

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**



**REPORT OF THE 21<sup>ST</sup> MEETING OF THE REGIONAL AIRSPACE SAFETY  
MONITORING ADVISORY GROUP (RASMAG/21)**

BANGKOK, THAILAND, 14 – 17 JUNE 2016

The views expressed in this Report should be taken as those of the  
Meeting and not the Organization

Approved by the Meeting  
and published by the ICAO Asia and Pacific Office, Bangkok

RASMAG/21  
Table of Contents

---

**CONTENTS**

INTRODUCTION .....	iii
Meetings.....	iii
Attendance .....	iii
Opening of the Meeting .....	iii
Documentation and Working Language .....	iii
Draft Conclusions, Draft Decisions and Decisions of RASMAG – Definition .....	iv
List of Decisions and Draft Conclusions/Decisions.....	iv
REPORT ON AGENDA ITEMS – RASMAG/21 .....	1
Agenda Item 1: Adoption of Agenda.....	1
Agenda Item 2: Review Outcomes of Related Meetings .....	1
Agenda Item 3: Reports from Asia/Pacific RMAs and EMAs .....	5
Agenda Item 4: Airspace Safety Monitoring Documentation and Regional Guidance Material.....	14
Agenda Item 5: Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific Region .....	15
Agenda Item 6: Review and Update RASMAG Task List .....	29
Agenda Item 7: Any Other Business.....	29
Agenda Item 8: Date and Venue of the Next RASMAG Meeting.....	29

RASMAG/21  
Table of Contents

---

**APPENDIXES TO THE REPORT OF RASMAG/21**

Appendix A:	List of Participants.....	A-1
Appendix B:	List of Papers.....	B-1
Appendix C:	APANPIRG ANS Deficiency List.....	C-1
Appendix D:	Draft Regional PBCS Transition Strategy.....	D-1
Appendix E:	RVSM Minimum Monitoring Requirements List.....	E-1
Appendix F:	List of Operators and Aircraft Groups Never Monitored.....	F-1
Appendix G:	Competent Safety Monitoring Organisations.....	G-1
Appendix H:	RASMAG Task List.....	H-1

## **INTRODUCTION**

### **Meetings**

1.1 The Twenty-First Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/21) was held from 14-17 June 2016 at Bangkok, Thailand.

### **Attendance**

2.1 A total of 46 participants attended RASMAG/21 from Australia, Bangladesh, China, Democratic People's Republic of Korea (DPRK) India, Indonesia, Japan, Malaysia, New Zealand, Philippines, Singapore, Thailand, the United States, IATA, IFALPA and ICAO. The list of participants is at **Appendix A** to this report.

### **Officers and Secretariat**

3.1 Mr. Robert Butcher, Systemic Analysis, Monitoring and Review Manager, Safety and Assurance Group, Airservices Australia, chaired the RASMAG/21 meeting. Mr. Len Wicks, Regional Officer, ATM, ICAO Asia and Pacific Office acted as the Secretary for the RASMAG/21 meeting.

### **Opening of the Meeting**

4.1 Mr. Robert Butcher welcomed participants to the meeting.

4.2 On behalf of Mr Arun Mishra, Regional Director of ICAO Asia and Pacific Office, Mr. Mr. Len Wicks welcomed all participants.

### **Documentation and Working Language**

5.1 The working language of the meeting and the language for all documentation was English. A total of 36 working papers (WPs), and seven information papers (IPs) were presented to RASMAG/21. The list of papers and presentations is shown at **Appendix B** to this report.

**Draft Conclusions, Draft Decisions and Decisions of RASMAG – Definition**

6.1 RASMAG recorded its actions in the form of Draft Conclusions, Draft Decisions and Decisions within the following definitions:

- a) **Draft Conclusions** deal with matters that, according to APANPIRG terms of reference, require the attention of States, or action by the ICAO in accordance with established procedures;
- b) **Draft Decisions** deal with the matters of concern only to APANPIRG and its contributory bodies; and
- c) **Decisions** of RASMAG that relate solely to matters dealing with the internal working arrangements of the RASMAG.

**List of Decisions and Draft Conclusions/Decisions**

7.1 List of Draft Conclusions

<b>Draft Conclusion RASMAG21-A: PBCS Operator Requirements</b>	
<p>That, States are urged to take appropriate measures to develop, establish, implement and promulgate, through advisory circular or other relevant State instrument, necessary policies and procedures to enable operators conducting flights in airspace where separations are dependent on performance-based communication and surveillance (PBCS) to start using required communication performance (RCP) / required surveillance performance (RSP) indicators in the flight plan as soon as possible. This should take into account:</p> <ul style="list-style-type: none"> <li>a) time for the operator to comply with the States’ policies; and</li> <li>b) the need for the State to distribute data from PBCS monitoring programs, as necessary.</li> </ul>	<p>Expected impact:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Political / Global</li> <li><input checked="" type="checkbox"/> Inter-regional</li> <li><input checked="" type="checkbox"/> Economic</li> <li><input type="checkbox"/> Environmental</li> <li><input checked="" type="checkbox"/> Ops/Technical</li> </ul>
<p>Why: To ensure aircraft operators are prepared for implementation of performance-based separations by States in Asia/Pacific and other Regions implementing the new PBCS provisions.</p>	
<p>When: 10-Nov-16</p>	<p>Status: Draft to be adopted by Subgroup</p>
<p>Who: <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: XXXX</p>	

RASMAG/21  
History of the Meeting

<b>Draft Conclusion RASMAG21-B: State Implementation of ICAO Provisions for PBCS</b>	
<p>That, States that apply or plan to apply 30 NM and/or 50 NM longitudinal separation minima and/or 23 NM lateral separation minimum are urged to implement the ATM system capability to process and use ICAO PBCS flight plan indicators to determine aircraft eligibility for performance-based separation by not later than 29 March 2018; and</p> <p>Common implementation dates are applied by States using RCP/RSP indicators to establish performance-based separation in adjacent airspace, supported by joint submission of Proposals for Amendment (PfA) to ICAO Doc 7030 – Regional Supplementary Procedures.</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input checked="" type="checkbox"/> Inter-regional</p> <p><input checked="" type="checkbox"/> Economic</p> <p><input type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Ops/Technical</p>
<p><b>Why:</b> Recognizing that many States will not be ready to fully implement the new PBCS provisions on the applicability date of 10 November 2016.</p>	
<p><b>When:</b> As soon as possible, but not later than 29-Mar-18</p>	<p><b>Status:</b> Draft to be adopted by Subgroup</p>
<p><b>Who:</b> <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other: XXXX</p>	

<b>Draft Conclusion RASMAG21-C: Asia/Pacific Region PBCS Transition Strategy</b>	
<p>That, the Asia/Pacific Region PBCS Transition Strategy at <b>Attachment RASMAG/21/WP3/Attachment B</b> be endorsed, and posted on the Asia/Pacific Regional Office website.</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input checked="" type="checkbox"/> Inter-regional</p> <p><input checked="" type="checkbox"/> Economic</p> <p><input type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Ops/Technical</p>
<p><b>Why:</b> Recognizing that many States will not be ready to fully implement the new PBCS provisions on the applicability date of 10 November 2016.</p>	
<p><b>When:</b> As soon as possible, but not later than 29-Mar-18</p>	<p><b>Status:</b> Draft to be adopted by Subgroup</p>
<p><b>Who:</b> <input checked="" type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:</p>	

RASMAG/21  
History of the Meeting

<b>Draft Conclusion RASMAG/21-1: Use of Available ADS-B Data for Aircraft Height Monitoring</b>	
<p>That, ADS-B data obtained by a Regional Monitoring Agency (RMA) for use in aircraft height-keeping monitoring by means of an ADS-B Height Monitoring System (AHMS), can be sourced from aircraft not subject to an ADS-B related operational approval.</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input type="checkbox"/> Inter-regional</p> <p><input type="checkbox"/> Economic</p> <p><input type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Ops/Technical</p>
<p><b>Why:</b> Approval for ADS-B is included in the overall operational approval and was no different to operating with radar; and APANPIRG Conclusion 26/41 stated that an operational approval was not required for the operational use of ADS-B OUT by ATC.</p>	
<p><b>When:</b> 8-Sep-16</p>	<p><b>Status:</b> Draft to be adopted by PIRG</p>
<p><b>Who:</b> <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input checked="" type="checkbox"/> ICAO HQ <input checked="" type="checkbox"/> Other: ROs</p>	

<b>Draft Conclusion RASMAG/21-2: Provision of PBN Approval Data by States</b>	
<p>That, when requested by an En-route Monitoring Agency (EMA) Asia/Pacific States should provide PBN approval data where that data is available.</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input type="checkbox"/> Inter-regional</p> <p><input type="checkbox"/> Economic</p> <p><input type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Ops/Technical</p>
<p><b>Why:</b> RASMAG/MAWG/2 and RASMAG/21 considered there may be future problems if States no longer provided approvals data for specific Performance-based Navigation (PBN) types, as data was needed to ensure valid data capture.</p>	
<p><b>When:</b> 8-Sep-16</p>	<p><b>Status:</b> Draft to be adopted by PIRG</p>
<p><b>Who:</b> <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:</p>	

