bengal (FIT-BOB) and Southeast Asia (FIT-SEA) be combined as a new body (FIT-Asia), reporting to RASMAG, in accordance with the Terms of Reference appended in **Appendix A**.

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

Australian, Nauru and Solomon Islands Airspace

2.9 Australia presented the results of the safety assessment of the Brisbane, Honiara, Melbourne and Nauru FIRs undertaken by the Australian Airspace Monitoring Agency (AAMA). The RVSM safety oversight was based on a one month traffic sample data (TSD) collected in December 2010 and monthly Large Height Deviation (LHD) reports from 1 May 2010 to 30 April 2011. The highest assessed duration of LHDs was for Category A and Category E type reports (flight crew failing to climb/descend as cleared by ATC and ATC coordination errors).

2.10 **Table 1** below summarizes the results of the airspace safety oversight in terms of the RVSM technical, operational, and total risks. **Figure 1** presents the collision risk estimate trends for each month using the appropriate cumulative 12-month of LHD reports since 1 May 2010.

Australian, Nauru and Solomon Islands RVSM Airspace *– estimated annual flying hours = 576,827.98 hours* *(note: estimated hours based on December 2010 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	0.028×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	5.63×10^{-9}	-	-
Total Risk	**5.66×10^{-9}**	5.0×10^{-9}	**Above Overall TLS**
RASMAG14			
Technical Risk	0.028×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	5.19×10^{-9}	-	-
Total Risk	**5.21×10^{-9}**	5.0×10^{-9}	**Above Overall TLS**
RASMAG15			
Technical Risk	0.029×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	4.24×10^{-9}	-	-
Total Risk	**4.27×10^{-9}**	5.0×10^{-9}	**Below Overall TLS**

Table 1: RVSM Risk Estimates for Australia, Nauru and Solomon Islands Airspace

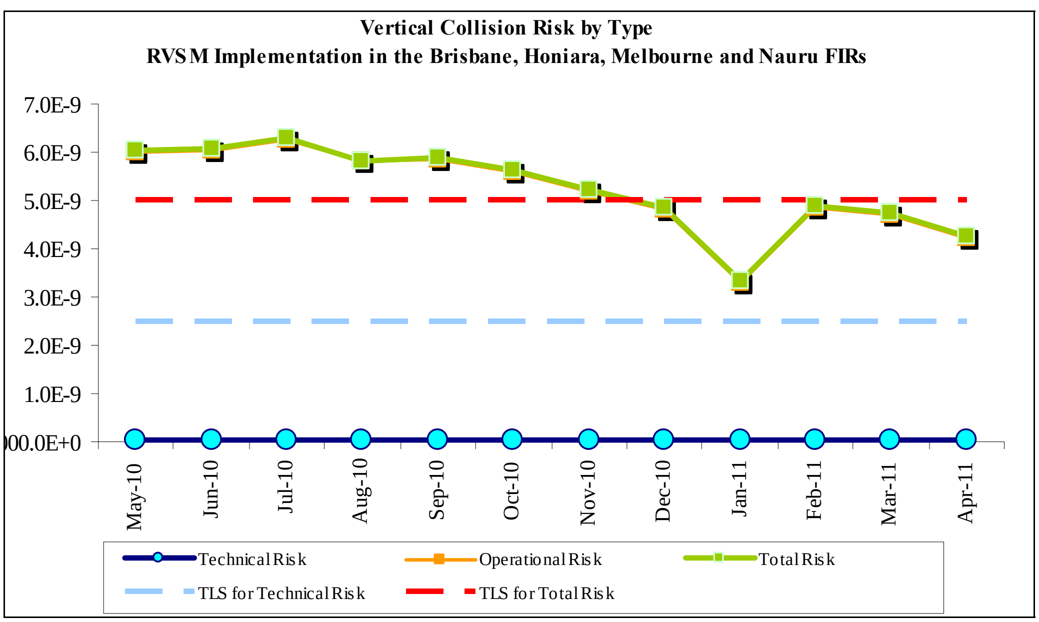


Figure 1: Risk Estimate Trends for Australian, Nauru and Solomon Islands Airspace

2.11 The meeting noted that the AAMA had completed further assessments for the months of May and June 2011 for the Australian, Nauru and Solomon Islands airspace. These assessments show that the assessed risk had reduced to approximately 3.49 x 10^{-9}.

<u>Indonesian Airspace</u>

2.12 Australia presented the results of a safety assessment for the Jakarta and the Ujung Pandang FIRs. The RVSM safety oversight was conducted based on a one-month TSD collected in December 2010 and monthly LHD reports between May 2010 and April 2011.

2.13 **Table 2** summarizes the results of the airspace safety oversight in terms of the RVSM technical, operational, and total risks for Indonesian airspace. **Figure 2** presents the collision risk estimate trends for the period from November 2008 to end of April 2011.

Indonesian RVSM Airspace – *estimated annual flying hours = 556 078.09 hours (note: estimated hours based on Dec 2010 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	0.761 x 10^{-9}	2.5 x 10^{-9}	Below Technical TLS
Operational Risk	4.67 x 10^{-9}	-	-
Total Risk	**5.43 x 10^{-9}**	5.0 x 10^{-9}	**Above Overall TLS**
RASMAG14			
Technical Risk	0.761 x 10^{-9}	2.5 x 10^{-9}	Below Technical TLS
Operational Risk	6.07 x 10^{-9}	-	-
Total Risk	**6.83 x 10^{-9}**	5.0 x 10^{-9}	**Above Overall TLS**
RASMAG15			
Technical Risk	0.173 x 10^{-9}	2.5 x 10^{-9}	Below Technical TLS
Operational Risk	6.10 x 10^{-9}	-	-
Total Risk	**6.27 x 10^{-9}**	5.0 x 10^{-9}	**Above Overall TLS**

Table 2: RVSM Risk Estimates for Indonesian Airspace

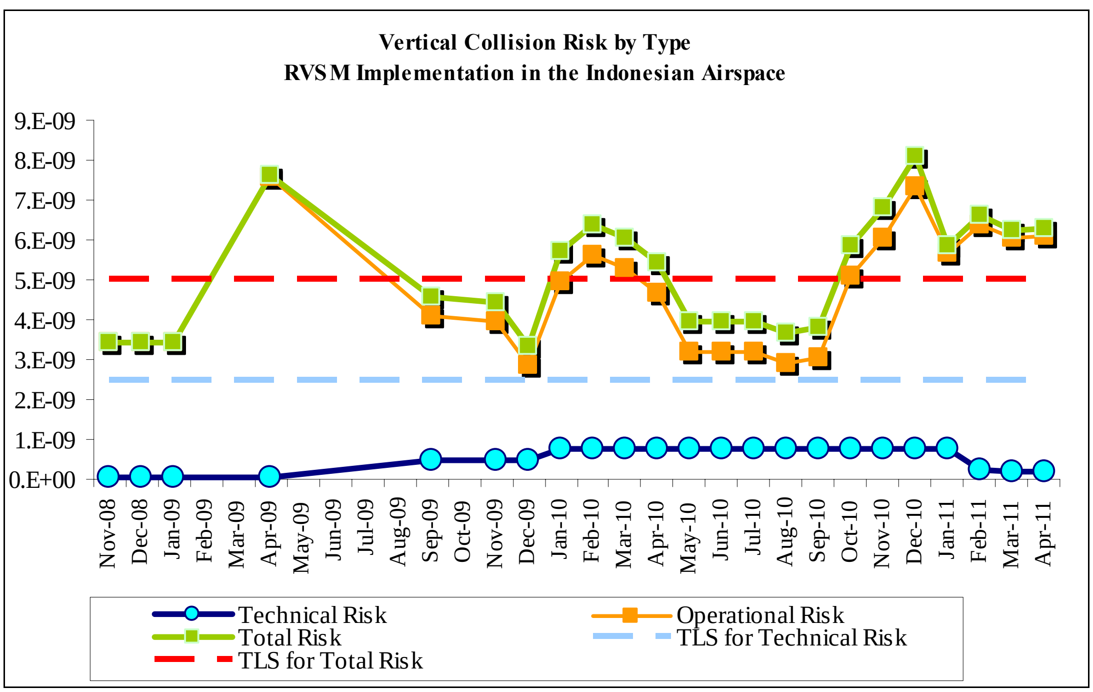


Figure 2: RVSM Risk Estimate Trends for Indonesian Airspace

2.14 The meeting noted that the AAMA has completed further assessments for the months of May and June 2011 for the Indonesian airspace. These assessments show that the assessed risk has reduced marginally to approximately 6.18 x 10^{-9}.

2.15 The AAMA was pleased to report that the on-going assistance it received from the Indonesian DGCA and the two air navigation service providers and this had enabled the AAMA to complete its monthly assessments in a timely manner. While there has been notable improvement in the reporting of LHDs by the two Indonesian ANSPs, the AAMA continues to work with the Indonesian authorities to improve the reporting of operational errors and LHD. The additional LHDs in the Indonesian data were believed to be from an improvement in the reporting culture, which was commendable.

Papua New Guinea Airspace

2.16 RASMAG/15 was informed that the AAMA was able to provide a risk assessment for the Papua New Guinea airspace last year for the period ending April 2010, but had been unable to finalise an assessment for the year ending April 2011 until after the meeting. The RVSM safety oversight was conducted based on a one-month TSD collected in December 2010 and monthly LHD reports between May 2010 and April 2011.

2.17 No LHDs were received from the Papua New Guinea Air Navigation Service Provider. The AAMA continues to work with the State authorities to improve the reporting of operational errors and large height deviations. Additionally the AAMA had access to reports provided by Australia that included possible risk bearing LHDs relative to the Port Moresby FIR. Assessment of these reports was made from the perspective of their impact within the Papua New Guinea airspace.

2.18 **Table 3** summarizes the results of the airspace safety oversight in terms of the RVSM technical, operational, and total risks for Papua New Guinea RVSM airspace. **Figure 3** presents collision risk estimate trends for each month using the appropriate cumulative 12-month of LHD reports since April 2010.

Papua New Guinea RVSM Airspace – *estimated annual flying hours = 18155.41 hours (note: estimated hours based on Dec 2010 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	0.0264 x 10^{-9}	2.5 x 10^{-9}	Below Technical TLS
Operational Risk	2.13 x 10^{-9}	-	-
Total Risk	**2.15 x 10^{-9}**	5.0 x 10^{-9}	**Below Overall TLS**
RASMAG14			
Technical Risk	-	-	-
Operational Risk	-	-	-
Total Risk	-	-	-
RASMAG15			
Technical Risk	0.0264 x 10^{-9}	2.5 x 10^{-9}	Below Technical TLS
Operational Risk	1.09 x 10^{-9}	-	-
Total Risk	**1.12 x 10-9**	5.0 x 10^{-9}	**Below Overall TLS**

Table 3: RVSM Risk Estimates for Papua New Guinea Airspace

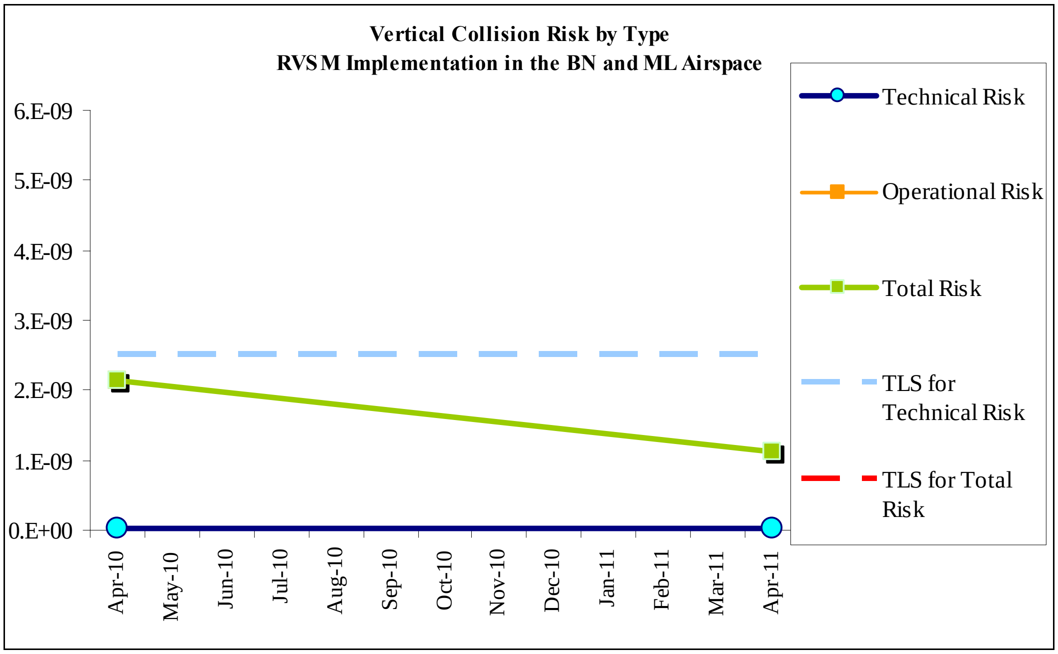


Figure 3: RVSM Risk Estimate Trends for Papua New Guinea Airspace

Chinese RVSM Airspace

2.19 China RMA provided the results of the airspace safety oversight for the RVSM operation in the Chinese FIRs for the period of 01 May 2010 - 30 April 2011.

2.20 The LHD occurrences in the China RVSM airspace were summarized as:

- Thirty reported large height deviations occurred during the reporting period. Twenty seven of the deviations were reported by China RMA, and three events were reported by neighbouring RMAs. Twelve events contribute to technical risk, and eighteen events contributed to the operational risk.

- The main contributor to the operational risk of Chinese RVSM airspace is flight crew failing to climb/descend the aircraft as cleared (Category A). One event of ten minutes duration was the main contributor to the operational risk. China had commented at RASMAG/14 that these were in radar surveillance involving aircraft that had failed to capture an assigned level and were identified by ATC.

2.21 **Table 4** summarizes the results of the airspace safety oversight in terms of the RVSM technical, operational, and total risks for Chinese RVSM airspace. **Figure 4** presents collision risk estimate trends for each month using the appropriate cumulative 12-month of LHD reports since May 2010.