RASMAG/21  
History of the Meeting

<b>Draft Conclusion RASMAG/21-3: Large Height Deviation Guidance Material</b>	
<p>That, Asia/Pacific States should utilise the Large Height Deviation (LHD) Guidance Material on LHD taxonomy, reporting form(s), cross-boundary LHD reporting flow, and LHD Point of Contacts (POC) posted on Asia/Pacific Regional Monitoring Agency (RMA) websites.</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input type="checkbox"/> Inter-regional</p> <p><input type="checkbox"/> Economic</p> <p><input type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Ops/Technical</p>
<p>Why: To harmonise the LHD handling procedures used by States in order to assist RMAs.</p>	
<p>When: 8-Sep-16</p>	<p>Status: Draft to be adopted by PIRG</p>
<p>Who: <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:</p>	

<b>Draft Conclusion RASMAG/21-4: Reduced Vertical Separation Minimum (RVSM) Approval Expiry</b>	
<p>That, Asia/Pacific States should:</p> <p>a) in case they intend to allow RVSM approvals to expire, review their RVSM approvals data sharing procedures to take into account their ability to update RVSM approvals to Regional Monitoring Agencies (RMAs) before they expire; and</p> <p>b) in case they do <u>not</u> allow RVSM approvals to expire, notify the RMA to remove all existing expiration dates (if any), and ensure that any future withdrawals of RVSM approvals are sent to the RMA.</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input type="checkbox"/> Inter-regional</p> <p><input type="checkbox"/> Economic</p> <p><input type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Ops/Technical</p>
<p>Why: To assist reduce unnecessary workload for the RMAs and increase efficiency in managing non-RVSM approved airframes.</p>	
<p>When: 8-Sep-16</p>	<p>Status: Draft to be adopted by PIRG</p>
<p>Who: <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:</p>	



RASMAG/21  
History of the Meeting

<b>Draft Conclusion RASMAG/21-5: Reduced Vertical Separation Minimum (RVSM) Monitoring of Small Fleets</b>	
<p>That, Asia/Pacific States should have processes to ensure that single aircraft operators or operators with small fleets are appropriately monitored in terms of Annex 6 requirements, including:</p> <p>a) the provision of guidance material so operators are aware of their responsibilities; and</p> <p>b) regulatory procedures being in place to ensure a State meets its obligation under Annex 6 that RVSM approved aircraft are monitored systematically.</p>	<p>Expected impact:</p> <p><input type="checkbox"/> Political / Global</p> <p><input type="checkbox"/> Inter-regional</p> <p><input type="checkbox"/> Economic</p> <p><input type="checkbox"/> Environmental</p> <p><input checked="" type="checkbox"/> Ops/Technical</p>
<p><b>Why:</b> To increase Annex 6 monitoring compliance levels within the Asia/Pacific.</p>	
<p><b>When:</b> 8-Sep-16</p>	<p><b>Status:</b> Draft to be adopted by PIRG</p>
<p><b>Who:</b> <input type="checkbox"/> Sub groups <input checked="" type="checkbox"/> APAC States <input checked="" type="checkbox"/> ICAO APAC RO <input type="checkbox"/> ICAO HQ <input type="checkbox"/> Other:</p>	

## REPORT ON AGENDA ITEMS – RASMAG/21

### Agenda Item 1: Adoption of Agenda

- 1.1 The provisional agenda (WP01) was adopted by the meeting.
- 

### Agenda Item 2: Review Outcomes of Related Meetings

#### Relevant Meeting Outcomes (WP02)

- 2.1 The Secretariat provided briefings on the outcomes of relevant meetings, including the:
- a) Second Meeting of the APANPIRG Contributory Bodies Structure Review Task Force (ABSRTF/2, Bangkok, Thailand, 24 to 25 June 2015);
  - b) Third Meeting of the APANPIRG Air Traffic Management Sub-Group (ATM/SG/3, Bangkok, 03 to 07 August 2015);
  - c) Twenty-Sixth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/26, Bangkok, 07 to 10 September 2015);
  - d) Fifty-Second Conference of Directors General of Civil Aviation, Asia and Pacific Regions (DGCA/52, Manila, the Philippines, 26 to 29 October 2015); and
  - e) combined Sixth Meeting of the South Asia/Indian Ocean ATM Coordination Group (SAIOACG/6) and Twenty-Third Meeting of the South-East Asia ATM Coordination Group (SEACG/23, Bangkok, 29 February to 03 March 2016).
- 2.2 RASMAG noted that APANPIRG agreed that RASMAG should keep its Subgroup status as it was, reporting directly to APANPIRG, and that [in 2017] Sub Groups should have the ability to adopt, without further APANPIRG endorsement, any Conclusion or Decision (especially those concerning guidance to States in the implementation of ICAO SARPs, GANP, RANP, Seamless ATM Plan) that does not have significant additional economic, environmental or political effects, which should be considered at a higher level at APANPIRG.
- 2.3 The meeting reviewed the RASMAG-related APANPIRG Deficiencies, including the:
- a) Non Provision of Safety-related Data (Annex 11, paragraph 3.3.5.1 refers): India and the Philippines; and
  - b) Data Link Performance Monitoring and Analysis requirements of Annex 11, paragraph 2.27.5 not met: China, Indonesia, Malaysia, Myanmar, Maldives, Sri Lanka\* and Viet Nam\*.
- 2.4 The meeting noted that an updated list of APANPIRG Deficiencies, including proposals for new or amended APANPIRG Deficiencies proposed by FIT-Asia5 (RASMAG21/WP03) related to Sri Lanka and Viet Nam, and any further proposals for new Deficiencies that transpired from RASMAG/21 discussions would be appended to the RASMAG/21 meeting report (**Appendix C**).

2.5 At SAIOACG/6 and SEACG/23, a number of RASMAG-driven ATM improvements were discussed:

- a. India – major initiatives within the Chennai FIR, including new Automatic Dependent Surveillance-Broadcast (ADS-B) sites (in the Andaman and Nicobar Islands, India) and Air Traffic Service Inter-facility Datalink Communications (AIDC) trials;
- b. The Philippines – Automatic Dependent Surveillance-Contract (ADS-C)/Controller Pilot Datalink Communication (CPDLC) trials were being conducted in the eastern portion of the Manila Flight Information Region (FIR), and AIDC tests with Singapore, Ujung Pandang, and Taipei Area Control Centres (ACCs); and
- c. South China Sea Major Traffic Flow Review Group (SCS/MTRFG/3) – review of the Flight Level Allocation Scheme (FLAS) used in the South China Sea (SCS) to align it with the standard Flight Level Orientation Scheme (FLOS) in Annex 2.

FIT-Asia5 Meeting Outcomes (WP03)

2.6 ICAO presented the outcomes of the Operational Data Link Seminar and Fifth Meeting of the Future Air Navigation Services (FANS) Interoperability Team – Asia (FIT-Asia/5, Bangkok, 02 to 06 May 2016).

2.7 FIT-Asia/5 agreed that the FIT-Asia Data Link Status Table (**RASMAG/21/WP3/ Attachment A**) should be further developed to include information on the data link status of the entire APAC Region including non-FIT-Asia States.

2.8 Eight FIT-Asia administrations were known to be providing Automatic Dependent Surveillance – Contract (ADS-C)/Controller-Pilot Data Link Communications (CPDLC) services. Only 3 of these administrations had submitted problem reports to a recognized CRA. Only three FIT-Asia administrations that provided operational ADS-C/CPDLC services submitted performance analyses to FIT-Asia/5. APANPIRG Air Navigation Service (ANS) Deficiencies were currently in place against eight FIT-Asia States for failure to comply with the requirements of Annex 11 paragraph 2.27.5.

2.9 The FIT-Asia Central Reporting Agency (CRA, provided by Boeing CRA) presented information highlighting problem reports received through the Informal South Pacific ATS Coordination Group (ISPACG) CRA website, which also provides the FIT-Asia CRA facility. A table of known software issues was provided for the information of aircraft operators.

2.10 Only China, India and Singapore provided data link performance reports to FIT-Asia/5.

2.11 Of the four data link ground systems operational in India, it was possible to extract data only from the Chennai ground system. CPDLC Actual Communications Performance (ACP) and ADS-C Downlink Latency for HF both fell well below target levels of performance.

2.12 In noting the outcomes of the operational data link seminar, the FIT-Asia meeting also noted the recommendation that a Regional Performance-based Communications and Surveillance (PBCS) Transition Strategy should be based on the third of three options proposed, i.e. to continue with the current operational implementation of performance-based separation minima under certain conditions, and recommended that the matter be referred to the ATM Sub-Group of APANPIRG (ATM/SG) for further consideration after RASMAG endorsement.

2.13 RASMAG/21 endorsed the following Draft Conclusions, and agreed that they should be referred to ATM/SG for further consideration:

**Draft Conclusion RASMAG/21-A: PBCS Operator Requirements**

That, States are urged to take appropriate measures to develop, establish, implement and promulgate, through advisory circular or other relevant State instrument, necessary policies and procedures to enable operators conducting flights in airspace where separations are dependent on performance-based communication and surveillance (PBCS) to start using required communication performance (RCP) / required surveillance performance (RSP) indicators in the flight plan as soon as possible. This should take into account:

- a) time for the operator to comply with the States' policies; and
- b) the need for the State to distribute data from PBCS monitoring programs, as necessary.