RVSM Airspace of Chinese FIRs– *estimated annual flying hours = 2 642 778 hours (note: estimated hours based on the December 2010 traffic sample data; estimate represents the sum of total flying hours for Radar and Procedural control areas)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	1.741×10^{-10}	2.5×10^{-9}	Below Technical TLS
Operational Risk	1.853×10^{-9}	-	-
Total Risk	$\mathbf{2.027 \times 10^{-9}}$	5.0×10^{-9}	**Below Overall TLS**
RASMAG14			
Technical Risk	1.741×10^{-10}	2.5×10^{-9}	Below Technical TLS
Operational Risk	1.602×10^{-9}	-	-
Total Risk	$\mathbf{1.776 \times 10^{-9}}$	5.0×10^{-9}	**Below Overall TLS**
RASMAG15			
Technical Risk	0.170 x 10^{-9}	2.5 x 10^{-9}	Below Technical TLS
Operational Risk	1.612 x 10^{-9}	-	-
Total Risk	**1.78 x 10^{-9}**	**5.0 x 10^{-9}**	**Below Overall TLS**

Table 4: RVSM Risk Estimates for Chinese Airspace

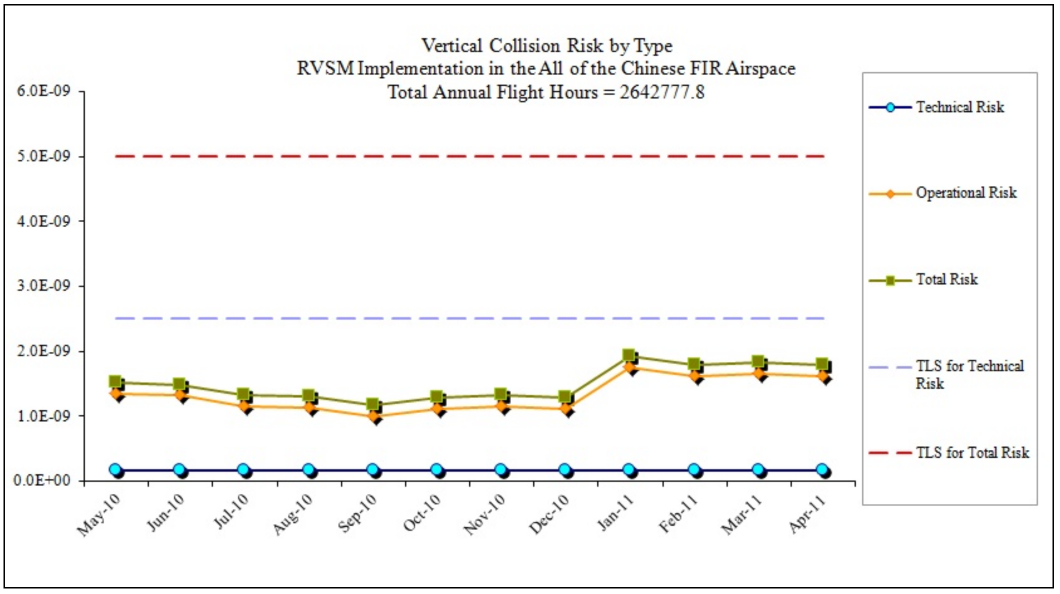


Figure 4: RVSM Risk Estimate Trends for Chinese Airspace

<u>Pyongyang FIR</u>

2.22 China RMA provided the results of the airspace safety oversight for the RVSM operation in the Pyongyang FIR for the period of 01 May 2010 - 30 April 2011. China informed the meeting that it had continued to work closely with DPR Korea to ensure that large height deviation reports and traffic sample data were reported effectively. However to date, there had been no report of a large height deviation for aircraft operating in the airspace of Pyongyang FIR.

2.23 As a result, to make a conservative estimate for the operational risk, China RMA applied the same operational risk value used in the preliminary assessment for Pyongyang FIR from a similar FIR in China. China noted that the new LHD taxonomy from the RMACG/6 meeting might hopefully further improve the understanding of LHD reporting, and would highlight this definition to the DPRK.

2.24 **Table 5** provides the results of the airspace safety oversight, as of April 2011, in terms of the RVSM technical, operational, and total risks for the airspace of DPR Korea. **Figure 5** presents the collision risk estimate trends for each month using the estimated LHD data since May 2010.

RVSM Airspace of DPR Korea – *estimated annual flying hours = 1781 hours (note: estimated hours based on the December 2010 traffic sample data; estimate represents the sum of total flying hours for Pyongyang FIR)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	0.402×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	1.55×10^{-9}	-	-
Total Risk	**1.95×10^{-9}**	5.0×10^{-9}	**Below Overall TLS**
RASMAG14			
Technical Risk	4.02×10^{-10}	2.5×10^{-9}	Below Technical TLS
Operational Risk	1.55×10^{-9}	-	-
Total Risk	**1.95×10^{-9}**	5.0×10^{-9}	**Below Overall TLS**
RASMAG15			
Technical Risk	$0.402 \text{ x } 10^{-9}$	$2.5 \text{ x } 10^{-9}$	Below Technical TLS
Operational Risk	$1.550 \text{ x}10^{-9}$	-	-
Total Risk	**$1.95 \text{ x}10^{-9}$**	**$5.0 \text{ x } 10^{-9}$**	**Below Overall TLS**

Table 5: RVSM Risk Estimates for DPR Korea Airspace

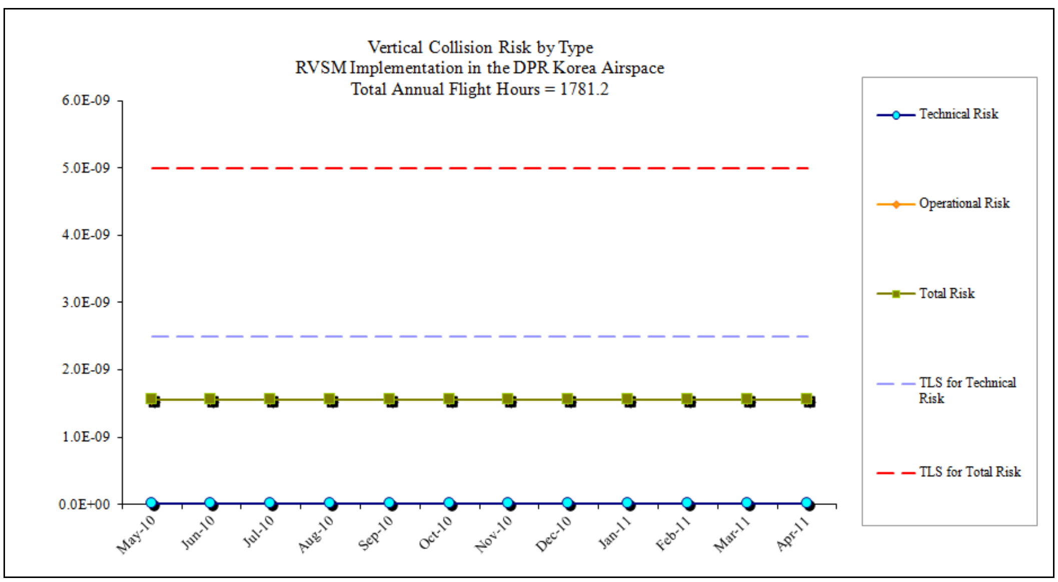


Figure 5: RVSM Risk Estimate Trends for DPR Korea Airspace

2.25 The meeting noted the low annual flying hours for the Pyongyang FIR and that no LHDs had been reported. The meeting encouraged China to continue its work with DPR Korea to ensure that the best possible data was made available for China to undertake its on-going risk assessments.

Fukuoka FIR

2.26 Japan Civil Aviation Bureau RMA (JCAB RMA) provided the results of safety assessment for the Fukuoka FIR for the period of 01 May 2010 - 30 April 2011.

2.27 The meeting was informed that ATC loop errors accounted for the largest number of LHD reports as well as the longest duration during the reporting period. The second biggest contributor was ATC coordination errors as a result of human factors. Japan stated that transfer errors on aircraft flying ATS route B576 between Fukuoka FIR and Incheon FIR, where JCAB RMA had been monitoring to examine the correlation with AIDC (ATS Inter-facility Datalink Communications) operation, had not occurred since November 2010. The meeting congratulated Japan on this significant outcome, particularly as it was evidence of the safety benefits of implementing AIDC.

2.28 **Table 6** summarizes the results of the airspace safety oversight in terms of the RVSM technical, operational, and total risks for the Fukuoka FIR. **Figure 6** presents the collision risk estimate trends for each month using the estimated LHD data since May 2010.

Japanese RVSM Airspace – *estimated annual flying hours = 1034175.6 hours (note: estimated hours based on December 2010 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	0.31×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	3.85×10^{-9}		
Total Risk	**4.16×10^{-9}**	5.0×10^{-9}	**Below Overall TLS**
RASMAG14			
Technical Risk	0.31×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	9.11×10^{-9}	-	-
Total Risk	**9.42×10^{-9}**	5.0×10^{-9}	**Above Overall TLS**
RASMAG15			
Technical Risk	0.33×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	9.97×10^{-9}	-	-
Total Risk	**10.3×10^{-9}**	5.0×10^{-9}	**Above Overall TLS**

Table 6: RVSM Risk Estimates for Japanese airspace

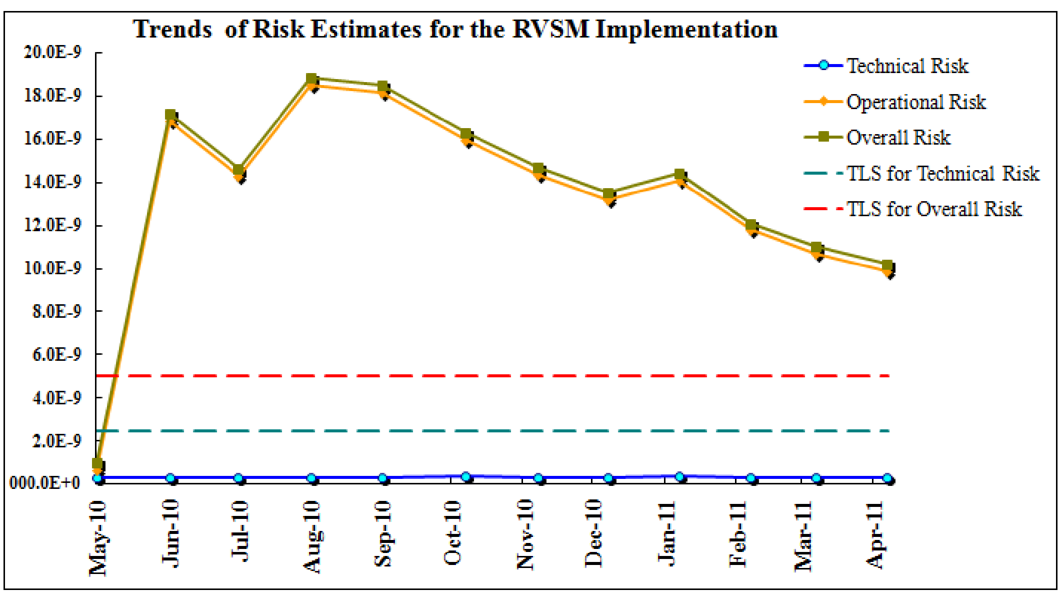


Figure 6: RVSM Risk Estimate Trends for Japanese Airspace

2.29 Although the current situation was that the estimated level of safety was above the TLS, the analysis was showing a rapid improvement in safety levels, and this would continue as the HF miscommunication and ATC loop errors would drop out of the 12 month assessment. The significant reduction of these occurrences indicated the effectiveness of the preventive measures.

2.30 The meeting noted the extensive work undertaken by Japan to identify possible causes of LHDs in their airspace and the activity to put in place effective risk controls. The report identified specific analysis of a number of LHD types including Category D and E as detailed in the Figures 7 and 8. The meeting recognised the value of such analyses noting that it showed positive changes to the LHD trends as a result of action taken to control the risks either through new procedures or introduction of AIDC.

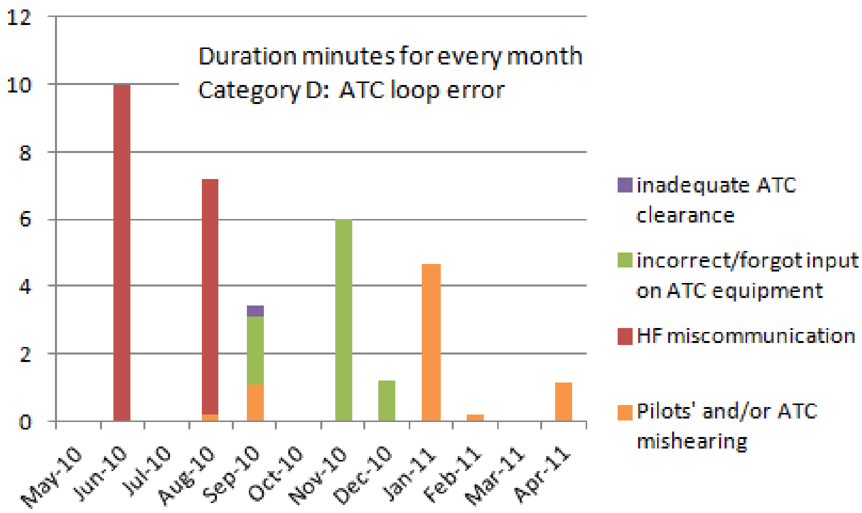


Figure 7: Analysis of Category D LHDs by Japan RMA

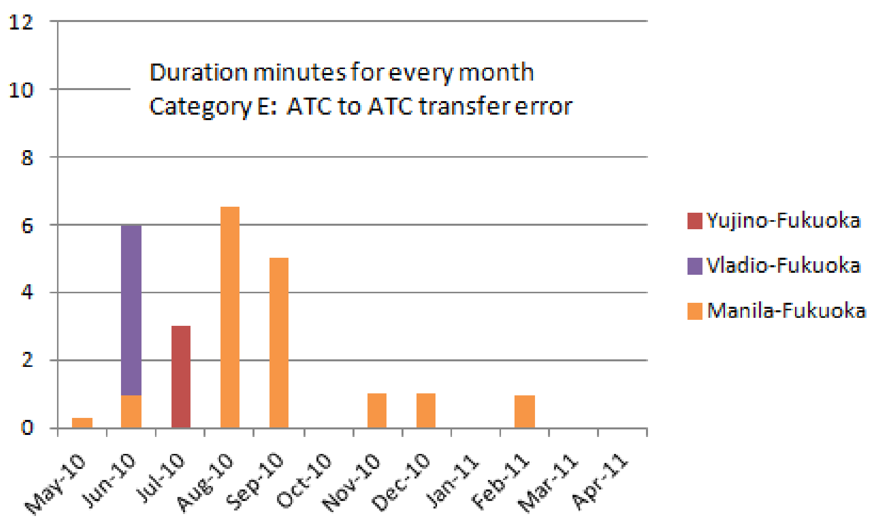


Figure 8: Analysis of Category E LHDs by Japan RMA

Bay of Bengal Airspace

2.31 The Monitoring Agency for Asia Region (MAAR) provided the summary of airspace safety oversight for the Bay of Bengal (BOB) airspace. The RVSM safety oversight had been conducted based on a one-month TSD collected in December 2010 and monthly LHD reports between May 2010 and April 2011 submitted by States in the BOB region.