**Draft Conclusion RASMAG/21-B: State Implementation of ICAO Provisions for PBCS**

That, States that apply or plan to apply 30 NM and/or 50 NM longitudinal separation minima and/or 23 NM lateral separation minimum are urged to implement the ATM system capability to process and use ICAO PBCS flight plan indicators to determine aircraft eligibility for performance-based separation by not later than 29 March 2018; and

Common implementation dates are applied by States using RCP/RSP indicators to establish performance-based separation in adjacent airspace, supported by joint submission of Proposals for Amendment (PfA) to ICAO Doc 7030 – Regional Supplementary Procedures.

**Draft Conclusion RASMAG/21-C: Asia/Pacific Region PBCS Transition Strategy**

That, the Asia/Pacific Region PBCS Transition Strategy at **RASMAG/21/WP3/Attachment B** be endorsed, and posted on the Asia/Pacific Regional Office website.

2.14 The FIT-Asia/5 meeting requested that, due to the timing of the APANPIRG/27 meeting being only two months before the applicability of the new RCP/RSP provisions, ICAO Asia/Pacific Regional Office circulate a State letter highlighting the outcomes from FIT-Asia/5 and the Draft Conclusions that would be proposed to APANPIRG/27. Accordingly, State Letter AP064/16 (ATM) was distributed to States on 03 June 2016.

2.15 The meeting discussed the possible future requirement for safety monitoring of data link performance reports under PBCS, and whether this may potentially be included in an expanded role for En-route Monitoring Agencies (EMAs). Noting the PBCS requirements supporting several horizontal separation minima either currently or planned to be implemented in the Asia/Pacific Region, RASMAG agreed to expand the role of Asia/Pacific Region EMAs to incorporate the provisions of APANPIRG Conclusion 24/25, and to also conduct safety monitoring of the new PBCS provisions.

2.16 IATA emphasised that the Asia/Pacific needed to conform with the PBCS implementation strategy (**Appendix D**) as the North Atlantic was implementing with 2018 and it was likely that after that date Asia/Pacific aircraft that did not conform would be unable to access the North Atlantic PBCS airspace. It was noted that the North Atlantic implementation has been moved to align with the Asia/Pacific's (29 March 2018). The emphasis was on State regulators to create the required approval processes for PBCS.

2.17 RASMAG recognised that horizontal separation standards (30NM and 50NM) had been demonstrated to easily meet the TLS for some years, and as a result option 3 (status quo) was agreed with the addition of extra text recognising this fact. The meeting agreed to a proposal from the Chair that the MAWG should discuss the assignment of PBCS oversight for each FIR to an established Asia/Pacific EMA.

Role and responsibilities of EMA regarding PBCS (IP03)

2.18 Japan Civil Aviation Bureau of Japan (JCAB) made a presentation about future activities of JASMA (EMA regarding Performance-based Communications and Surveillance (PBCS) and their national transition strategy for PBCS.

RASMAG/MAWG/3 Report (WP04)

2.19 Topics discussed by the meeting included:

- a) the new Manual on Monitoring the Application of Performance-Based Horizontal Separation Minima (PBHSM, Doc. 10063);
- b) China Regional Monitoring Agency's (RMA's) progress on use of ADS-B for height monitoring by the end of 2015;
- c) concerns regarding States not responding effectively to RMA requests for Reduced Vertical Separation Minimum (RVSM) approvals confirmation, which may trigger RASMAG to highlight the issue and recommend an APANPIRG Deficiency if the matter was not resolved;
- d) whether the ADS-B Height Monitoring System (AHMS) system needed to check the ADS-B operational approval status of aircraft before using the data for Altimetry System Error (ASE) estimate, which resulted in the following Draft Conclusion agreed by RASMAG/21 for APANPIRG's consideration:

**Draft Conclusion RASMAG/21-1: Use of Available ADS-B Data for Aircraft Height Monitoring**

That, ADS-B data obtained by a Regional Monitoring Agency (RMA) for use in aircraft height-keeping monitoring by means of an ADS-B Height Monitoring System (AHMS), can be sourced from aircraft not subject to an ADS-B related operational approval.

- e) the provision by States of approvals data for specific PBN types if available, to the relevant EMA, which resulted in the following Draft Conclusion agreed by RASMAG/21 for APANPIRG's consideration:

**Draft Conclusion RASMAG/21-2: Provision of PBN Approval Data by States**

That, when requested by an En-route Monitoring Agency (EMA) Asia/Pacific States should provide PBN approval data where that data is available.

RMACG/11 Report (IP02)

2.20 Australia presented information from the Eleventh Meeting of the Regional Monitoring Agencies Coordination Group (RMACG/11, 16 to 20 May 2016, Montreal, Canada).

2.21 The RASMAG Chair had agreed to draft a version of the new EUR Document.34, which contains guidance material related to the continued monitoring of RVSM airspace in Europe, for applicability within the Asia/Pacific region and to provide it to RASMAG for consideration. The meeting agreed that a small team led by the RASMAG Chair would review the European document and report back to RASMAG.

2.22 The RMACG/11 also reviewed the June 2015 RVSM Minimum Monitoring Requirements (MMR) Chart and endorsed the new MMR Chart provided at **Appendix E** for applicability in Asia/Pacific by RMAs publishing the material on their web sites.

2.23 Other significant actions by the meeting included:

- a) endorsing a template for identified non-approved airframes operating with RVSM approval flight plan status based on a form developed by the Monitoring Agency for the Asian Region (MAAR) for RMAs to non-approved airframes report to States;
- b) reviewing data related to observed changes in the altimetry system error of A320 aircraft and the detailed work undertaken by involved RMAs to resolve the issues with State authorities and operators; and
- c) discussing a planned ASE Workshop (September 2016, Atlantic City, United States) and considered a similar workshop for the Asia/Pacific in 2017. RASMAG agreed in principle to pursue a workshop in Bangkok in association with the next RASMAG/22 in 2017.

---

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

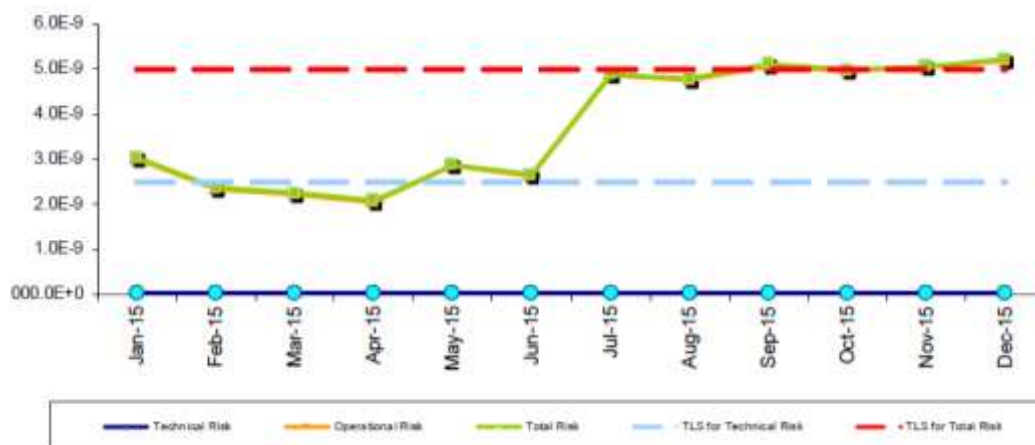
AAMA Safety Report (WP05)

3.1 Australia presented the results of RVSM safety assessments undertaken by the Australian Airspace Monitoring Agency (AAMA) for the twelve month period ending 31 December 2015.

3.2 The report showed that for the Australian (Brisbane, Melbourne), Nauru, Papua New Guinea (Port Moresby) and Solomon Islands (Honiara) Flight Information Regions (FIRs), the Target Level of Safety (TLS) was marginally not met with a risk assessment of  $5.22 \times 10^{-9}$  (TLS,  $5.0 \times 10^{-9}$ ).

3.3 There had been a total of 36 occurrences of pilots climbing or descending an aircraft not in accordance with the Air Traffic Control (ATC) clearance (18) or without an ATC clearance (18). The occurrences involved a range of operators and locations and there did not appear to be any underlying common factor. Additionally a number of long duration LHDs had been reported that generated the spike in risk in July 2015.

3.4 **Figure 1** presents the collision risk estimate trends for Australian, Nauru, Papua New Guinea and Solomon Islands airspace.



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

3.5 Regarding Indonesian airspace, the TLS was reportedly met for the period ( $1.10 \times 10^{-9}$ ). However, AAMA noted that (WP30 later refers):

*The reporting of LHDs to the AAMA by Indonesia was problematic over the twelve-month period, with significant delays being experienced in reports reaching the AAMA. Additionally, the AAMA observed what appeared to have been a reduction in reporting compared to previous years which could not be explained. As a result, the AAMA was unable to effectively validate monthly assessments with any confidence. This situation has been the subject of direct coordination between the AAMA and the Indonesian authorities and the reporting culture seems to have improved, during 2016 particularly since the introduction of AirNav Indonesia's new reporting application.*

#### China RMA Safety Report (WP06)

3.6 China presented the airspace safety oversight results for RVSM in the airspace of Chinese FIRs and the Pyongyang FIR (DPRK) during 2015. The estimates of technical and total risks for the airspace of Chinese FIRs met the TLS, with an overall risk estimate of  $3.27 \times 10^{-9}$ . Category E (ATC transfer of control coordination errors due to human factors) and M ('Other Causes') were the main contributors to risk.

3.7 The estimate by China RMA of the overall vertical collision risk for the Pyongyang FIR was  $834.10 \times 10^{-9}$  fatal accidents per flight hour. This was several orders of magnitude above the TLS. However the extremely low traffic densities within this airspace meant that the result was not as significant as other airspace in East Asia.