2.32 A series of cumulative 12-month of LHD reports were used in this safety assessment starting from June 2010 until May 2011. Compared to the RASMAG/14 report, LHD occurrences increased from 33 to 39 occurrences, while total LHD duration increased from 57 to 180 minutes. The significant increase was mainly caused by one LHD with an estimated duration of 110 minutes. MAAR was discussing the matter to confirm the actual duration, cause and preventive measures. As the number of LHD reports increased, a significant portion of LHD occurrences (24 of 39) was contributable to Category E ATC coordination errors as a result of human factors issues.

2.33 **Table 7** summarizes the results of the airspace safety oversight, as of April 2011, in terms of the RVSM technical, operational, and total risks for BOB airspace. **Figure 9** presents the trends of collision risk estimates for each month using the estimated LHD data since May 2010.

Bay of Bengal RVSM Airspace – *estimated annual flying hours = 1,574,362 hours (note: estimated hours based on December 2010 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	0.74×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	0.56×10^{-9}	-	-
Total Risk	**1.30×10^{-9}**	5.0×10^{-9}	**Below Overall TLS**
RASMAG14			
Technical Risk	0.51 x 10-9	2.5×10^{-9}	Below Technical TLS
Operational Risk	1.08 x 10-9	-	-
Total Risk	**1.59 x 10-9**	5.0×10^{-9}	**Below Overall TLS**
RASMAG15			
Technical Risk	0.54×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	2.81×10^{-9}	-	-
Total Risk	**3.06×10^{-9}**	**5.0×10^{-9}**	**Below Overall TLS**

Table 7: RVSM Risk Estimates for BOB Airspace

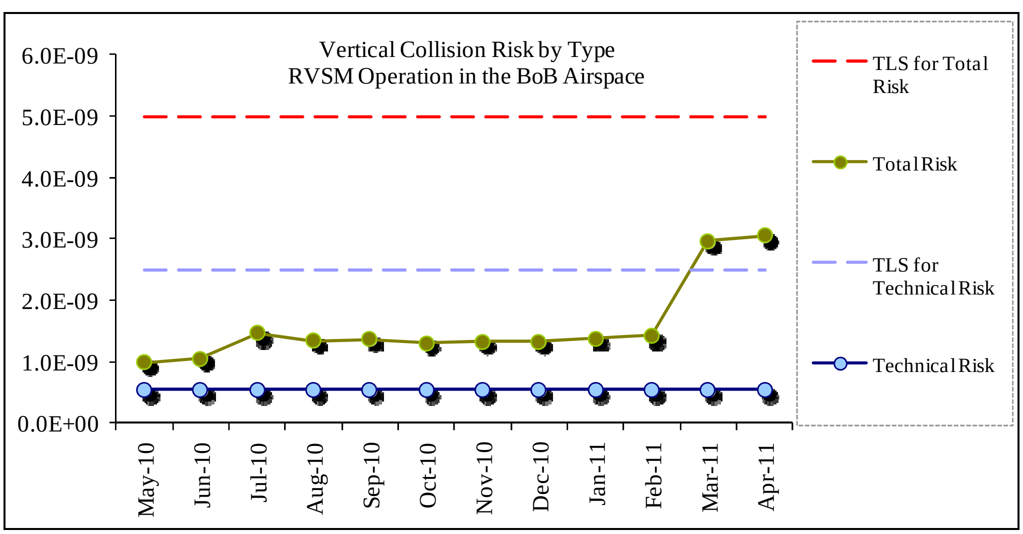


Figure 9: RVSM Risk Estimates Trends for BOB Airspace

Western Pacific/South China Sea Airspace

2.34 MAAR provided the summary of airspace safety oversight for the RVSM implementation in the Western Pacific/South China Sea (WPAC/SCS) airspace. The RVSM safety oversight analysis was conducted based on a one-month TSD collected in December 2010 and monthly LHD reports between May 2010 and April 2011 submitted by WPAC/SCS States.

2.35 Compared to RASMAG/14, the number of LHD occurrences decreased from 116 to 91 while the total LHD duration remained unchanged at 176 minutes due to a number of longer duration LHDs. A significant portion of LHD occurrences (79 of 91 occurrences) as well as duration (130 of 176 minutes) was attributable to Category E ATC coordination errors. Nonetheless, in the last six months of this reporting period (November 2010 – April 2011), the Category E LHD occurrences and duration decreased from 61 to 18 occurrences and 96 to 34 minutes, respectively.

2.36 **Table 8** summarizes the results of the airspace safety oversight, as of April 2011, in terms of the RVSM technical, operational, and total risks for WPAC/SCS airspace. **Figure 10** presents the trends of collision risk estimates for each month using the appropriate cumulative 12-month of LHD reports.

WPAC/SCS RVSM Airspace – *estimated annual flying hours = 961,468 hours (note: estimated hours based on December 2010 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	0.92×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	2.79×10^{-9}	-	-
Total Risk	**3.71×10^{-9}**	5.0×10^{-9}	**Below Overall TLS**
RASMAG14			
Technical Risk	0.64 x 10-9	2.5 x 10-9	Below Technical TLS
Operational Risk	5.07 x 10-9	-	-
Total Risk	**5.71 x 10-9**	**5.0 x 10-9**	**Above Overall TLS**
RASMAG15			
Technical Risk	0.66×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	4.70×10^{-9}	-	-
Total Risk	**5.36×10^{-9}**	**5.0×10^{-9}**	**Above Overall TLS**

Table 8: RVSM Risk Estimates for WPAC/SCS Airspace

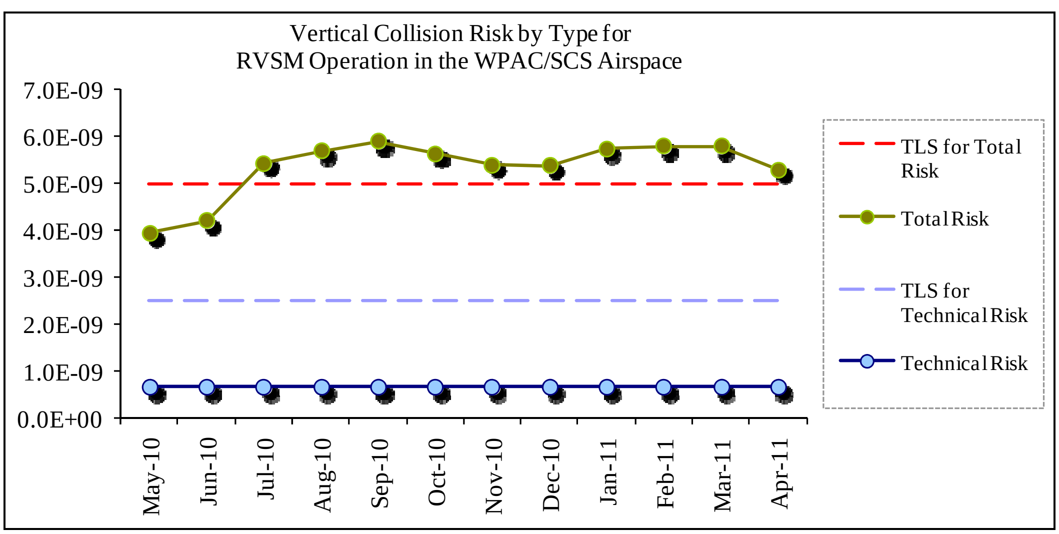


Figure 10: RVSM Risk Estimate Trends for WPAC/SCS Airspace

Pacific Airspace

2.37 The Pacific Approvals Registry and Monitoring Organization (PARMO) provided assessments of the Pacific and North-East Asia airspace from 1 May 2010 to 30 April 2011.

2.38 PARMO reported a slight decrease in the total LHD duration (minutes) was observed from the reported risk-bearing events in Pacific airspace. The safety monitoring report presented to RASMAG/14 included 179 minutes of LHD duration compared to 145 minutes for the RASMAG/15 report. The largest contributor to risk-bearing LHDs was flight crew climbing/descending without ATC clearance (Category A), a notable change from previous reports where ATC-to-ATC transitions errors were the largest contributor. There were six reported events attributed to the flight crew changing flight level without ATC clearance, four of in the NOPAC and Arctic traffic flows.

2.39 **Table 9** summarizes the results of the safety oversight, as of April 2011, in terms of the RVSM technical, operational, and total risks for Pacific airspace. **Figure 11** presents the trends of collision risk estimates for each month using the appropriate cumulative 12-month of LHD reports.

Pacific RVSM Airspace – *estimated annual flying hours = 1,019,436 hours (note: estimated hours based on the December 2010 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	0.062×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	1.019×10^{-9}	-	
Total Risk	$\mathbf{1.080 \times 10^{-9}}$	5.0×10^{-9}	**Below Overall TLS**
RASMAG14			
Technical Risk	0.064×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	4.374×10^{-9}	-	
Total Risk	$\mathbf{4.438 \times 10^{-9}}$	5.0×10^{-9}	**Below Overall TLS**
RASMAG15			
Technical Risk	0.123×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	4.662×10^{-9}	-	
Total Risk	$\mathbf{4.785 \times 10^{-9}}$	5.0×10^{-9}	**Below Overall TLS**

Table 9: RVSM Risk Estimates for Pacific Airspace

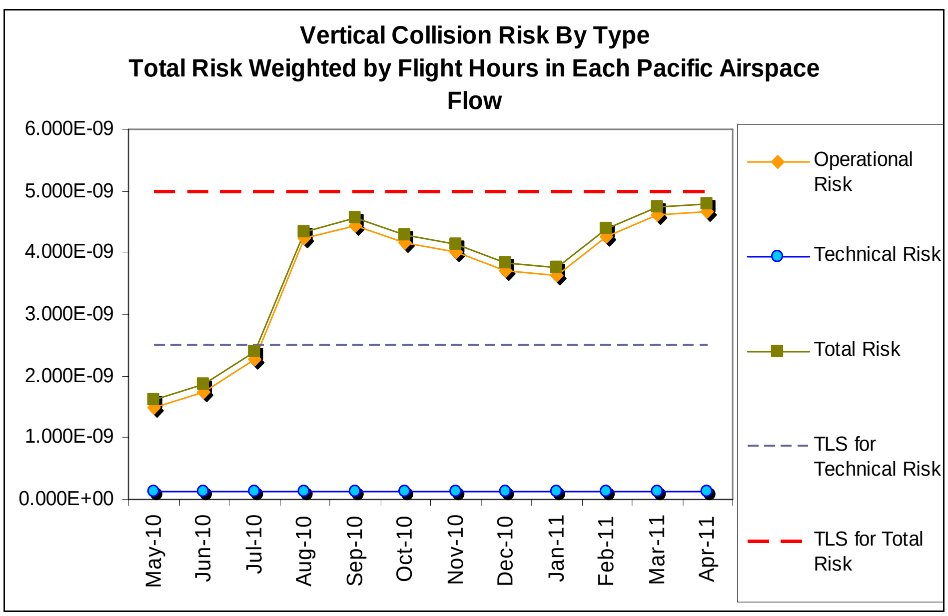


Figure 11: RVSM Risk Estimate Trends for Pacific Airspace

Incheon FIR

2.40 PARMO provided assessments of the Incheon FIR airspace. There was one risk-bearing event reported for the Incheon FIR airspace during the current reporting period.

2.41 **Table 10** summarizes the results, as of April 2011, in terms of the RVSM technical, operational, and total risks for Incheon FIR airspace. **Figure 12** presents the trends of collision risk estimates for each month using the appropriate cumulative 12-month of LHD reports.

Incheon FIR RVSM Airspace – *estimated annual flying hours = 175,248 hours (note: estimated hours based on the December 2010 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG13			
Technical Risk	1.786×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	2.284×10^{-9}	-	
Total Risk	**4.070×10^{-9}**	5.0×10^{-9}	**Below Overall TLS**
RASMAG14			
Technical Risk	0.064×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	4.374×10^{-9}	-	
Total Risk	**4.438×10^{-9}**	5.0×10^{-9}	**Below Overall TLS**
RASMAG15			
Technical Risk	1.286×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	0.360×10^{-9}	-	
Total Risk	**1.628×10^{-9}**	5.0×10^{-9}	**Below Overall TLS**

Table 10: RVSM Risk Estimates for North East Asia Airspace

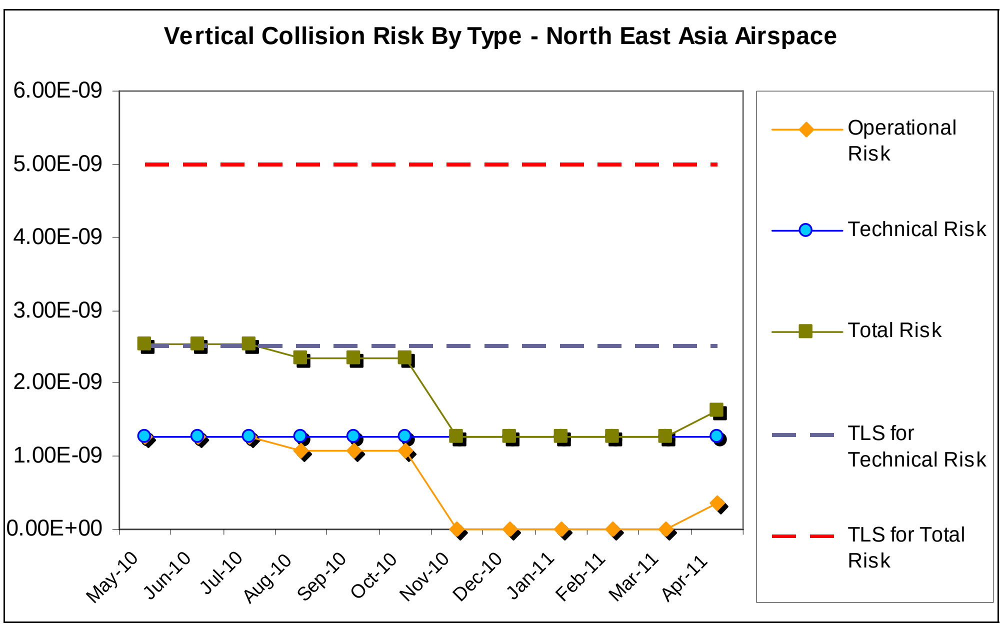


Figure 12: RVSM Risk Estimate Trends for North East Asia Airspace

2.42 PARMO noted that the United States Arctic airspace was not included in any other RMA safety assessment. The meeting supported PARMO including this airspace in the future.