3.8 The China RMA had undertaken a technical exchange with DPRK during August 2015, and presented the regional safety monitoring assessment of RASMAG/20. This had highlighted the continuous non-Large Height Deviation (LHD) reporting in the Pyongyang FIR over many years. DPRK advised that they would review and refine their LHD reporting procedure, and China RMA received two LHD reports from Pyongyang FIR after this meeting (at Transfer of Control waypoints KANSU – Republic of Korea and NULAR – Russian Federation).

3.9 RASMAG/21 congratulated China and the DPRK for their work in enhancing safety reporting and furthermore, and for China RMA's extensive analysis and scrutiny group effort to help drive down safety incidents.

China RMA'S Attendance at APRAST/8 (IP04)

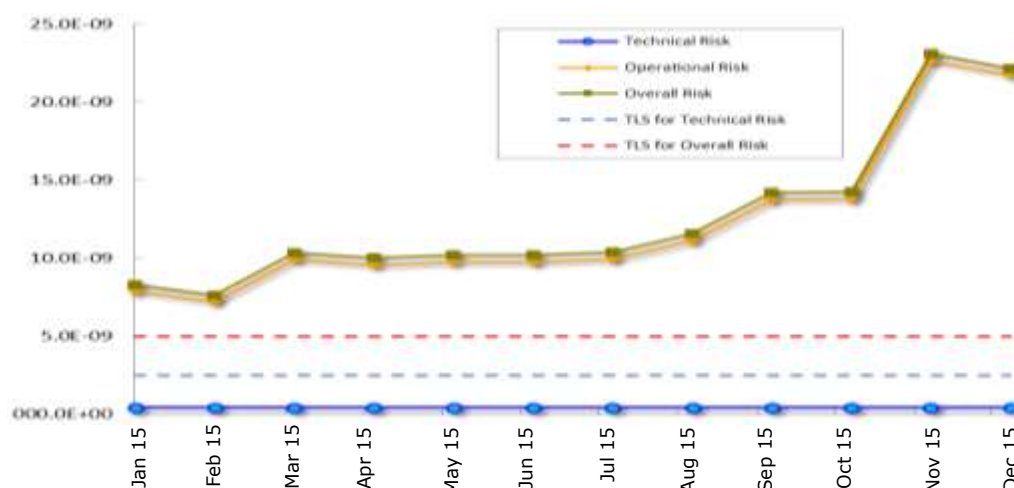
3.10 China discussed the benefits of the China RMA's attendance at the Eighth Meeting of the Asia Pacific Regional Aviation Safety Team (APRAST/8), including familiarization with the Safety Reporting Working Group (SRP WG), which is responsible for determining aviation safety risks and key contributors to accidents in the Asia/Pacific. IP04 noted Decision APRAST 8/17, regarding the SRP WG providing an update to APRAST/9 on the information to be shared with RASMAG for further analysis.

JASMA Vertical Safety Report (WP07)

3.11 Japan presented the results of the airspace safety assessment of the Fukuoka FIR by the JASMA. The report showed that the Fukuoka FIR did not meet the TLS, with the assessed risk calculated as  $22.11 \times 10^{-9}$ . There were two main contributors to this steep increase in estimated risk:

- a) Category E LHDs, mainly on the FIR boundary with the Manila FIR; and
- b) Category I (Turbulence or other weather related cause) LHDs, which occurred primarily in a localised area southwest of Japan, RASMAG21/WP30 refers).

3.12 **Figure 2** presents collision risk estimate trends during 2015.



**Figure 2:** Fukuoka FIR RVSM Risk Estimate Trends

3.13 The meeting discussed aspects of the Category I reports identified in the JASMA report and specifically noted the location of these in the AKARA area, noting the RVSM should be suspended during periods of known severe turbulence. This has significant impact on this area given the implementation of the FLAS by the three different ATS units controlling that airspace.

MAAR Vertical Safety Report (WP08)

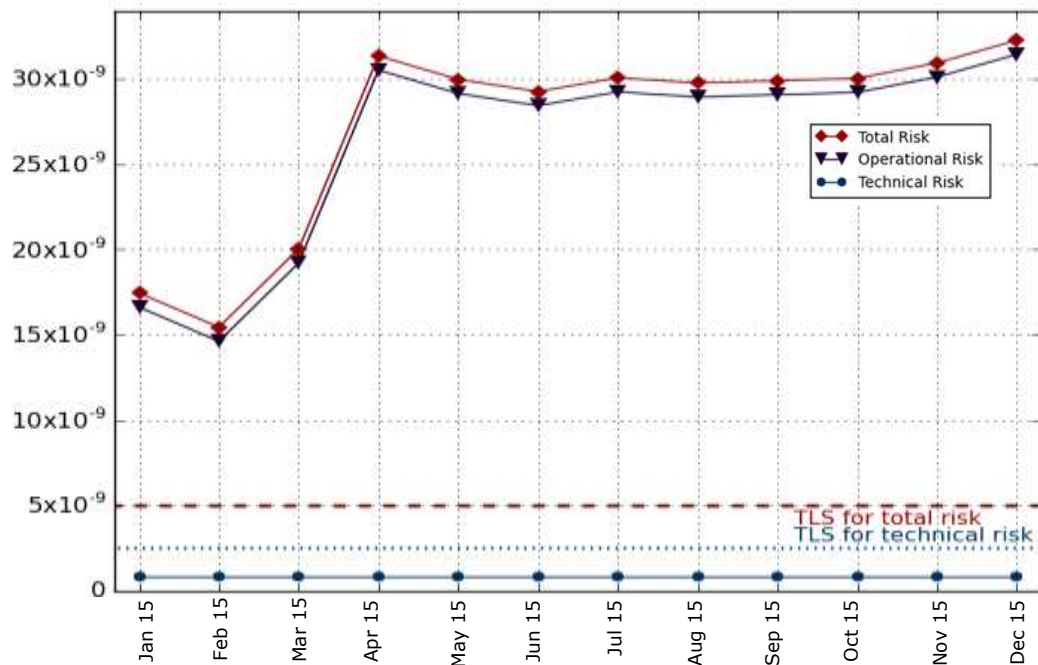
3.14 MAAR provided the airspace safety oversight results for the RVSM operation in the Bay of Bengal (BOB), Western Pacific/South China Sea (WPAC/SCS), and Mongolian airspace for 2015.

3.15 The BOB RVSM airspace overall risk was estimated to be  $32.27 \times 10^{-9}$ , which did not meet the TLS by a substantial margin. The Transfer of Control (TOC) points between the Kolkata FIR and Dhaka/Yangon FIRs and the Chennai and Kuala Lumpur/Jakarta FIRs remained the most prominent hot spots in the Asia/Pacific region, with ATC Category E errors accounting for more than 96% of reported LHDs in the BOB. More detailed analysis was provided in RASMAG21/WP09.



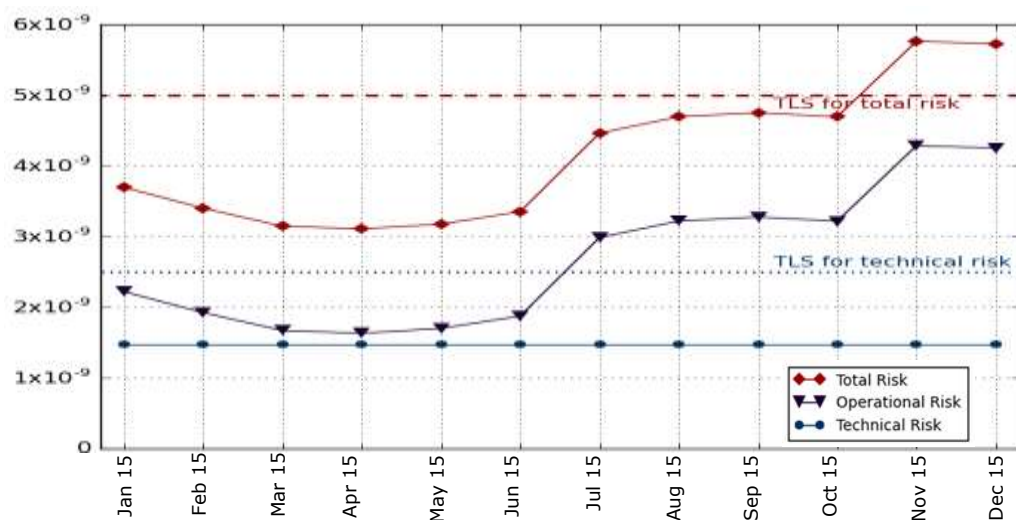
3.16 A new hot spot emerged during 2015 along the western boundary of the Mumbai FIR, which interfaced with the Mogadishu, Sana'a, and Muscat FIRs. The surge in long duration LHDs in March and April 2015 coincided with the temporary closure of Sana'a FIR and redirected contingency traffic through the Mogadishu FIR. However, the meeting noted that the spike in risk in March and April 2015 appeared temporary as the calculated monthly risk values for the remainder of the year were below the TLS. MAAR informed the meeting that two long duration LHDs were reported in the first quarter of 2016 even with the reopening of Sana'a FIR.

3.17 **Figure 3** presents collision risk estimate trends during 2015.



**Figure 3:** BOB Airspace RVSM Risk Estimate Trends

3.18 The WPAC/SCS RVSM airspace total risk was estimated to be  $5.73 \times 10^{-9}$ , which did not achieve the TLS. **Figure 4** presents collision risk estimate trends during 2015.



**Figure 4:** WPAC/SCS Airspace RVSM Risk Estimate Trends

3.19 The main hot spot for the SCS remains the interfaces around Manila FIR boundary, although most LHDs in this hot spot had zero duration since the area had good communication and surveillance coverage. A few LHDs had a short duration at the areas where there are holes in ATS surveillance coverage such as at the Manila – Hong Kong and Manila – Ho Chi Minh interfaces.

3.20 The overall risk in the region exceeded the TLS due one loss of separation occurrence of long duration within the Bangkok FIR in July 2015 which was caused by ATC human error, and a number of high risk LHDs reported in August and November.

3.21 The Mongolian RVSM airspace total risk was estimated to be **0.98 x 10<sup>-9</sup>**, which met the TLS. The improvement in performance was understood to be due to a concerted effort by China and Mongolia to enhance their ATC systems and procedures in this area.

3.22 The meeting discussed issues related to the Manila FIR interfaces and that resolution of these hot spot areas needed priority. The Philippines informed the meeting that technical interoperability issues of the ATM system with the adjacent ACC's were encountered. Resolution of the problems took a significant amount of time due to more stringent testing performed by the vendor taking into consideration the current operational requirements of Manila.

3.23 Technical tests with Singapore were expected to commence on July 4, 2016 using the operational platform after the successful tests. RASMAG requested an update on the technical implementation of AIDC and the operational mitigations to risk be made available by the Philippines to the ATM/SG and the MAAR. The meeting noted the possibility of delegating the western portion of the Manila FIR to a State able to provide the services. It was noted that the AIDC schedule for implementation provided by Manila was in the 2016-2017 timeframe (RASMAG/21/WP09 Appendix B), but the question remained what the State was doing to resolve the ATC procedural systemic issues in the meantime.

#### Hot Spot Analysis (WP09)

##### *South Asian LHDs*

3.24 MAAR had analysed the two hot spot areas associated with Indian airspace mentioned in RASMAG21/WP08. All the western long duration LHDs were as a result of breakdowns in coordination between Mogadishu and Mumbai FIR or Muscat and Mumbai FIR. The absence of a transfer message together with the lack of ATS surveillance and poor communication service in the area resulted in aircraft traversing the whole Mumbai FIR without Mumbai ACC's knowledge. The LHD with the highest risk spanned two hours and accounted for 45 % of TLS risk for the whole year.

3.25 India thanked MAAR for analysing the LHD hotspots after identification of the hotspots which had been unidentified in the preceding decade. India also agreed that there could be some more LHDs within the FIR boundaries that might not have been reported. India indicated that the main focus should be to resolve these LHD hotspots in a timely manner while continuing to report LHDs within BOBASIO airspace. India was in agreement with the Secretary of FIT-Asia that AIDC implementation cannot be construed as the only solution for mitigation of LHD hotspots and that States need to look into other possible mitigation measures as well.

3.26 MAAR raised the issue to the AFI Regional Monitoring Agency (ARMA), which oversees the Mogadishu FIR and the Middle East Regional Monitoring Agency (MIDRMA), which oversees the Muscat FIR. Further investigation revealed that Sana'a FIR was closed and traffic was being rerouted through the Mogadishu FIR at the time of the spike in LHDs in March and April 2015, causing a large increase in workload. However, a few of long duration LHDs were still being reported in the first quarter of 2016, even with the reopening of Sana'a FIR.

3.27 India stated that they had established the ATS coordination group BOBASIO in 2011 for the purpose of having a common forum where all States of the BOBASIO area could coordinate their efforts to resolve operational issues. Issues such as establishing Direct Speech Circuits (DSCs) using submarine cables with the African States and other ATS coordination procedures were discussed at these meetings.

3.28 ICAO noted that Mogadishu had limited capacity, which was understood to be a procedural ATC system with constrained communications capability, but that neighboring ACCs in Kenya (which used to service Mogadishu airspace) and the Seychelles were implementing AIDC and modern ATM systems. Therefore, if the hot spot remained, it was possible that RASMAG would recommend consideration of a delegation of upper airspace management to more capable ACCs in future, to reduce the unacceptable risk within the Asia/Pacific Region.

3.29 The meeting was informed that MIDRMA had notified Muscat ACC of the situation; however MAAR had not received any further information regarding the issues affecting Muscat. ICAO noted this, and would follow up with the ICAO MID Office.

3.30 The RASMAG Chair expressed appreciation for BOBASAMA's effort to reveal the LHD hotspots in BOBASIO airspace.

3.31 Regarding the LHDs on the eastern boundary of the Kolkata and Chennai FIRs, the number of occurrences had increased from 2014. The reported LHDs seemed to concentrate in the north near the Dhaka FIR and in the south around waypoint IGOGU between the Chennai FIR and the Kuala Lumpur FIR. There had been initiatives taken since the situation had been identified by RASMAG in 2013, such as plans to share ADS-B data and to implement AIDC on the problematic interfaces. The Bay of Bengal Arabian Sea Indian Ocean (BOBASIO) agency had accepted the role of the scrutiny group for the BOB sub-region (*APANPRG Conclusion 26/28 Asia/Pacific LHD Hot Spot Action Plans refers*).

3.32 India had commenced AIDC trial operations with Kuala Lumpur and AIDC testing with Colombo and Male; however actual commissioning was yet to take place as there were interoperability issues and thus trial operations continued while addressing the anomalies.

3.33 The first task of the scrutiny group was to set up a uniform procedure to handle cross-boundary LHDs for all BOBASIO States. MAAR had continuously queried States involved for the status of the scrutiny group's initial action plan implementation, but had received no feedback except from India and Myanmar.

3.34 The Airport Authority of India (AAI) had informed MAAR that the new LHD handling procedure has been implemented. AAI had issued an ATM Circular that emphasised the need to strictly follow the coordination procedures and the ATS Letter of Agreement (LOA). Myanmar informed MAAR that they had implemented the LHD handling procedure, and had also re-sectorized their airspace from two into four sectors from 26 May 2016, which was expected to reduce controllers' workload. The meeting noted that monitoring organisations and scrutiny groups should consider publishing information on a more regular basis regarding hot spot analysis.

#### *Southeast Asian LHDs*

3.35 The initial action plan regarding this hot spot mainly consisted of AIDC implementation, which was a high priority for the Philippines, so several technical tests were conducted with adjacent ACCs. However, many technical problems were discovered and needed to be resolved by the system vendor. ICAO commented that this was a high priority implementation for the region, so decision-makers needed to address these issues urgently.

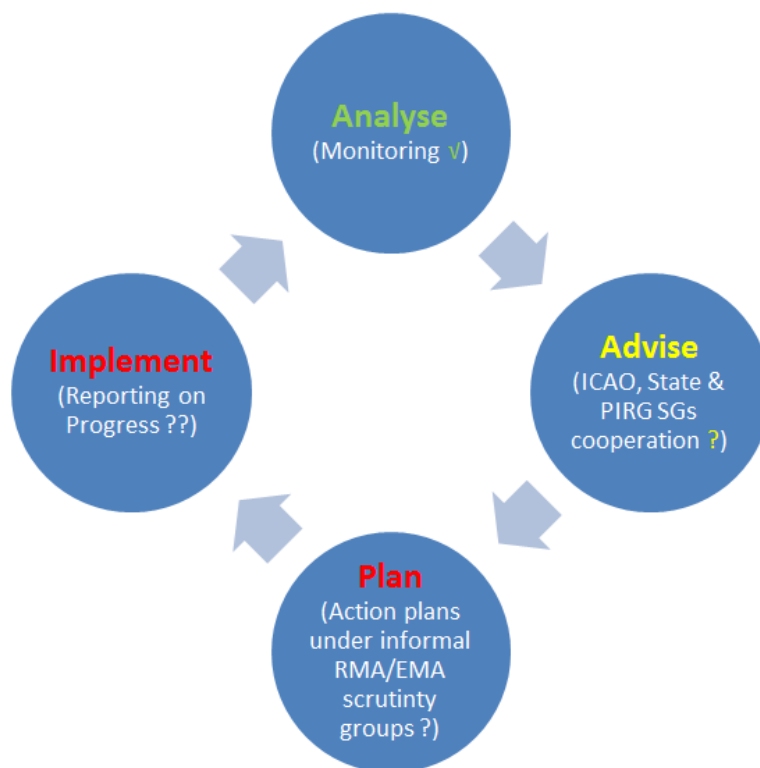
3.36 The theoretical ATS surveillance coverage provided an opportunity to further reduce LHD duration and risk by sharing ATS surveillance data between Malaysia, Viet Nam and the Philippines. The theoretical ADS-B coverage appeared to cover many of the LHD TOC waypoints and there was extra surveillance capability planned with future ADS-B sites in the Philippines (Palawan, Pangasinan and Zambales).

3.37 IATA asked the meeting to consider a more systematic approach of managing safety hot spots. The meeting discussed the problems of States not responding to monitoring agency enquiries, and the difficulty of establishing corrective action plans for safety issues from the agencies identified.

3.38 India stated that since not many States were present at RASMAG meetings (particularly some of those States which were of concern with identified hotspots), this issue should be further taken up in the ATM Subgroup and APANPIRG and perhaps even in the DGCA Conference so that it could be effectively ~~and~~ addressed in a timely manner.