Kabul FIR Pre- RVSM Implementation Safety Assessment

2.43 The United States Air Forces Central (AFCENT) currently managed Afghanistan airspace. AFCENT contracted the MITRE Corporation to conduct a safety assessment for the implementation of Reduced Vertical Separation Minimum (RVSM) within the Kabul FIR, to determine whether the collision risk posed by the introduction of RVSM meets ICAO TLS. The safety assessment was based on a traffic sample data for the month of October 2010 provided by the Kabul Area Control Center (KACC).

2.44 Only two LHDs were reported within the Kabul FIR within the 12 month study period. One of these was filed in November 2010 and was caused by a Traffic Collision Avoidance System (TCAS) Resolution Advisory (RA), and was not considered to be a risk-bearing deviation. The other was a category E ATC transfer of control responsibility as a result of human factors issues.

2.45 The assessment for Afghanistan estimated the technical risk for fatal accidents per flying hour due to loss of vertical separation using two approaches. The quantitative assessment approach resulted in a technical vertical risk of 0.00572×10^{-9}. The qualitative assessment approach used conservative values for the probability of vertical overlap and lateral overlap and resulted in a technical vertical risk of 2.49×10^{-9}. Both estimates were below the TLS.

Mongolian Airspace Pre- RVSM Implementation Safety Assessment

2.46 MAAR provided the results of the safety assessment process for RVSM implementation in the Mongolia airspace, scheduled for 17 November 2011.

2.47 The meeting was informed that the report demonstrates that, based on the collected TSD, approximately 99% of the aircraft operations have been conducted by RVSM approved aircraft. Large Height Deviation (LHD) occurrences in Mongolia airspace since January 2010 were examined to estimate the risk for RVSM implementation noting there were 11 LHD occurrences, accounting for the duration of 144 minutes. Based on the risk estimate, the technical risk satisfies the agreed technical risk target level of safety value of no more than 2.5×10^{-9} fatal accidents per flight hour, but the overall risk estimate of 11.2×10^{-9} exceeded the TLS of 5.0×10^{-9} fatal accidents per flight hour, mainly due to number of long duration large height deviation occurrences.

2.48 **Table 11** summarizes the results of the risk assessment in terms of RVSM technical, operational, and total risks for Mongolia airspace. **Figure 12** presents the collision risk estimates trends for each month using the appropriate 12-month interval of LHD reports since January 2010.

Mongolian Airspace– *estimated annual flying hours = 94,132 hours (note: estimated hours based on the October 2010 traffic sample data)*			
Source of Risk	**Risk Estimation**	**TLS**	**Remarks**
RASMAG15			
Technical Risk	0.51×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	10.69×10^{-9}	-	-
Total Risk	11.20×10^{-9}	5.0×10^{-9}	Exceeds Overall TLS

Table 11: RVSM Risk Estimates for Mongolian Airspace

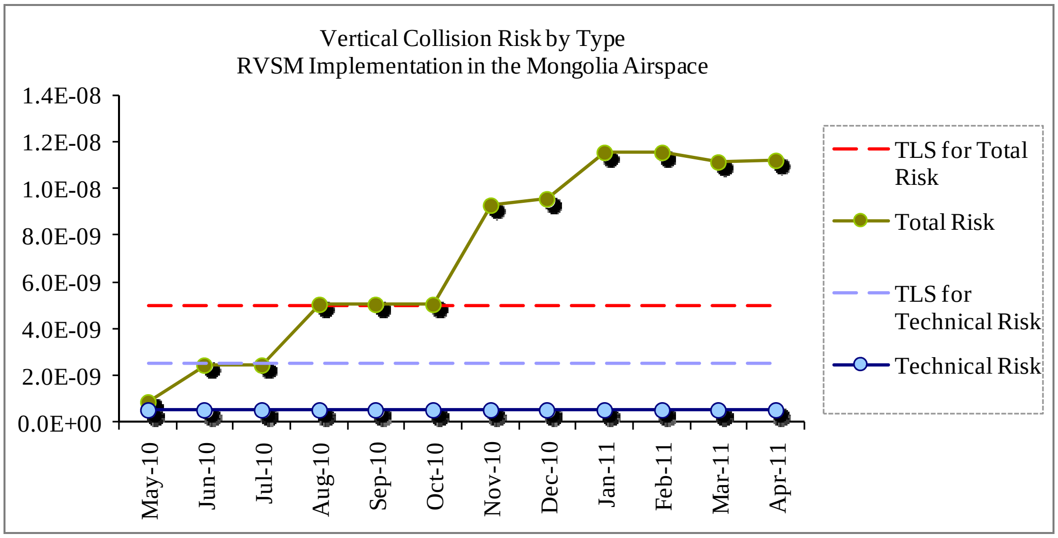


Figure 12: RVSM Risk Estimate Trends for Mongolia Airspace

2.49 MAAR advised that to further assist in the decision making process, another risk estimation was conducted, based on the assumption that the planned implementation of radar might be an effective preventive measure for long duration LHD occurrences. In this regard, the risk estimate is based on the actual number of LHD occurrences during May 2010 – April 2011 with duration being capped at 3 minutes as an effect from radar target availability. The adjusted risk estimate was calculated at 2.20 x 10^{-9} fatal accidents per flight hour due to all causes which would meet the TLS.

2.50 The meeting expressed concern that representatives from that State were unable to attend RASMAG/15. The meeting was concerned at the risk level determined by MAAR specifically as this was a pre-implementation assessment. The meeting noted the existence of a number of high duration LHDs.

2.51 The meeting agreed that it could not endorse an implementation given the current risk estimation and the nature of the LHDs reported. To assist with further assessments to inform the GO/NO-GO decision to be made by EURASIA Task Force, MAAR agreed to undertake monthly assessments and the Secretary would forward these to EURASIA TF and to RASMAG members. The meeting acknowledged that final decision would rest with the EURASIA TF in consultation with both the Paris and Bangkok ICAO Regional Offices, and that they should also receive these assessments.

2.52 A map showing the overall state of compliance of APAC FIRs with the RVSM TLS is appended at Appendix **B**.

Fukuoka FIR Oceanic Longitudinal Separation Safety Assessment

2.53 The Japan RMA provided details of the safety assessment for the application of 10-minute longitudinal separation without Mach Number Technique (MNT) in the oceanic airspace of Fukuoka FIR, assisted by the Electronic Navigation Research Institute (ENRI).

2.54 Prior to the introduction of this standard, JCAB and ENRI conducted a safety assessment. This concluded that the estimated collision risk was below the regionally agreed Target TLS of 5.0 x 10^{-9} if the waypoint reports were at intervals of 350NM or less for North Pacific (NOPAC) routes, and 370NM or less for other oceanic routes.

2.55 The Study resulted in various safety estimates for different airspaces, with the highest level being 2.4706 x 10^{-9}, which was below the TLS.

South China Sea Horizontal Safety Assessment

2.56 The South East Asia Safety Monitoring Agency (SEASMA) provided a periodic assessment report on whether flight operations on the six major South China Sea routes (L642, M771, N892, L625, N884 and M767) complied with the TLS values for lateral and longitudinal separation standards. The period assessed was from 1 May 2010 until 30 April 2011.

2.57 Two Large Lateral Deviations (LLDs) were reported due to Category E ATC coordination errors, while no Large Longitudinal Errors (LLEs) were reported over the monitored fixes during the assessment period. **Table 12** summarizes the results of the airspace oversight, as of April 2011.

Type of Risk	Risk Estimation	TLS	Remarks
RASMAG/13			
Lateral Risk	0.044×10^{-9}	5×10^{-9}	**Below TLS**
Longitudinal Risk	1×10^{-9}	5×10^{-9}	**Below TLS**
RASMAG/14			
Lateral Risk	1.54×10^{-9}	5 x 10-9	**Below TLS**
Longitudinal Risk	1.00×10^{-9}	5 x 10-9	**Below TLS**
RASMAG/15			
Lateral Risk	0.83×10^{-9}	5.0×10^{-9}	**Below TLS**
Longitudinal Risk	1.18×10^{-9}	5.0×10^{-9}	**Below TLS**

Table 12: Lateral and Longitudinal Risk Estimation

2.58 **Figure 13** presents the results of the collision risk estimates for each month using the cumulative 12-month LLD and LLE reports since May 2010, which indicated compliance with the corresponding respective TLS values during all months of the monitoring period.

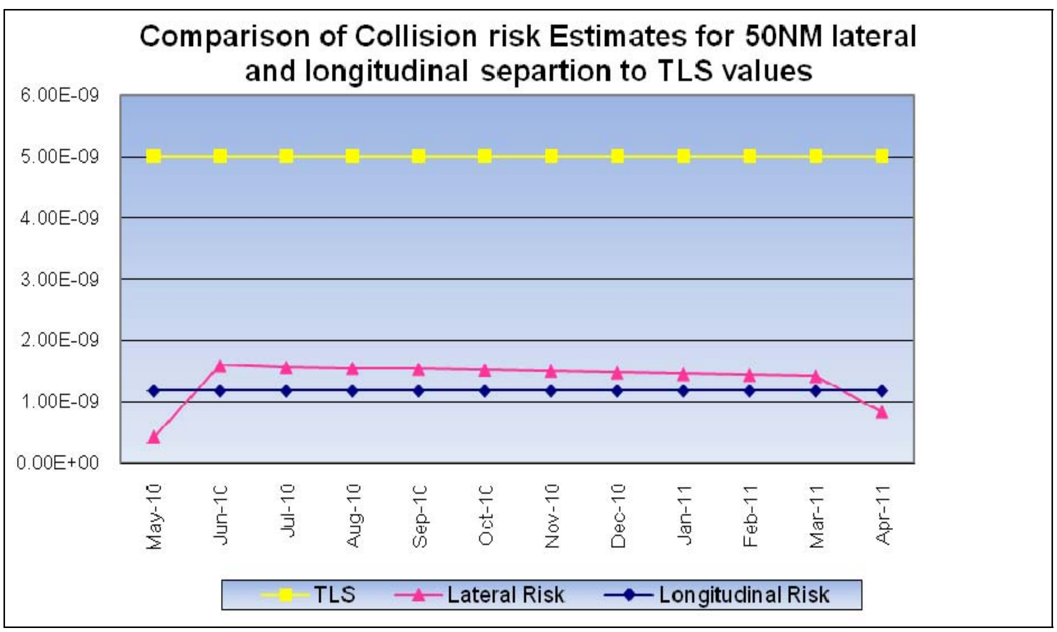


Figure 13 - Assessment of Compliance with Lateral and Longitudinal TLS Values

Bay of Bengal Horizontal Safety Assessment

2.59 India presented a revised safety assessment for the 50NM implementation in the Bay of Bengal. The RASMAG/15 meeting recalled that at RASMAG/14, it had reviewed a similar assessment developed by India to demonstrate the credentials of BOBASMA in its desire to be endorsed as an Enroute Monitoring Agency (EMA). The meeting reviewed the assessment in some detail with India providing responses to questions in relation to specific aspects of the modelling.

2.60 The safety assessment and Airspace Analysis have been carried out by a team of ATM professionals of AAI and mathematical experts from Indian Statistical Institute and the regulator (DGCA). The lateral collision risk was estimated to be 0.621694 x 10^{-9} and the longitudinal collision risk 0.964658 x 10^{-9}, both of which were well below the TLS of 5 x 10^{-9}. Thus it was concluded that the Safety Assessment supports the introduction of 50NM RLS on L510 and P628 and continued safe use of RLS on N571 and P762.

2.61 India informed the meeting that as a result of a peer review of the original assessment by the FAA Technical Center, it had made a number of changes to the assessment and modelling. Notwithstanding this, there was significant discussion on concerns raised by the FAA Technical Center, and the Chairman and the Secretary met with Indian representatives to discuss these concerns. The Chairman informed the meeting that as a result of the meeting with the Indian representatives he was satisfied that most of the concerns raised by the FAA could or would be readily resolved in the short term, such as the establishment of Letters of Agreement, the database and website.

2.62 The issue of significance that needed to be addressed was in relation to the additional training that had previously been identified that India needed to undertake before it could be endorsed as an EMA. While India informed the meeting that they had undertaken direct liaison visits with SEASMA since the last meeting in an attempt to better learn how an EMA is to undertake its functions, there were still concerns raised as to the adequacy of any training undertaken.

2.63 As a result, and considering all the activity already undertaken by India to date, the Chairman proposed that this aspect of further training could be resolved if India were to accept a period of mentoring by another EMA and peer review of any safety assessments undertaken. To that end it was proposed that the meeting endorse India as an EMA and that India enters into a 12 month period of mentoring by SEASMA with added assistance in peer review of safety assessments by the AAMA. India and the meeting agreed to this proposal. RASMAG/15 agreed to the following Draft Decision:

Draft Decision RASMAG 15/4 − Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) Endorsement

That, the Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) be endorsed as an En-Route Monitoring Agency (EMA).

Non-RVSM-Approved Aircraft Operating in Asia Pacific RVSM Airspace

2.64 The meeting recalled previous discussion in RASMAG and APANPIRG relating to the issue of non-RVSM approved aircraft operating in Asia Pacific RVSM airspace while flight planning as RVSM 'approved'. This matter was of significant concern to the meeting, and this was also a concern expressed by the global monitoring agencies through the Regional Monitoring Agency Coordination Group (RMACG).

2.65 Given the risk that such activity posed to the safety of RVSM operations, RASMAG had tasked RMAs to identify so called 'rogue' operators so that States could work to resolve the issue. The meeting recognised that a number of the identified aircraft may in fact have the appropriate approvals but processing of that information to RMAs by State authorities could be delayed.

Non-RVSM-Approved Aircraft Identified

2.66 The meeting was informed that the AAMA had now extended the process it uses to undertake a crosscheck of RVSM approvals data against Australian flight plan data to include a comparison of all RVSM approval databases from the global RMAs. The flight plan information data set utilised for the current comparison equated to a period of one month from 1 to 30 June 2011. The meeting noted that the comparison for June 2011 identified 250 individual airframes in the data set, with airframes from India showing the highest number of 56. The next highest State was the Philippines with 39 aircraft.

2.67 China RMA provided the results of a scrutiny assessment in the airspace of Chinese Flight Information Regions and Pyongyang Flight Information Region for the period of December, 2010. China informed the meeting that the purpose of this assessment is to identify the airframes conducted RVSM flights with no registration information in RMA's approval database.

2.68 The meeting was informed that MAAR had undertaken an assessment of aircraft operating within the RVSM airspace with no available RVSM approval records using the available Traffic Sample Data (TSD) for the month of December 2010. MAAR commented that in reviewing the TSD it had identified that in a number of cases the aircraft registration was not available in the data provided by States and therefore use of that specific data proved difficult.

2.69 PARMO provided the meeting with an assessment of non-State-approved operators using the RVSM airspace overseen by PARMO in the Pacific and a portion of North East Asia for the period of December 2010 that identified the operators who flight planned as having State RVSM approval, but for whom a record of RVSM approval was not found. The meeting noted that a total of five unique airframes from the PARMO analysis required further follow up action. Some airframes identified by PARMO were also noted in the recent AAMA WP/56 to the RMA CG/6 meeting. One of these airframes (registration YJAV1 B738) was observed many times in both the Auckland and Nadi TSD and had been identified by the AAMA analysis.

Non-RVSM-Approved Aircraft Conclusions

2.70 RASMAG discussed the need for airworthiness authorities to provide RVSM approval data to the appropriate RMA in a timely manner, so that RVSM approvals databases were complete and current.

2.71 The meeting noted that some RMAs relied on the December TSD to identify non-compliant aircraft, and this may not be reliable enough to identify errant aircraft. However, the AAMA was able to obtain flight-plan data, on a monthly basis, allowing it to undertake more frequent assessments of non-compliant aircraft. The AAMA was therefore able to provide the Australian ANSP with current, validated lists of apparently non-compliant aircraft. Using an automated process, the ANSP was able to use this data to identify non-compliant aircraft and take appropriate action.

2.72 The meeting noted that the RMACG had been discussing the need to establish a Central Registry for RVSM approvals. The RMACG proposed to amend Annex 6 to ensure the effective analysis of RVSM data and ensure a current record was available to RMAs.

2.73 The meeting agreed that, wherever possible, ANSPs should provide details to their RMA on a monthly basis of all flight plans filed showing RVSM approval, in order to enhance the currency and quality of data available to the RMAs. On the basis of the validated data provided by their RMA, States were encouraged to take appropriate action.

2.74 It would take time for some RMAs to enable their systems to receive and process this enhanced data and it may require a degree of automation and good quality of data to reduce the workload of RMAs. The timeline for delivery of data was discussed, and it was suggested that data should be delivered by the 20th of each month if possible.

2.75 The meeting was informed that the intention was not to burden ANSPs and RMAs with a significant additional workload. The use of standard data formats should allow a degree of automation and quality assurance practices could be expected to reduce RMA workload, while the amount of data required for each aircraft was minimal (not the complete flight plan).

2.76 The meeting was informed that the intention was not to burden ANSPs and RMAs with a significant additional workload. The use of standard data formats should allow a degree of automation and quality assurance practices could be expected to reduce RMA workload, while the amount of data required for each aircraft was minimal (not the complete flight plan).

2.77 Noting that there was a significant number of flight plans submitted by operators indicating RVSM approval without such approval being evident, the RASMAG developed the following draft conclusion and a decision.

Draft Conclusion RASMAG 15/1 – RVSM Approvals

That, the States are urged to:

a) ensure that they provide point of contact details and complete RVSM approval data to the appropriate RMA in a timely manner; and

b) encourage their ANSP to provide details to their RMA, on a monthly basis, of all flight plans filed showing RVSM approval; and

c) take appropriate action regarding non-compliant aircraft, on the basis of the data provided by their RMA.

Decision RASMAG 15/6 − Distribution of RVSM Approvals Data

That, the RMAs are urged to utilise monthly flight plan data to undertake frequent assessments of non-compliant aircraft and to provide this information to States for onward transmission to ANSPs.

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

Endorsement of Amended Minimum Monitoring Requirements

2.78 Australia presented a summary of the recent 6th meeting of the RMACG held in June 2011, at which 11 of the 13 global RMAs attended. RASMAG was informed that RMACG/6 undertook extensive discussions on a range of issues related to RMA activity and procedures that included a revised globally standardised Minimum Monitoring Requirements (MMR) Table.

2.79 The meeting received information on coordination efforts employed by NAARMO, PARMO and FAA Flight Standards to achieve the implementation of long term monitoring requirements. In particular in relation to the Annex 6 monitoring requirement, the meeting noted that the United States has regulated that it will be up to the operator to provide sufficient information to the State authority that they operated less than 1000 hours in the respective 2 year period. The meeting agreed that all RMAs should consider a similar approach for long term monitoring requirements.

2.80 The meeting noted that some States do not maintain a centralised RVSM database and that often acquiring relevant approval data has been difficult particularly to enable RMA checking for rogue aircraft. In addition, ICAO provisions, such as Annex 6, should include a requirement to maintain central records of RVSM approvals and ensure that information is updated with relevant RMAs. A draft proposal of a new paragraph 7.2.9 of Annex 6 addressing a State requirement to establish and maintain a database of RVSM approvals was developed and included in the WP.

2.81 In reviewing the information provided by Australia, RASMAG responded to the actions identified in the paper as follows:

a) In relation to the draft amendment proposal to Annex 6, it was agreed that text would be included in RASMAG's report to APANPIRG for that group's information.

b) The meeting agreed that non-approved operations present a risk to RVSM airspace safety and that Asia/Pacific RMAs should continue their work to identify rogue operators. The meeting did not support submitting rogue operator reports to APANPIRG but agreed that other actions put in place by RASMAG would assist in efficient processing of rogue operator information within the Region.

c) The meeting agreed that information concerning the United States regulation in regards to the 1,000 hours period for long term height-keeping monitoring should be forwarded to APANPIRG, noting that States should be informed of the information and decide whether or not to adopt the United States procedure.

2.82 The meeting endorsed the new MMR, and agreed to forward the table for further endorsement by APANPIRG for Regional application in accordance with the following Draft Conclusion:

Draft Conclusion RASMAG 15/2 − Minimum Monitoring Requirements Amendment

That, the updated Minimum Monitoring Requirements (MMR) Table attached in **Appendix C** be endorsed for Regional application.

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

Establishment of Japan En-Route Monitoring Agency

2.83 Japan informed the RASMAG/5 meeting in June 2006 of its intention to fulfill the responsibility of providing airspace safety assessment and monitoring services for RVSM and RNAV/RNP within the Fukuoka FIR, and to be recognized as an RMA and an EMA.

2.84 The meeting noted that at RASMAG/13 (August 2010) Japan had presented an RVSM-PBN combined database, and the safety assessment of the reduced horizontal separation applied in the international oceanic airspace of the Fukuoka FIR. RASMAG/15/WP23 further described the on-going collaboration between ENRI, PARMO and JCAB in order to develop safety assessment expertise.

2.85 On the basis of the fact that all requirements within the EMA Handbook having been fulfilled and taking note of Japan's role in ICAO technical panels over many years, including participating in the development of 50NM and 30NM minima, and the continued peer relationship with PARMO in particular, Japan requested the meeting to endorse the monitoring agency as an EMA. RASMAG developed the following Draft Decision regarding the Japanese monitoring agency:

Draft Decision RASMAG 15/5 − Japan Airspace Safety Monitoring Agency (JASMA) Endorsement

That, the Japan Airspace Safety Monitoring Agency (JASMA) be endorsed as an En-Route Monitoring Agency (EMA), which will also undertake the current Japan Regional Monitoring Agency (RMA) functions.

RASMAG List of Competent Airspace Safety Monitoring Organizations

2.86 RASMAG updated the list of *Competent Airspace Safety Monitoring Organizations*, including the endorsement of India and Japan as an EMA, and amended contact details as appropriate. The list is included as **Appendix D** to this report.

LHD Taxonomy Amendment (WP05)

2.87 RASMAG/14 had agreed with an Australian proposal to amend the current taxonomy used to categorise LHD reports and that the amendment proposal should be provided to the RMACG/6 meeting in June 2011 for global endorsement.

2.88 The Chairman informed the RASMAG/15 meeting that he had presented the amended taxonomy to RMACG/6 and that with one minor amendment, that group had endorsed the proposal and asked that the RMA Manual, Doc 9937 to be amended accordingly.

2.89 In further considering the amended taxonomy agreed to by RMACG, included as **Appendix E** to this report, RASMAG agreed that the new taxonomy should be made available to States by the Asia/Pacific RMAs.

Preliminary Safety Assessment of the Incheon FIR

2.90 The Republic of Korea presented a paper on the results of the preliminary analysis of the airspace characteristics in the Incheon Flight Information Region (FIR) and of the Air Traffic Service (ATS) route B576 for safety assessment.

2.91 The Chairman thanked Korea for their detailed work, noting it was the intention of the Republic of Korea to apply for EMA status in the future on the basis of further assessment. Commenting on this, the Chairman stated that RASMAG had previously agreed that the number of monitoring agencies should be expected to decrease and consolidate, noting that only the Asia/Pacific had multiple RMAs and EMAs compared to other regions.

2.92 The intent of the establishment of RMAs and EMAs was to help facilitate regional and sub-regional implementations and not for specific implementations that only affect a single FIR. To that end, the meeting agreed that while it was unlikely that any future endorsements of RMAs and EMAs for a single FIR would occur, a future implementation that affects a group of FIRs in the Region may require an EMA to undertake safety assessments and on-going monitoring. This should not deter a State from developing safety assessment capabilities to ensure the safe implementation of new standards and procedures.

Datalink Performance Monitoring Results

2.93 New Zealand presented a detailed analysis of datalink performance within the Auckland Oceanic FIR. The Informal South Pacific ATS Coordinating Group CRA publishes a collection of data-link monitoring data on its website at http://www.ispacg-cra.com/performance.asp.

2.94 Figure **14** shows the duration of monthly network outages and of the cumulative annual outage. The number in each bar shows the number of outages in each month. The *Global Operational Datalink Document* (GOLD) requires an availability of 99.9% for safety, but adds the more stringent availability of 99.99% for traffic efficiency for ANSPs operating reduced separations in areas of high traffic density. The current availability was 99.999%.

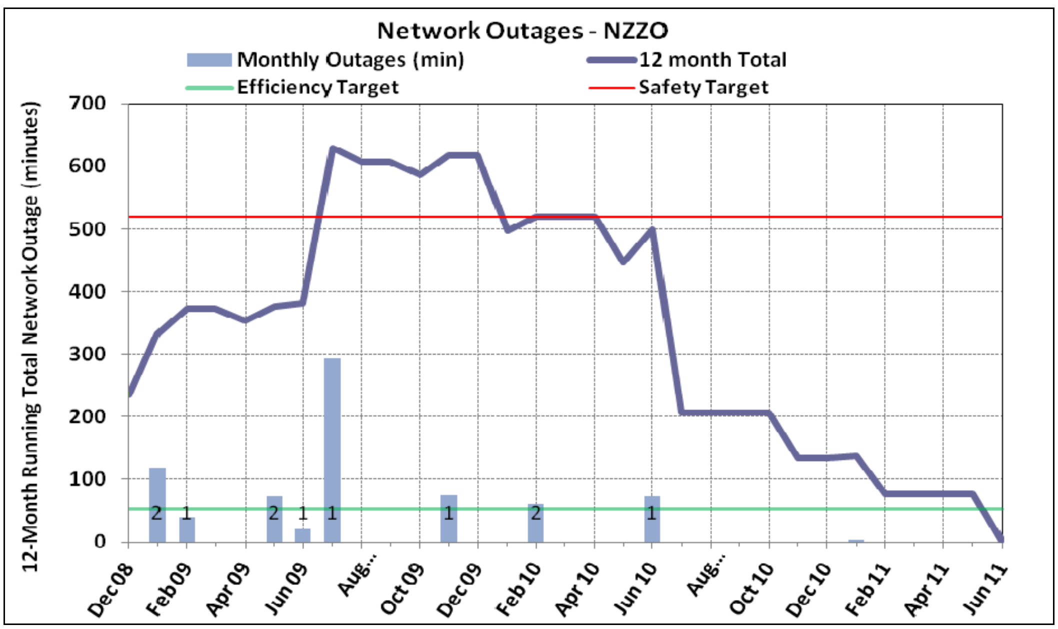


Figure 14: Network Outages

2.95 **Figure 15** compared the Controller Pilot Datalink Communications (CPDLC) Actual Communications Performance (ACP) with the continuity requirements for RCP 400 and RCP 240. Continuity was the required probability that an operational communication transaction can be completed within the communication transaction time, either expiration time (ET) or nominal time (TT 95%), given that the service was available at the start of the transaction). It should be noted that the ACP includes the pilot operational response time, for which 60s is allowed.

2.96 The graph shows that the continuity for both ACP and Actual Communications Performance (ATCP) using all RGS were well above the target for TT 95%, but the only ET that reached the target 99.9% is that for ACTP 400.

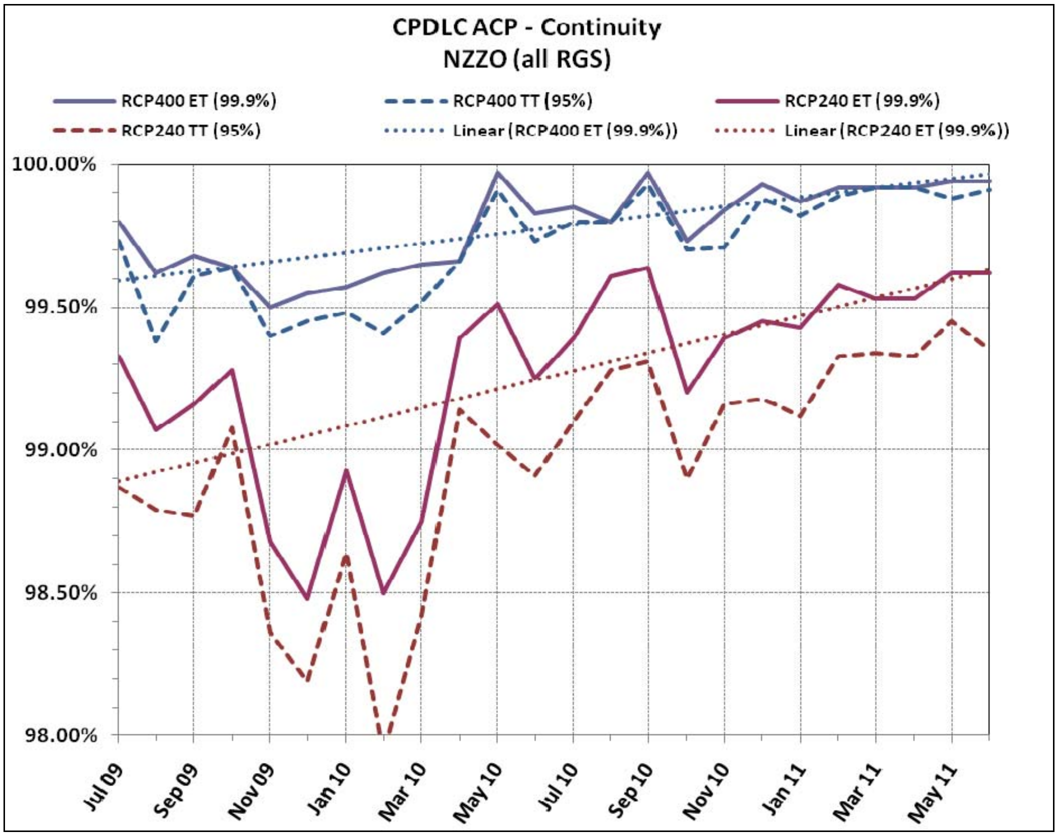


Figure 15: CPDLC Continuity Performance – ACP

2.97 **Figure 16** compared the ADS-C (Automatic-Dependent-Surveillance-Contract) downlink performance with the continuity standards for surveillance Types 400 and 180. Continuity is the required probability that surveillance data can be delivered within the surveillance delivery time parameter, either overdue time (OT) or delivery time 95% (DT), given that the service was available at the start of delivery. The 95% figure represents the delivery time within which 95% of surveillance data is to be delivered, and the 99.9% figure represents the overdue time, which is the maximum time for the successful delivery of surveillance data.