3.39 ICAO noted that in many cases improper ‘aviation safety’ culture created barriers that caused difficulties for safety monitoring agencies, and that the agencies had a key role in educating regulators and service providers about the importance of the correct culture (which included management culture, organization culture, Human Factors and ‘Just Culture’).

3.40 Moreover, the problem was compounded by safety monitoring agencies being good at analyzing data, but less proficient at developing corrective action strategies and reporting on implementation (**Figure 5**).



**Figure 5:** Theoretical Model of Safety Problem Management Process

3.41 The meeting agreed that the RASMAG-MAWG would discuss the matter of RMA/EMA empowerment and a widening of their scope, to ensure that when significant safety problems were identified, an emphasis would be placed on scrutiny group follow-up as a normal part of business.

3.42 Additionally the Chair proposed that the RMAs and EMAs at the next MAWG meeting should develop a document that contained examples of best practice actions taken to resolve identified hot spot risks and other risk bearing scenarios within the Region. This material could then be made available to States and other groups to provide awareness of lessons learned and suitable options to control risks.

Estimation of Vertical Overlap Probability for BOB and WPAC/SCS Regions (WP10)

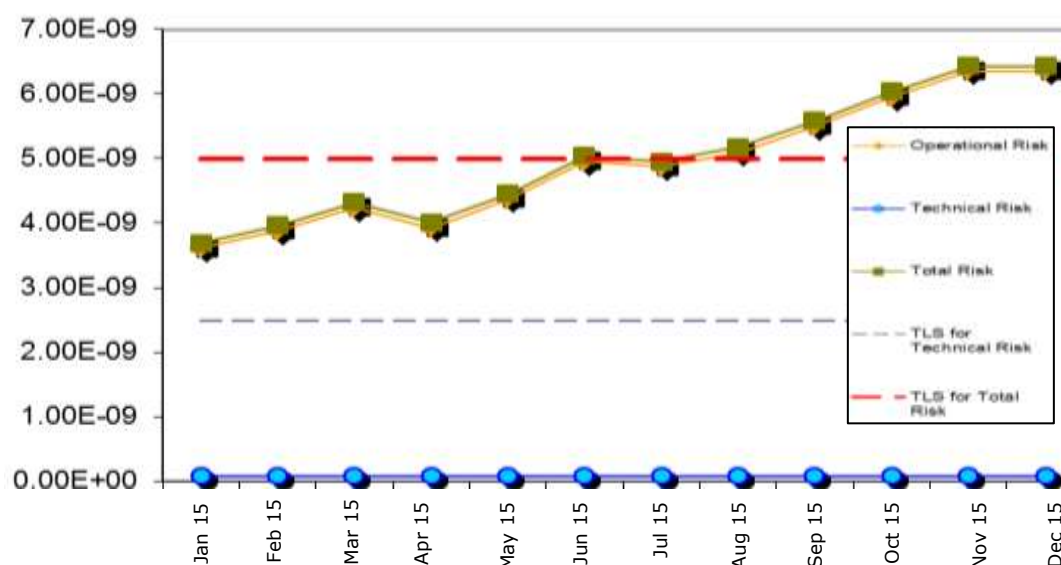
3.43 Thailand presented the result of the MAAR’s estimate of probability of vertical overlap using recent vertical error data from the BOB WPAC/SCS. A conservative value of  $P_z(1000)$  obtained from this calculation was  $3.076 \times 10^{-10}$ , which was smaller than the currently used value of  $1.7 \times 10^{-8}$ . The result suggested that the value currently being used in MAAR’s risk estimation may be overly conservative. Additionally MAAR had calculated a range of values for  $P_z(0)$  that were similar to the currently used value of 0.538 which MAAR decided to continue using.

PARMO Vertical Safety Report (WP11)

3.44 The Pacific Approvals Registry and Monitoring Organization (PARMO) presented a safety assessment of RVSM for the Pacific and the Republic of Korea’s (ROK) airspace for 2014. The Pacific airspace total risk was estimated to be  $4.30 \times 10^{-9}$ , which met the TLS.

3.45 The estimate of overall vertical risk for 2015 increased from 2014. This result was primarily due to the increased number of event reports and the associated time spent at incorrect flight level (88 minutes in 2014 and 202 minutes in 2015) spent at an incorrect level.

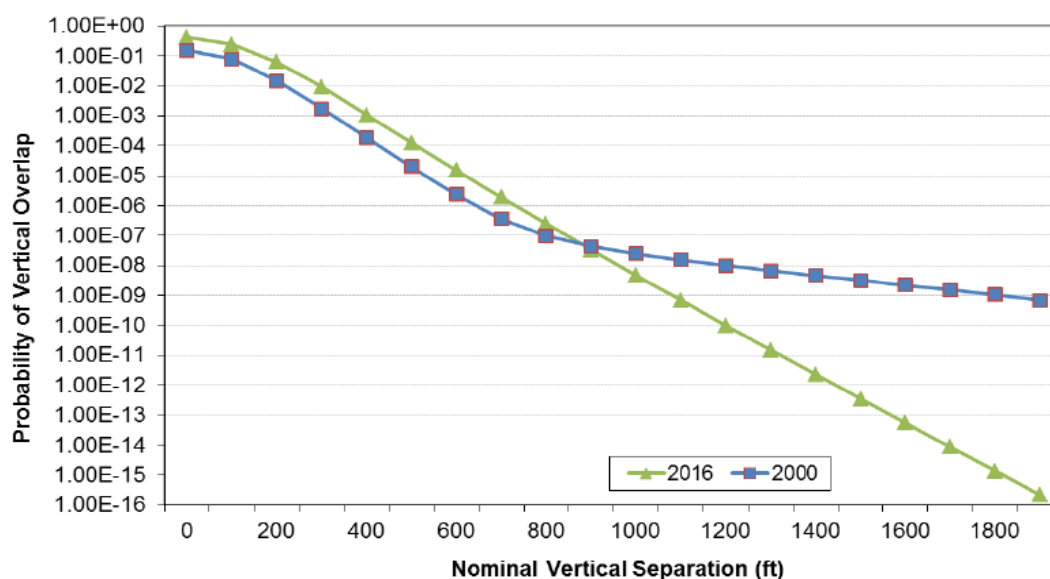
3.46 The Incheon FIR RVSM total risk was estimated to be  $6.43 \times 10^{-9}$ , which did not meet the TLS (**Figure 6**). This result was primarily due to the increased number of event reports received by PARMO and the associated time spent at incorrect flight level. In 2014 there was a total of two minutes spent at incorrect level, while in 2015 the number had increased to over 11 minutes spent at the incorrect level. A detailed airspace analysis for the Incheon FIR AKARA Corridor Interface with Shanghai/Fukuoka/Taipei FIRs was provided in RASMAG21/WP12.



**Figure 6:** ROK Airspace RVSM Risk Estimate Trends

Vertical Overlap Probability Parameter Re-Estimation (WP13)

3.47 The United States provided a paper on the calculations used to re-estimate the probability of vertical overlap for Collision Risk Modelling (CRM) by utilizing current aircraft type population data and recalculated ASE values. The results are indicated in **Figure 7**.



**Figure 7:** Comparison of Current to Previous Estimates

Horizontal Risk Assessment for Brisbane and Melbourne FIRs (WP14)

3.48 Australia presented estimates of the horizontal risk for application of 30NM separation within the Brisbane and Melbourne FIRs. The results indicated that in all three areas of Australian airspace assessed where 30 NM lateral minimum is applied, the TLS was met (WEST  $2.62 \times 10^{-9}$ , NORTH  $1.91 \times 10^{-9}$ , and EAST  $1.92 \times 10^{-9}$ ). There were a total of five Large Lateral Deviations (LLD) and Large Longitudinal Error (LLE) reports analysed. Similarly, the longitudinal risk for 50 and 30 NM minima was well under TLS.

*Note: a summary of risk estimates for all EMAs is at RASMAG21/WP30.*

BOBASMA Safety Report (WP15)

3.49 India presented the horizontal safety monitoring report of the Bay of Bengal Arabian Sea Monitoring Agency (BOBASMA) for 2015. The results of the safety assessment confirmed that the TLS was easily satisfied at  $1.70 \times 10^{-9}$  (lateral),  $3.97 \times 10^{-9}$  (50NM longitudinal) and  $0.14 \times 10^{-9}$  (30NM longitudinal).

3.50 A total of eight LLD and LLE reports were analysed, consisting of six Category E (*Coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility*) and two Category G (*Turbulence or other weather related causes*).

JASMA Horizontal Safety Report (WP16)

3.51 Japan provided the results of the horizontal airspace safety assessment by JASMA of the time-based longitudinal, distance-based longitudinal and lateral collision risk within the Fukuoka FIR. The calculations yielded an overall safety estimate result of  $0.49 \times 10^{-9}$  (50NM lateral) and  $0.04 \times 10^{-9}$  (30 NM longitudinal), which achieved TLS.

PARMO Horizontal Safety Report (WP17)

3.52 The USA presented the horizontal safety monitoring report for the Anchorage and Oakland FIRs for 2014. The report contained a summary of Large Longitudinal Errors (LLE) and Large Lateral Deviations (LLD) received by the PARMO.