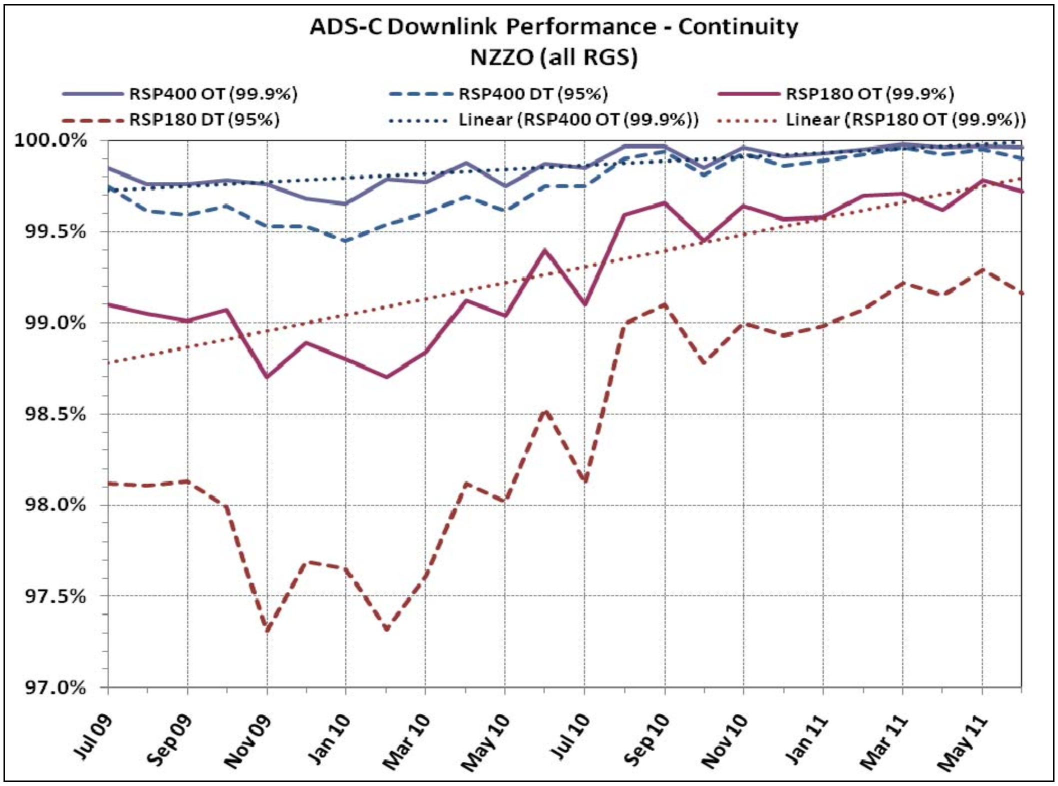


Figure 16: ADS-C Continuity Performance (all RGS)

2.98 As with CPDLC, the continuity easily met the target for DT 95%; however, while it almost meets the target for RSP400 OT (achieving 99.96%), only 99.97% is achieved against the RSP180 OT. While the safety targets for network availability were being achieved, it was clear that considerable improvement was necessary for the efficiency target to be met. The nominal times for CPDLC and ADS-C continuity were also being achieved, but some improvement was necessary to reach the target for ET. The meeting noted that the analysis indicated data link performance was improving, and that this was probably largely due to the efforts of the ISPACG/FIT and CRA.

Implementation of the use of ADS-B Height-Keeping Monitoring in Australia

2.99 The meeting recalled that RASMAG had been supportive of work to assess the viability of using ADS-B geometric height data as a means of estimating ASE. Australia informed the meeting that to progress this work, both Airservices Australia and the FAA worked cooperatively in a formally recognized research project that utilized data available from the extensive ADS-B network in Australia, and the software and expertise available in the United States used for estimating ASE.

2.100 At the Separation and Airspace Safety Panel (SASP) in May 2011 and the RMACG in June 2011, Australia and the United States presented working papers (SASP/WGWHL/19 WP/16 and RMACG/6 WP/49) that provided results from a year-long, continent-wide capture of ADS-B data. Both the SASP and RMACG had endorsed the use of ADS-B as a height monitoring system. Australia was now implementing this system in accordance with the Asia/Pacific Long Term Height Keeping Monitoring Plan endorsed by APANPIRG.

2.101 Australia advised that an extensive network of ADS-B ground stations was not required, nor was integration of ground stations into an ATM system. Depending on the local geoid surface, recordings from three well sited ADS-B receivers may suffice. Australia offered to provide advice to RMAs and States who were considering ADS-B as a height keeping monitoring system.

Airspace Safety Implementation in the Indonesian FIRs

2.102 Indonesia presented the RVSM, AIDC, and CPDLC Implementation Progress within Indonesia FIRs (Jakarta FIR and Ujung Pandang FIR). Indonesia advised that the majority of LHD reports submitted to the AAMA by Indonesian ANSPs were the result of operational errors, deviations due to TCAS Resolution Advisories (RA), and ATC Coordination errors.

2.103 ADS-C/CPDLC had been fully operational in Ujung Pandang FIR since September 2010, however there were some constraints in regard to delay of uplink and downlink messages in certain areas; notably through the PUPIT waypoint on the boundary of Australian airspace, where pilots were requested to log on and log off manually. New Zealand asked what the cause of this was, and apparently the main reason was a network routing issue via Jakarta.

Australian Data-link Performance Monitoring Results

2.104 Australia informed the meeting that it had undertaken work to enhance the reporting of data-link performance in Australian airspace, and provided an analysis of ADS-C data for the Brisbane and Melbourne FIRs during January to June 2011. Processing of CPDLC results for the same period is continuing.

2.105 The meeting noted the data showed that the performance of ADS-C down-link messages in both the Brisbane and Melbourne FIRs meets the GOLD metric for SPT180 nominal delivery time (DT) of 95% within 90 seconds. Notably performance in the Brisbane FIR in this regard was slightly lower than in the Melbourne FIR. While both FIRs were performing well in terms of the required continuity metric, neither met the stringent overdue delivery time (OT) metric of 0.999 within 180 seconds.

ADS-C/CPDLC Data Link Performance Monitoring

2.106 Monitoring of data link performance was a most important element of the provision of data link applications such as CPDLC, ADS-C and AIDC, especially where these applications were used as a basis for reduced separation minima. The efficiency benefits arising from reduced separation can only be achieved if specific data link performance criteria are met, and this can only be determined by regular monitoring of data link traffic and analysis of the resulting data.

2.107 While the guidance material includes information on performance data that ANSPs were expected to provide to CRAs, to date the CRAs have received minimal data. Consequently, little is known of data link performance in much of the Region, with the inevitable corollary that poor performance may not be detected or corrected. It is therefore important that all ANSPs, whether state agencies or independent organisations, collect data link performance data and pass it to the appropriate CRA for analysis, investigation and initiation of any required corrective action. Accordingly, the meeting proposed a Draft Conclusion as follows:

Draft Conclusion 14/1 - Provision of Datalink Performance Data to CRA

Noting the pre- and post-implementation system performance monitoring required by Annex 11[2], the Global Operational Data Link Document (GOLD) and the Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service Data Link Systems in the Asia/Pacific Region, States are urged to ensure that the appropriate data link performance monitoring is undertaken and reported to CRAs/FITs, as required, in a timely manner.

[2] – *Air Traffic Service* (Para 2.26.5)

Performance-Based Approach for Communications and Surveillance

2.108 New Zealand proposed that a performance-based communications and surveillance framework should apply performance specifications to FANS1/A CPDLC, ADS-C, and satellite communications (SATCOM) voice for air traffic control. This matter had been discussed at the recent CNS-MET/SG/15 meeting (25-29 June 2011), and a Draft Conclusion had been developed for consideration by APANPIRG.

2.109 The paper noted that, with an increasing proliferation of different aircraft FANS1/A systems, and given current ground system implementations, it was possible that ATC separations may be misapplied because the qualification criteria (set out in the GOLD), for communication and surveillance were not formally applied within the Asia/Pacific Region.

2.110 RASMAG/15 noted that the GOLD criteria were guidelines, not standards, and had been understood to be strategic targets, most of which were not formally incorporated into the ATC separation standards themselves in PANS ATM (Doc 4444). Moreover, the meeting noted that it was important that the region did not get out-of-step with global applications, and that the SASP had an opportunity to review and assess the potential impacts of this on previous modelling for ATC standards.

ATS Inter-Facility Data-link Communications Implementation

2.111 Japan informed RASMAG/14 that it has analyzed the trend of Category E LHD occurrences before and after the Japan - Republic of Korea AIDC implementation. The official implementation of AIDC commenced in February 2010.

2.112 **Figure 17** shows the number of LHD occurrences caused by transfer errors at ATOTI between December 2008 and November 2010. Despite the gradual increase of traffic in the last year, the number of transfer errors decreased significantly after the implementation of AIDC. Comparing the 22 month reports of LHDs before and after the implementation of AIDC, 16 Category E/F LHDs occurred between 1 August 2008 and 15 June 2009, whereas 10 LHDs occurred between 16 June 2009 and 30 May 2010. These outcomes appeared to vindicate the use of AIDC to reduce error.

2.113 The Chairman commented that in his view, the data presented was a 'good news story' in that it demonstrated the effectiveness of AIDC in controlling coordination errors that impacted on the airspace risk. The meeting congratulated Japan and Republic of Korea on a successful implementation of AIDC.

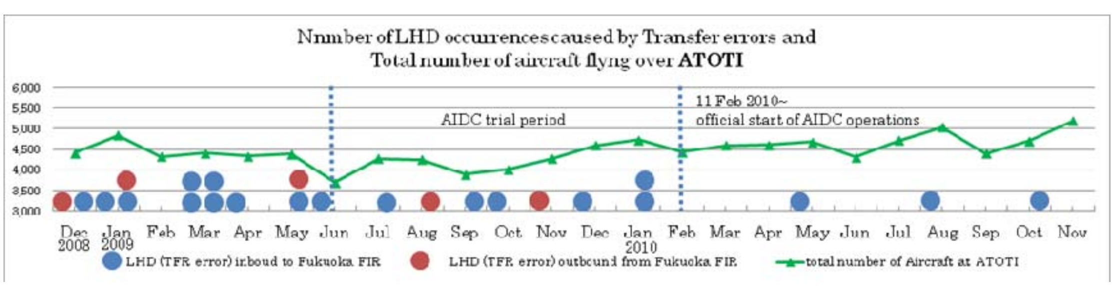


Figure 17: Number of LHD occurrences caused by Transfer errors at ATOTI

Height Monitoring Unit (HMU) in Japan

2.114 Japan had indicated its intention to deploy three HMUs (Height Monitoring Units) in Japan, with the first (Okayama HMU: HMU-1) targeted to become operational in the third quarter of 2011. The results for each aircraft would be published at http://www.japan-rma-ema.com/.

Agenda Item 6: Review and Update RASMAG Task List

2.115 The meeting updated the RASMAG task list.

Agenda Item 7: Any Other Business

Deputy Chairman

2.116 The Chairman discussed the fact that there was no Deputy Chairman for RASMAG, unlike the CNS-MET Sub-Group. Thailand nominated Mr. Peter Rabot of Singapore as a suitably experienced and long serving member of RASMAG for the Deputy Chairmanship, and this nomination was duly accepted by RASMAG/15.

Frequency of RASMAG Meetings

2.117 The Secretariat briefly discussed the matter of whether it was necessary to hold one or two RASMAG meetings per year, given the need to be efficient in terms of time and the cost of the meeting attendance. It was suggested that the August RASMAG meeting was most important, as this allowed the assessment of safety reports up until the month of April, and reporting to APANPIRG one month later. Meeting participants were asked to consider if it was necessary to hold the RASMAG meeting normally held in February, and in 2012 this matter would be further formally discussed.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) note that the Afghanistan pre-RVSM Safety Assessment indicated a safety estimate that complied with the TLS (Paragraph 2.45);

c) note that the Mongolia pre-RVSM Safety Assessment indicated a safety estimate that did **not** comply with the TLS (paragraph 2.47);

d) note that RASMAG/15 emphasised there should be no more APAC Regional RMAs, but where required for any future implementation of horizontal separation, then a new EMA may need to be established (paragraph 2.91);

e) take action on Draft Conclusions RASMAG 14/1 (paragraph 2.107), RASMAG 15/1 (paragraph 2.77), RASMAG 15/2 (paragraph 2.82);

f) take action on Draft Decisions RASMAG 15/3 (paragraph 2.8), RASMAG 15/4 (paragraph 2.63), RASMAG 15/5 (paragraph 2.85);

g) note RASMAG Decision 15/6 regarding Distribution of RVSM Approvals Data (paragraph 2.77); and

h) take actions as appropriate in relation to other matters discussed in this paper.

…………………………

Appendix A: Draft Terms of Reference

FANS INTEROPERABILITY TEAM - ASIA (FIT-ASIA)

TERMS OF REFERENCE

<u>FIT-Asia Objective and Scope</u>

The FANS Interoperability Team - Asia (FIT-Asia) shall be responsible for overseeing system configuration and the end-to-end monitoring process of datalink systems to ensure they are implemented and continue to meet performance, safety, and interoperability requirements within the Asian Region.

The FIT-Asia shall:

<u>Implementation</u>

a) support the implementation and operational benefits of AIDC, CPDLC and ADS;

<u>Reporting and problem resolution processes</u>

b) establish a problem reporting system;
c) review de-identified problem reports, identify trends and determine appropriate resolution;
d) develop interim operational procedures to mitigate the effects of problems until resolution;
e) monitor the progress of problem resolution;
f) prepare summaries of problems encountered and their operational implications;

<u>System performance and monitoring processes</u>

g) determine and validate system performance requirements;
h) establish a performance monitoring system;
i) assess system performance based on information from the CRA;
j) coordinate system testing and trials;
k) identify accountability for each element of the end-to-end system;
l) develop, document and implement a quality assurance plan that will provide a stable system;
m) identify end-to-end system configurations that provide acceptable data link performance;
n) ensure that such configurations are maintained by all stakeholders;

<u>New procedures</u>

o) coordinate testing in support of implementation of enhanced operational procedures

<u>Reporting</u>

p) report safety-related issues to the appropriate State or regulatory authorities for action;
q) provide reports to relevant ATM coordinating groups; and
r) report to RASMAG.

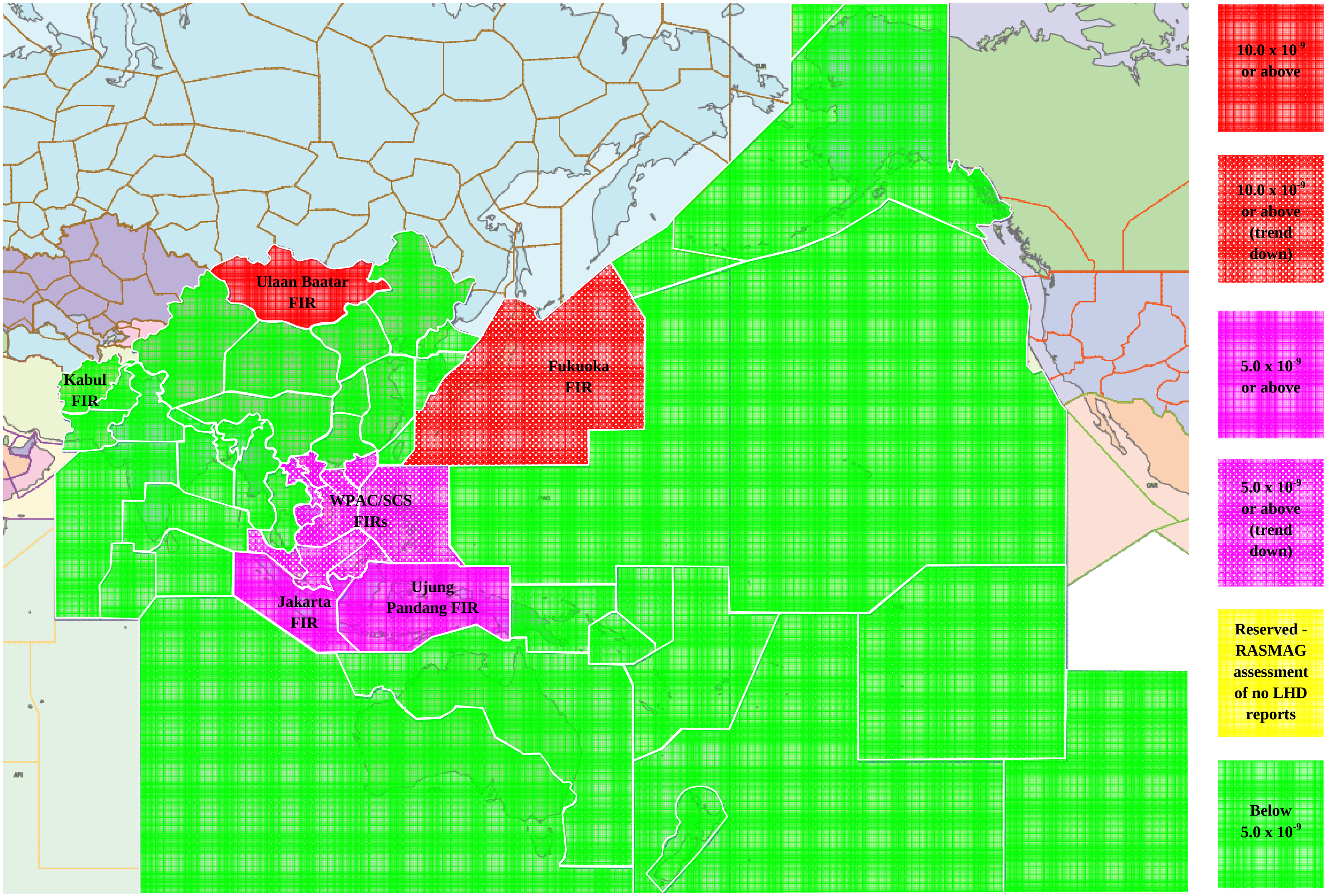
Relevant Central Reporting Agencies (CRA) and States will report, as required, to the FIT-Asia. ICAO Secretariat will submit reports to appropriate sub-groups of APANPIRG.

<u>Composition of FIT-Asia</u>

The FIT-Asia will consist of representatives from States (ANS Providers) communication service providers (CSP), CRAs, IATA, CANSO, IFALPA and IFATCA. Aircraft and ancillary equipment manufacturers may also be requested to participate.

…………………………….

Appendix B: APAC FIR RVSM TLS Compliance



RMACG/6-WP/63
08/06/11

REGIONAL MONITORING AGENCIES(RMA)

SIXTH SPECIAL COORDINATION MEETING

Cornwall, Canada, 6 – 10 June 2011

Agenda Item 4: Coordination and Harmonization issues

Review of Minimum Monitoring Targets Table by EUROCONTROL and FAA

(Presented by A Lewis – European Regional Monitoring Agency)

SUMMARY

This paper presents the results of the 2011 review of the RVSM Minimum Monitoring Requirements table conducted by EUROCONTROL and FAA for endorsement by the RMA Coordination Group

1. INTRODUCTION

1.1 All operators of RVSM approved aircraft are required to participate in regional height monitoring programmes. The global minimum height monitoring requirement is specified in ICAO Annex 6 and states that a minimum of 2 aircraft of each RVSM monitoring group type should be monitored every 2 years or 1,000 flying hours whichever is the greater.

1.2 It has been accepted by many regions that the global minimum requirement only applies to aircraft monitoring groups for which the RVSM MASPS has been fully satisfied including long term ASE stability. Groups which have not met this requirement are required to meet a higher level of monitoring, typically 60% of fleet until the verification of MASPS has been satisfied. Aircraft approved for RVSM on an individual basis and aircraft types for which no common MASPS compliance method exists are classified as non-group and it is necessary for all these aircraft to be height monitored every 2 years.

1.3 These 3 categories of aircraft; MASPS fully verified, MASPS not yet fully verified and non-group, are combined in a table of Minimum Monitoring Requirements. EUROCONTROL and FAA have undertaken to maintain this table on behalf of all the global RMAs on an annual basis and submit revisions to the RMACG for endorsement. The majority of aircraft groups are contained in category I which equates to groups that have fully demonstrated compliance with MASPS and are required to meet the global minimum height monitoring requirement defined in ICAO Annex 6. Category II contains those aircraft groups which have yet to satisfy MASPS and category III contains groups without a common compliance method.

1.4 EUROCONTROL and FAA currently hold approximately 90% of the global height monitoring results and this data is reviewed to determine if a group can be moved from category II to category I. On rare occasions it may be necessary to move a group from category I to category II.

1.5 The structure of the monitoring groups themselves is reviewed and new aircraft types are added and groups modified when appropriate.

1.6 This paper presents the results of the 2011 MMR review to the RMACG for endorsement.

2. AMENDMENT TO MMR

2.1 At the review of the MMR held in May 2011 14 new aircraft groups were added to the MMR. These were all placed in category II requiring operators to meet a 60% monitoring target until compliance with the RVSM MASPS is fully verified. This process takes a minimum of 2 year to ensure ASE stability.

2.2 A number of aircraft types for which no common compliance method exists were included in category III. Category III also applies to all aircraft approved on an individual basis even though the generic aircraft type may be contained in category I or II. However it is not practical to list these aircraft within the MMR.

2.3 Some minor changes to the monitoring group structure are made but these primarily relate to consolidation of ICAO type definitions. The complete list of MMR and monitoring group definitions are contained in Appendix A. Changes from the 2010 MMR are highlighted in bold.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) Note the contents of this paper;

b) Review the recommended changes and supply additional information that may be required to improve the accuracy of the table, and

c) Endorse the final version for publication by all RMAs.

— END —

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE

MONITORING PRIOR TO THE ISSUE OF RVSM APPROVAL IS **NOT** A REQUIREMENT

CATEGORY		**AIRCRAFT GROUP**	**MINIMUM OPERATOR MONITORING FOR EACH AIRCRAFT GROUP**
1	GROUP APPROVED: DATA INDICATES COMPLIANCE WITH THE RVSM MASPS	A124, A300, A306, A310-GE, A310-PW, A318, A320, A330, A340, A345, A346, A3ST, AVRO, B712, B727, B737CL, B737C, B737NX, B747CL, B74S, B744-5, B744-10, B752, B753, B767, B764, B772, B773, BD100, CL600, CL604, CL605, C17, C525, C560, C56X, C650, C680, C750, CARJ, CRJ7, CRJ9, DC10, E135-145, E170-190, F100, F900, FA10, GALX, GLEX, GLF4, GLF5, H25B-800, J328, KC135, LJ40, LJ45, LJ60, MD10, MD11, MD80, MD90, PRM1, T154	Two airframes from each fleet* of an operator to be monitored
2	GROUP APPROVED: INSUFFICIENT DATA ON APPROVED AIRCRAFT	Other group aircraft other than those listed above including: A148, **A158**, A380, **A400, AC90**, AC95, AN72, ASTR, ASTR-SPX, B701, B703, B703-E3, B731, B732, **B787**, BD700, BE20, BE30, BE40, B744-LCF, B748, C130, C500, C25A, C25B, C25C, C441, C5, C510, C550-552, C550-B, C550-II, C550-SII, **CRJ10**, D328, DC85, DC86-87, **DC91**, DC93, **DC94** DC95, E50P, **E55P**, EA50, F2TH, F70, FA20, FA50, FA7X, G150, **G250**, GLF2, GLF2B, GLF3, **GLF6**, H25B-700, H25B-750, H25C, HA4T, IL62, IL76, IL86, IL96, L101, **LJ23, LJ24, LJ25, LJ28**, L29B-2, L29B-731, LJ31, LJ35-36, LJ55, MU30, P180, **PAY4**, PC12, SB20, SBR1, SBR2, T134, T204, T334, TBM, WW24, YK42	60% of airframes (round up if fractional) from each fleet of an operator **or** individual monitoring
3	Non-Group	**Aircraft types for which no generic compliance method exists:** **BA11, R722, SJ30, STAR, B720, A225, GLEX-ASTOR, GLF5-AEW, VC-10, GSPN, B74S-SOFIA**	100% of aircraft shall be monitored

Table 1: MONITORING REQUIREMENTS TABLE

Table 2: MONITORING GROUPS FOR AIRCRAFT CERTIFIED UNDER GROUP APPROVAL REQUIREMENTS

Monitoring Group	A/C ICAO	A/C Type	A/C Series
A124	A124	AN-124 RUSLAN	ALL SERIES
A148	A148	AN-148	100
A158	**A158**	**AN-158**	
A300	A30B	A300	B2-100, B2-200, B4-100, B4-100F, B4-120, B4-200, B4-200F, B4-220, B4-220F, C4-200
A306	A306	A300	600, 600F, 600R, 620, 620R, 620RF
A310-GE	A310	A310	200, 200F, 300, 300F
A310-PW	A310	A310	220, 220F,320
A318	A318	A318	ALL SERIES
A320	A319 A320 A321	A319 A320 A321	CJ , 110, 130 110, 210, 230 110, 130, 210, 230
A330	A332 A333	A330 A330	200, 220, 240 300, 320, 340
A340	A342 A343	A340 A340	210 310
A345	A345	A340	500, 540
A346	A346	A340	600, 640
A380	A388	A380	800, 840, 860
A3ST	A3ST	A300	600R ST BELUGA
A400	**A400**	**A400M**	
AC90	**AC90**	**COMMANDER 690** **COMMANDER 840** **COMMANDER 900**	
AC95	AC95	AERO COMMANDER 695	A
AN72	AN72	AN-72 AN-74	ALL SERIES
ASTR	ASTR	1125 ASTRA	ALL SERIES
ASTR-SPX	ASTR	1125 ASTR SPX, G100	ALL SERIES
AVRO	RJ1H RJ70 RJ85	AVRO AVRO AVRO	RJ100 RJ70 RJ85
B701	B701	B707	100, 120B
B703	B703	B707	320, 320B, 320C

Monitoring Group	A/C ICAO	A/C Type	A/C Series
B703-E3	**E3TF**	B707	E-3
B712	B712	B717	200
B727	B721 B722	B727 B727	100, 100C, 100F,100QF 200, 200F
B731	B731	B737	100
B732	B732	B737	200, 200C
B737CL	B733 B734 B735	B737 B737 B737	300 400 500
B737NX	B736 B737 B738 B739	B737 B737 B737 B737	600 700, BBJ 800, BBJ2 900
B737C	B737	B737	700C
B747CL	B741 B742 B743	B747 B747 B747	100, 100B, 100F 200B, 200C, 200F, 200SF 300
B74S	B74S **B74R**	B747	SR, SP
B744-5	B744 **B74D**	B747	400, 400D, 400F (With 5 inch Probes up to SN 25350)
B744-10	B744 **B74D**	B747	400, 400D, 400F (With 10 inch Probes from SN 25351)
B744-LCF	B744	B747	LCF
B748	B748	B747	8F, 81
B752	B752	B757	200, 200PF, 200SF
B753	B753	B757	300
B767	B762 B763	B767 B767	200, 200EM, 200ER, 200ERM, 300, 300ER, 300ERF
B764	B764	B767	400ER
B772	B772 **B77L**	B777	200, 200ER, 200LR, 200LRF
B773	B773 **B77W**	B777	300, 300ER
B787	**B788** **B789**	**B787-8** **B787-9**	
BD100	CL30	CHALLENGER 300	ALL SERIES
BD700	GL5T	GLOBAL 5000	ALL SERIES
BE20	BE20	200 KINGAIR	ALL SERIES
BE30	BE30 **B350**	B300 SUPER KINGAIR B300 SUPER KINGAIR 350	ALL SERIES
BE40	BE40	BEECHJET 400 BEECHJET 400A	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
		BEECHJET 400XP HAWKER 400XP	
C130	C130	HERCULES	H, J
C17	C17	C-17 GLOBEMASTER 3	ALL SERIES
C441	C441	CONQUEST II	ALL SERIES
C5	C5	C5	ALL SERIES
C500	C500	500 CITATION 500 CITATION I 501 CITATION I SINGLE PILOT	ALL SERIES
C510	C510	MUSTANG	ALL SERIES
C525	C525	525 CITATIONJET 525 CITATIONJET I 525 CITATIONJET PLUS	ALL SERIES
C25A	C25A	525A CITATIONJET II	ALL SERIES
C25B	C25B	CITATIONJET III 525B CITATIONJET III	ALL SERIES
C25C	C25C	525C CITATIONJET IV	ALL SERIES
C550-552	C550	552 CITATION II (USN)	ALL SERIES
C550-B	C550	550 CITATION BRAVO	ALL SERIES
C550-II	C550	550 CITATION II 551 CITATION II SINGLE PILOT	ALL SERIES
C550-SII	C550	S550 CITATION SUPER II	ALL SERIES
C560	C560	560 CITATION V 560 CITATION V ULTRA 560 CITATION V ENCORE	ALL SERIES
C56X	C56X	560 CITATION EXCEL	ALL SERIES
C650	C650	650 CITATION III 650 CITATION VI 650 CITATION VII	ALL SERIES
C680	C680	680 CITATION SOVEREIGN	
C750	C750	750 CITATION X	ALL SERIES
CARJ	CRJ1 CRJ2 CRJ2 CRJ2	REGIONALJET REGIONALJET CHALLENGER 800 CHALLENGER 850	100, 100ER, 200, 200ER, 200LR ALL SERIES ALL SERIES
CRJ7	CRJ7	REGIONALJET	700, 700ER, 700LR
CRJ9	CRJ9	REGIONALJET	900, 900ER, 900LR