3.53 The Anchorage and Oakland oceanic airspace horizontal risk estimates all comfortably met the  $5.0 \times 10^{-9}$  TLS with lateral risk estimated at  $0.51 \times 10^{-9}$  (30NM) and longitudinal risk at  $2.32 \times 10^{-9}$  (50NM) and  $3.74 \times 10^{-9}$  (30NM). There were six LLD and LLE reported in 2015 – three Category A (Flight crew deviate without ATC Clearance), one Category B (Flight crew incorrect operation or interpretation of airborne equipment) and two Category E.

SEASMA Safety Report (WP18)

3.54 Singapore provided the horizontal safety assessment report from the South East Asia Safety Monitoring Agency (SEASMA) for operations on ATS routes N892, L625, N884 and M767 within the SCS in 2015. The assessment concluded that the TLS was conservatively satisfied for the lateral ( $0.66 \times 10^{-9}$ ) and longitudinal ( $0.38 \times 10^{-9}$ ) separation standards.

3.55 A single Large Longitudinal Error (LLE) Category E (ATC Coordination Error) was reported in 2015, compared to seven in 2014, which could be attributed to the use of technology (AIDC). In this occurrence, three-party AIDC was in place between the boundary of Ho Chi Minh and Singapore and between Singapore and Kota Kinabalu. However there was no AIDC transfer carried out at the Ho Chi Minh/Singapore boundary.

3.56 Both human error and AIDC software issues contributed to the LLE – the controller did not notice that there was a negative transfer from the electronic strip and the ATC system assigned an incorrect reference number while sending the AIDC EST message, which was subsequently rejected by the next FIR.

3.57 Mitigations had been carried out to impress on the controllers the importance of proper and timely coordination and the AIDC trial involving all three FIRs has been suspended until the issue is resolved. SEASMA clarified that the two-way AIDC between Singapore and Viet Nam was still in operation, and it was only the three way AIDC trial that had been suspended.

---

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

LHD Material Package 2016 (WP19)

4.1 Thailand presented WP19, which contained consolidated LHD material as a package to capture the current set of material to promote an understanding of LHD reporting. This package included LHD Frequently Asked Questions (FAQ), LHD taxonomy, LHD reporting form, cross-boundary LHD reporting flow, and LHD point of contacts (POC).

4.2 The meeting thanked MAAR for championing the material in conjunction with the other RMAs. India noted that they had provided generic email addresses as points of contact for coordination of LHDs however other States that used personal email addresses may cause problems if the individual was not available. The meeting encouraged States use generic email addresses for nominated points of contact and for the Points of Contact list to be amended accordingly.

4.3 RASMAG considered the material as being suitable as guidance material for the Asia Pacific Region, and agreed all RMAs would post relevant items on their websites. In order to strengthen the use of the guidance material and support RMAs, RASMAG agreed to the following Draft Conclusion for APANPIRG's consideration:

**Draft Conclusion RASMAG/21-3: Large Height Deviation Guidance Material**

That, Asia/Pacific States should utilise the Large Height Deviation (LHD) Guidance Material on LHD taxonomy, reporting form(s), cross-boundary LHD reporting flow, and LHD Point of Contacts (POC) posted on Asia/Pacific Regional Monitoring Agency (RMA) websites.

---

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

AAMA Assessment of Non-RVSM Approved Aircraft (WP20)

5.1 Australia identified five individual airframes in the data set assessment, with airframes from India and New Zealand being from the Asia/Pacific Region. The overall results showed a significant positive trend.

China RMA Assessment of Non-RVSM Approved Aircraft (WP21)

5.2 WP21 provided the results of a monthly comparison between the RMA approval databases and flight plans operated within the RVSM airspace of Chinese FIRs and Pyongyang FIR. Six airframes were identified as non-RVSM, three of those being from the Asia/Pacific – ROK.

JASMA Assessment of Non-RVSM Approved Aircraft (WP22)

5.3 JASMA identified 15 airframes which had been flying within Fukuoka FIR RVSM airspace with a 'W' on their flight plans, but without registration in the KSN database for a considerable length of time. The only flights with an Asia/Pacific State of registration were six from the ROK.

MAAR Assessment of Non-RVSM Approved Aircraft (WP23)

5.4 MAAR found a total of 106 aircraft registrations operating within RVSM airspace without proof of valid RVSM approval. Asia/Pacific States in this data were from India (60), China (4), Thailand (3), Malaysia (3), ROK (3), Afghanistan (2), Australia (2), Indonesia (2), Pakistan (2), Cambodia (1), Hong Kong, China (1), The Philippines (1), and Viet Nam (1). MAAR made the following observations:

- *Indian aircraft represent 60% of the MAAR rogue list, comprised of registrations with expired approvals and new registrations from commercial operators such as AirAsia India, Air India, Go Air, Indigo Airlines, and Vistara. Upon further investigation, MAAR found that all expired Indian aircraft had fulfilled their LTHM requirement, but approvals extensions were not received from the State CAA. 24 of the 106 rogue aircraft were detected in the December 2014, where 21 are Indian aircraft containing 9 RVSM-expired registrations.*



- *MAAR has contacted States and RMAs to try to resolve the rogue aircraft issues as much as possible. Nevertheless, we were unable to reduce the number of rogue aircraft from India, which accounts for 60% of the reported registration. MAAR would like to thank BOBASMA for its support in updating Indian RVSM approvals on their website along with the Indian PBN approvals. However, the BOBASMA list is missing some required data fields (such as Mode S address codes, Expiration dates, etc.) as well as RVSM approvals of aircraft with no PBN approvals. The above, in conjunction with a lack of communication between the DGCA India and MAAR, lead to the inefficiency in confirming the RVSM approvals status of Indian registrations.*

5.5 MAAR noted that invalidity of RVSM approval due to States giving expiration dates in the RVSM approvals had become an issue in the 'W' compliance check process. This was because the required coordination workload was very high compared to approvals without expiration, and therefore, some States did not commit to updating the renewed approvals before they expired.

5.6 To reduce the number of unnecessary rogue aircraft reporting workload, RASMAG agreed to the following Draft Conclusion for APANPIRG's consideration:

**Draft Conclusion RASMAG/21-4: Reduced Vertical Separation Minimum (RVSM) Approval Expiry**

That, Asia/Pacific States should:

- a) in case they intend to allow RVSM approvals to expire, review their RVSM approvals data sharing procedures to take into account their ability to update RVSM approvals to Regional Monitoring Agencies (RMAs) before they expire; and
- b) in case they do not allow RVSM approvals to expire, notify the RMA to remove all existing expiration dates (if any), and ensure that any future withdrawals of RVSM approvals are sent to the RMA.

PARMO Assessment of Non-RVSM Approved Aircraft (WP24)

5.7 PARMO advised that a total of 11 operations remained on the list of non-approved operations within the PARMO area of responsibility (one from Australia and one from China).

Integration of Unmanned Aircraft Systems (IP05)

5.8 The United States discussed their holistic approach to effectively integrating Unmanned Aircraft Systems (UASs) into the US national airspaces. The FAA was undertaking an incremental and multi-faceted approach toward UAS integration, which included significant educational outreach activities. The United States noted that most of the risk was in the areas of small UAS which are proliferating at a rapid rate and which are being used for 'non-traditional' applications.

5.9 IATA thanked the United States for the paper as there was significant concern about how UAS will be managed as a global issue. India noted that they had a nationwide ban. In order to permit legitimate UAS operations, India suggested that the procedures and approvals processes as practiced by the USA may be shared with other States.

5.10 ICAO noted that there was discussion underway as to the possibility of forming an Asia/Pacific UAS Task Force to manage policy for the implementation of small UAS. Australia informed the meeting that an operational concept document had recently been released by Australia covering RPAS/UAS operations (<http://newsroom.airservicesaustralia.com/news/airservices-launches-operational-concept-for-remotely-piloted-aircraft-systems>).

Updating the Global Aviation Safety Plan (IP06)

5.11 The United States shared a paper for the forthcoming IVAO Assembly which discussed future updates to the Global Aviation Safety Plan. The United States strongly supported the desire for all Member States to implement effective oversight capabilities and adopt globally-recognized standards and best practices for the interest of sustaining improvements to safety. However, the United States urges ICAO to maintain priority on reducing the global accident risk

AAMA LTHM Burden Estimate Update (WP25)

5.12 The AAMA determined that the number of RVSM approved aircraft from the population of RVSM approved aircraft of 1,135 that needed to be monitored totalled 328 aircraft. Taking into account the aircraft already successfully monitored, the outstanding burden was 85 aircraft, which represented a decrease of 28 from that reported in May 2015.

5.13 Australia noted that they had experienced some difficulty with aircraft fitted with ADS-B but having no geometric height information available in the message data. This was an essential element for AHMS monitoring and the relevant operators had been advised. Thailand advised that they had experienced a similar issue with A380 aircraft for some two years before the data resumed after the issuance of a service bulletin. The Chair noted that this was an issue that had been identified to the RMACG and was to be monitored to establish the extent of the problem before that group would undertake further action.

China RMA LTHM Burden Estimate Update (WP26)

5.14 China stated that the monitoring burden list of China RMA had risen to 2,860 aircraft, resulting in 311 needing to be monitored; thus, the current number of aircraft that remain outstanding in terms of needing to be monitored totalled 66 aircraft. Since 2008, China RMA had been using two sets of Enhanced Global Positioning System (GPS)-based Monitoring Unit (EGMU) to conduct on-board monitoring for Chinese airlines.