Monitoring Group	A/C ICAO	A/C Type	A/C Series
CRJ10	**CRJ10**	**REGIONALJET**	**1000ER**
CL600	CL60	CL-600 CL-601	CL-600-ALL SERIES CL-601- ALL SERIES,
CL604	CL60	CL-604	CL-604- ALL SERIES
CL605	CL60	CL-605	CL-605- ALL SERIES
DC10	DC10	DC-10	10, 10F, 15, 30, 30F, 40, 40F
D328	D328	328 TURBOPROP	100
DC85	DC85	DC-8	50, 50F
DC86-87	DC86 DC87	DC-8 DC-8	61, 62, 63 71, 72, 73
DC91	**DC91**	**DC-9**	**10, 15**
DC93	DC93	DC-9	30, 30F
DC94	**DC94**	**DC-9**	**40**
DC95	DC95	DC-9	51
E135-145	E135 E145	EMB-135 EMB-145	ALL SERIES
E170-190	E170 E170 E190 E190	EMB-170 EMB-175 EMB-190 EMB-195	ALL SERIES
E50P	**E**50P	PHENOM 100	ALL SERIES
E55P	**E55P**	**PHENOM 300**	**E55P**
EA50	EA50	ECLIPSE	ALL SERIES
F100	F100	FOKKER 100	ALL SERIES
F2TH	F2TH	FALCON 2000 FALCON 2000-EX FALSON 2000LX	ALL SERIES
F70	F70	FOKKER 70	ALL SERIES
F900	F900	FALCON 900 FALCON 900DX FALCON 900EX	ALL SERIES
FA10	FA10	FALCON 10	ALL SERIES
FA20	FA20	FALCON 20 FALCON 200	ALL SERIES
FA50	FA50	FALCON 50 FALCON 50EX	ALL SERIES
FA7X	FA7X	FALCON 7X	ALL SERIES
G150	G150	G150	ALL SERIES
G250	**G250**	**G250**	
GALX	GALX	1126 GALAXY G200	ALL SERIES
GLEX	GLEX	BD-700 GLOBAL EXPRESS	ALL SERIES
GLF2	GLF2	GULFSTREAM II (G-	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
		1159)	
GLF2B	GLF2	GULFSTREAM IIB (G-1159B)	ALL SERIES
GLF3	GLF3	GULFSTREAM III (G-1159A)	ALL SERIES
GLF4	GLF4	GULFSTREAM IV (G-1159C) G300 G350 G400 G450	ALL SERIES
GLF5	GLF5	GULFSTREAM V (G-1159D) G500 G550	ALL SERIES
GLF6	**GLF6**	**G650**	
H25B-700	H25B	BAE 125 / HS125	700A, 700B
H25B-750	H25B	HAWKER 750	ALL SERIES
H25B-800	H25B	BAE 125 / HS125 HAWKER 800XP HAWKER 800XPI HAWKER 800 HAWKER 850XP HAWKER 900XP HAWKER 950XP	800A, 800B ALL SERIES
H25C	H25C	HAWKER 1000	ALL SERIES
HA4T	HA4T	HAWKER 4000	ALL SERIES
IL62	IL62	ILYUSHIN-62	ALL SERIES
IL76	IL76	ILYUSHU-76	ALL SERIES
IL86	IL86	ILYUSHIN-86	ALL SERIES
IL96	IL96	ILYUSHIN-96	ALL SERIES
J328	J328	328JET	ALL SERIES
KC135	B703	KC-135	ALL SERIES
L101	L101	L-1011 TRISTAR	ALL SERIES
L29B-2	L29B	L-1329 JETSTAR 2	ALL SERIES
L29B-731	L29B	L-1329 JETSTAR 731	ALL SERIES
LJ23	**LJ23**	**LEARJET 23**	
LJ24	**LJ24**	**LEARJET 24**	
LJ25	**LJ25**	**LEARJET 25**	
LJ28	**LJ28**	**LEARJET 28** **LEARJET 29**	
LJ31	LJ31	LEARJET 31	ALL SERIES
LJ35-36	LJ35	LEARJET 35 LEARJET 36	ALL SERIES ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
LJ40	LJ40	LEARJET 40	ALL SERIES
LJ45	LJ45	LEARJET 45	ALL SERIES
LJ55	LJ55	LEARJET 55	ALL SERIES
LJ60	LJ60	LEARJET 60	ALL SERIES
MD10	MD10	MD-10	ALL SERIES
MD11	MD11	MD-11	COMBI, ER, FREIGHTER, PASSENGER
MD80	MD81 MD82 MD83 MD87 MD88	MD-80 MD-80 MD-80 MD-80 MD-80	81 82 83 87 88
MD90	MD90	MD-90	30, 30ER
MU30	MU30	MU-300 DIAMOND	1A
P180	P180	P-180 AVANTI	ALL SERIES
PAY4	**PAY4**	**PA-42**	**1000 CHEYENNE**
PC12	PC12	PC-12	ALL SERIES
PRM1	PRM1	PREMIER 1	ALL SERIES
SB20	SB20	SAAB 2000	ALL SERIES
SBR1	SBR1	SABRELINER 40 SABRELINER 60 SABRELINER 65	ALL SERIES
SBR2	SBR2	SABRELINER 80	ALL SERIES
T134	T134	TU-134	A, B
T154	T154	TU-154	A, B, M, S
T204	T204	TU-204 TU-224 TU-234	100, 100C, 120RR 200, 214, C
T334	T334	TU-334	ALL SERIES
TBM	TBM7 TBM8	TBM-700 TBM-850	ALL SERIES
WW24	WW24	1124 WESTWIND	ALL SERIES
YK42	YK42	YAK-42	ALL SERIES

Appendix D: 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. RVSM, 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 23 February 2011)

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
Australian Airspace Monitoring Agency (AAMA) - Airservices http://www.airservicesaustralia.com/organisations/aama/default.asp Mr. Robert Butcher, Operational Analysis Manager, Safety and Assurance Group email: robert.butcher@airservicesaustralia.com or aama@airservicesaustralia.com	Australia	APANPIRG RMA	Current	Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby and Ujung Pandang (including Timor-Leste) 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	RMA	Current	Beijing, Guangzhou, Kunming, Lanzhou, Shanghai, Shenyang, Urumqi, Wuhan, Sanya and Pyongyang FIR.
India Bay of Bengal Airspace Safety Monitoring Agency (BOBASMA) http://www.aai.aero/public_notices/aaisite_test/bobasma_index.jsp Mr. A. P. Udayanarayanan Joint General Manager (ATM) Phone No:+ 91 44 22561253 Fax No: +91 44 22561740 Email: bobasmachennai@gmail.com : bobasma@aai.aero	India	EMA as endorsed by RASMAG/15	Current	Chennai, Colombo, Delhi, Dhaka, Kabul, Karachi, Kolkata, Lahore, Male, Mumbai, Yangon,
Japan Airspace Safety Monitoring Agency (JASMA) Mr. Noritoshi Suzuki, Special Assistant to the Director, Flight Procedures and Airspace Program Office, Japan Civil Aviation Bureau, email: suzuki-n248@mlit.go.jp CRA function: Mr. Hironori Okayama, Deputy Director, Air Traffic Control Association Japan, Japan Civil Aviation Bureau, email: okayama@atcaj.or.jp	Japan	RMA and CRA, endorsed as an EMA at RASMAG/15	Current	Fukuoka FIR

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
Monitoring Agency for the Asia Region (MAAR) **Aeronautical Radio of Thailand LTD** (AEROTHAI) http://www.aerothai.co.th/maar Dr. Paisit Herabat Director, MAAR AEROTHAI Email: paisit@aerothai.co.th or maar@aerothai.co.th	Thailand	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
Pacific Approvals Registry and Monitoring Organization (PARMO) – Federal Aviation Administration (US FAA) http://www.faa.gov/air_traffic/separation_standards/parmo/ Mr. Dale Livingston, Manager, Separation Standards Analysis Team, FAA, email: dale.livingston@faa.gov or aparmo@faa.gov	USA	RMA and EMA	Current	RMA for Anchorage Oceanic, Auckland Oceanic, Incheon, Nadi, Oakland Oceanic, New Zealand, Tahiti FIRs EMA for 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 and CRA	Current	EMA for Hong Kong, Ho Chi Minh, Kota Kinabalu, Kuala Lumpur, Manila, Jakarta, Sanya and Singapore FIRs CRA for Singapore, Viet Nam and Philippines

Organisation *(including contact officer)*	State	Competency	Status	Airspace assessed (FIRs)
~~**FIT – BOB**~~ **FIT-ASIA** (endorsed by RASMAG/15) ~~ICAO Regional Office email icao_apac@bangkok.icao.int &~~ Mr. Bradley Cornell, Boeing Engineering email: Bradley.D.Cornell@Boeing.Com ~~**FIT - SEA**~~ ~~(ICAO Regional Office email icao_apac@bangkok.icao.int &~~	~~ICAO Regional Office &~~ Boeing USA	FIT & CRA	Current	FIRs in the Asian Region not covered by IPACG/FIT and ISPACG/FIT
IPACG/FIT Mr. Shoichi Kosugi, JCAB Co-Chair email: kosugi-s07vf@mlit.go.jp and Mr. Reed Sladen, FAA Co-Chair, email: reed.b.sladen@faa.gov	Japan and USA	FIT & CRA	Current	North & Central Pacific (Oceanic airspace within Fukuoka FIR, and Anchorage & Oakland FIRs)
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)

Appendix E: Amended LHD Taxonomy

Code	LHD Cause
	Operational Errors
A	Flight crew failing to climb/descend the aircraft as cleared *Example: Aircraft A was at FL300 and assigned FL360. A CLAM alert was seen as the aircraft passed FL364. The Mode C level reached FL365 before descending back to FL360.*
B	Flight crew climbing/descending without ATC Clearance *Example: At 0648, Aircraft A reported leaving cruise level FL340. The last level clearance was coincident with STAR issue at 0623, when the flight was instructed to maintain FL340. ATC was applying vertical separation between Aircraft A and two other flights. The timing of the descent was such that Aircraft A had become clear of the first conflicting aircraft and there was sufficient time to apply positive separation with the other.*
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) *Example: The aircraft was maintaining a flight level below the assigned altitude. The altimeters had not been reset at transition. The FL assigned was 350. The aircraft was maintaining FL346 for in excess of 4 minutes.*
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message. Includes situations where ATC delivery of operational information, including as the result of hear back and/or read back errors, is absent, delayed, incorrect or incomplete, and may result in a loss of separation.) *Example: All communications between ATC and aircraft are by HF third party voice relay. Aircraft 1 was maintaining FL360 and requested FL380. A clearance to FL370 was issued, with an expectation for higher levels at a later point. A clearance was then issued to Aircraft 2 to climb to FL390, this was correctly read back by the HF operator, but was issued to Aircraft 1.* *The error was detected when Aircraft 1 reported maintaining FL390.*
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) *Example 1: Sector A coordinated Aircraft 1 to Sector B at FL380. The aircraft was actually at FL400.* *Example 2: The Sector A controller received coordination on Aircraft 1 for Waypoint X at FL370 from Sector B. At 0504 Aircraft 1 was at Waypoint X at FL350 requesting FL370.*
F	Coordination errors in the ATC to ATC transfer or control responsibility as a result of equipment outage or technical issues *Example: Controller in FIR A attempts to send AIDC message to coordinate transfer of aircraft at FL320. Messaging unsuccessful and attempts to contact adjacent FIR by telephone fail. Aircraft contacts adjacent FIR without coordination being completed.*

	Aircraft Contingency Events
G	Deviation due to aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure) *Example: Aircraft 1 descended from F400 to F300 with a pressurisation issue.*
H	Deviation due to airborne equipment failure leading to unintentional or undetected change of flight level *Example: Aircraft 1 cruising at FL380. ATC receives alert indicating aircraft climbing through FL383. Flight crew advises attempting to regain cleared level with autopilot and navigation system failure.*
	Deviation due to Meteorological Condition
I	Deviation due to turbulence or other weather related cause *Example: During the cruise at F400, the aircraft encountered severe turbulence, resulting the aircraft descending 1,000 ft without a clearance.*
	Deviation due to TCAS RA
J	Deviation due to TCAS resolution advisory, flight crew correctly following the resolution advisory *Example: Aircraft 1 was cruising at FL350. Flight crew received "Traffic Alert" from TCAS and almost immediately after an "RA Climb" instruction. Flight crew responded and climbed Aircraft 1 to approx FL353 to comply with TCAS instruction. TCAS display indicated that opposite direction Aircraft 2 descended to approx FL345 and passed below Aircraft 1.*
K	Deviation due to TCAS resolution advisory, flight crew incorrectly following the resolution advisory.
	Other
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) *Example 1: Original flight plan details submitted by FIR A for outbound leg showed Aircraft 1 as negative RVSM. Subsequent flight plan submitted by FIR B showed Aircraft 1 as RVSM approved. FIR A controller checked with aircraft shortly after entering FIR A and pilot confirmed negative RVSM.* *Example 2: Aircraft 2 cruising FL310 was handed off to the Sector X controller who noticed the label of Aircraft 2 indicated RVSM approval. The Sector X controller had controlled the aircraft the day before. It was then a non-RVSM aircraft. The controller queried the status of Aircraft 2 with the pilot who advised the aircraft was negative RVSM.*
M	Other – this includes situations where: i) There has been a failure to establish or maintain a separation standard between aircraft; or ii) Where flights are operating (including climbing/descending) in airspace where flight crews are unable to establish normal air-ground communications with the responsible ATS unit. *Example: Aircraft 1 cruising at FL350. At time xxxx Aircraft 1 advised “Negative RVSM” due equipment failure. At that time Aircraft 2 on converging reciprocal track FL360 less than 10 minutes prior to time of passing.*