5.15 China RMA now uses AHMS, and a majority of aircraft of Chinese operators had received successful monitoring records, which reduced the on-board monitoring burden. Also, an increasing number of foreign aircraft had monitoring records from the AHMS, which helped to support these fleets to meet their long-term height monitoring requirement.

5.16 For the DPRK, China reported that there were 11 aircraft and the biennial monitoring number was 10, with the remaining burden being six.

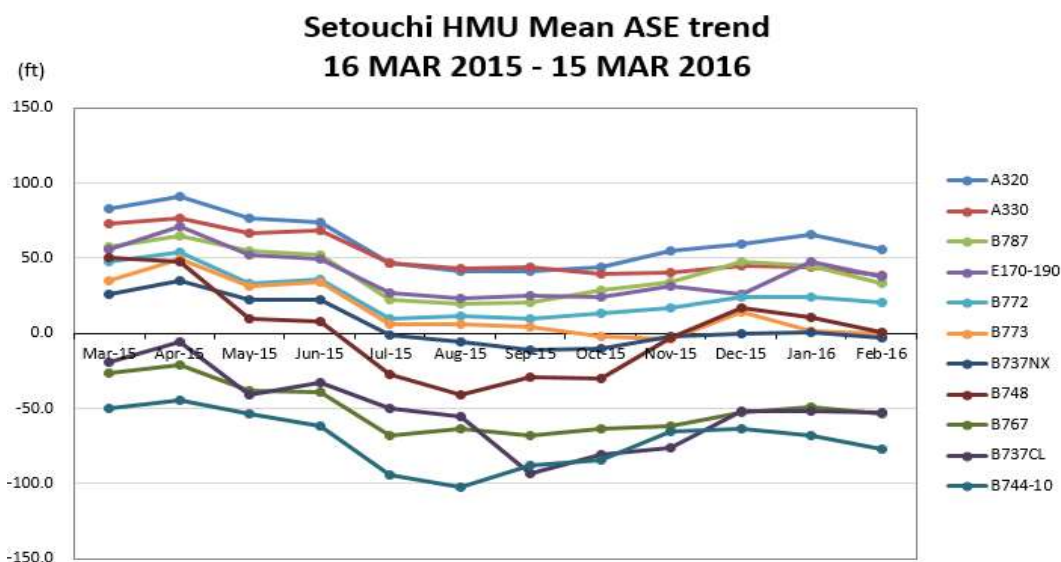
JASMA LTHM Burden Estimate Update (WP27)

5.17 Japan informed the meeting that the total number of RVSM approved airframes was 746. Applying the MMR, the total monitoring burden was 148 airframes. Taking into account the aircraft already successfully monitored, the current outstanding burden was 14 airframes.

Latest Monitoring Results from the Setouchi HMU (IP07)

5.18 Japan presented a summary of the latest results from the Setouchi height monitoring unit (HMU) for the period between 16 March 2015 and 15 March 2016.

5.19 **Figure 8** illustrated the trend for each aircraft monitoring group, with B747-100 showing a mean ASE of -70.8ft.



**Figure 8:** Monthly Mean ASE Trend of each Monitoring Group

5.20 The meeting noted the apparent deteriorating performance of the B744-10 aircraft group. The United States advised that this matter was being actively discussed with the manufacturer.

MAAR LTHM Burden Estimate Update (WP28)

5.21 MAAR undertook its monitoring programs using a Global Positioning System-based Monitoring Unit (GMU) and an AHMS, with ADS-B data from Bangkok and Taipei FIRs. The resultant monitoring burden for 2,340 approved aircraft from the 21 MAAR States was 669 airframes. As at 01 May 2016, there were 172 airframes remaining to be monitored, a similar number of airframes compared to the same period last year.

5.22 MAAR noted that of their 21 States, only India and Thailand failed to provide RVSM Approval Data for 2015.

5.23 MAAR also brought to the meeting’s attention that about 51 operators with remaining monitoring burden had never had their entire fleet height monitored since they were first introduced (**Appendix F**). The meeting discussed whether there were enough GMUs to progress height-monitoring for these aircraft, most of them being International General Aviation (IGA) operators. The meeting agreed that, despite the plethora of guidance material available for States regarding the requirements for monitoring, it would be appropriate to remind regulators of the State responsibilities prescribed under Annex 6 in this regard, and agreed to the following Draft Conclusion to be considered by APANPIRG/27:

**Draft Conclusion RASMAG/21-5: Reduced Vertical Separation Minimum (RVSM) Monitoring of Small Fleets**

That, Asia/Pacific States should have processes to ensure that single aircraft operators or operators with small fleets are appropriately monitored in terms of Annex 6 requirements, including:

- a) the provision of guidance material so operators are aware of their responsibilities; and
- b) regulatory procedures being in place to ensure a State meets its obligation under Annex 6 that RVSM approved aircraft are monitored systematically.

RASMAG/21  
Report of the Meeting

---

5.24 India proposed that, considering the height monitoring burden reported by MAAR, that the task of aircraft height monitoring could be delegated to the States having adequate ADS-B ground stations. The meeting had an extensive discussion on the process used by some RMAs to conduct monitoring using AHMS, which was not an easy task for a single State to undertake due to the differing geoid slopes and the need to cross-reference data with other monitoring agencies to establish the height reference in the data, i.e.: either Height Above Mean Sea Level (HAMSL) or Height Above Ellipsoid (HAE).

5.25 The Chair informed the meeting that dependant on the available geoid slope in any State, AHMS monitoring may not be possible by that State alone even though ADS-B data was available. The MAWG would consider the resources needed to process ADS-B data within the Region for ASE monitoring. The United States confirmed that there was also a requirement for detailed analysis of any height-keeping monitoring output to determine likely causes of excessive ASE values and whether maintenance or other airframe issues need to be coordinated with manufacturers. Such specialist capability had been built up in a small group of specialist RMAs and it was not possible, or desirable, to devolve that knowledge and activity to individual States. It was important to keep the process within a manageable group.

PARMO LTHM Burden Estimate Update (WP29)

5.26 PARMO's Long Term Height Monitoring (LTHM) monitoring burden of 99 resulted from a total of 445 airframes with RVSM approval.

Regional Safety Monitoring Assessment (WP30)

*LHD Reporting*

5.27 **Table 1** provides a comparison of the estimated flight hours for airspace analysed by an RMA, divided by the reported LHDs at RASMAG/20 and RASMAG/21, in order to assess reporting.

Airspace	RASMAG 20 LHDs	RASMAG 21 LHDs	RASMAG 21 Estimated Flight Hours	RASMAG 20 Reporting Ratio	RASMAG 21 Reporting Ratio
Mongolia	18	*2	116,664	1: 6,042	1:58,332
Indonesia	39	13	343,100	1: 19,522	1:26,392
Japan	34	51	1,101,469	1: 32,396	1:21,597
China	103	120	2,285,269	1:20,628	1:19,043
SW Pacific	69	72	821,496	1:11,528	1:11,410
WPAC/SCS	144	166	1,769,352	1: 10,498	1:10,659
ROK	3	19	178,800	1:164,120	1:9,410
India/BOB	224	380	2,326,493	1: 9,423	1:6,122
DPRK	0	2	3,387	0	1:1,693
<b>Total</b>	634	825	8,946,030	1:14,214	1:10,844
Pacific	37	42	1,670,790	1:45,125	1:39,780

**Table 1:** Comparison of Estimated Flight Hours and Reported LHDs (NC = no change)

\*MAAR indicates that there was only one report at position NIXAL

5.28 The RASMAG/21 analysis shows major improvements in reporting for Chinese, DPRK, Japanese and ROK airspace, which is probably the result of State and RMA intervention. The States and RMAs should be encouraged for this effort, which is producing a clearer picture of risk.

5.29 Australian/SW Pacific airspace has demonstrated a consistent result over several years, indicating a mature reporting culture in the ratio band of 1:10,000 – 1:12,000. Therefore a ratio at or below this band in high density airspace is assumed to represent a good reporting culture (but it may also be due to a large number of incidents that indicate major safety problems). A ratio 50% or more above this band (1:18,000+) in high density airspace may indicate a lack of safety reporting. Therefore there is probably further improvement possible regarding Chinese and Japanese airspace.

5.30 The RASMAG/20 report had described a lack of reporting in several airspaces:

*5.29 An analysis of the rate of LHD reporting in Chinese, Indian, Indonesian, Japanese (with a low reporting ratio of 1: 37,549) and ROK airspace indicated that despite an improvement in reporting, there may be further improvements required to paint a true picture of the risk-bearing incidents (especially within Indian domestic airspace), particularly by implementation of all elements of a 'just culture' environment. The indications included a lack of reporting over an entire continental airspace, very low reporting ratios such as is evident in ROK airspace, and the reporting of LHDs by one RMA that were not reported by another on the same RMA boundary.*

5.31 Australian airspace analysis revealed about 77% of LHDs were within the Brisbane and Melbourne FIR boundaries, while China's data improved from 2014 to indicate about 40% of LHDs to be 'internal'. While the Australian, Chinese, Indian and Indonesian FIRs all have different operating characteristics, it is noticeable that within the Indian and Indonesian FIRs there were very few LHDs being reported. Less than 3% of LHD reports were made within the boundary of Indian FIRs. This was acknowledged as being statistically not possible by the Indian expert at RASMAG/20, and may be an indication of substantial under-reporting.

5.32 On the other hand, approximately 85% of boundary reports that were made by adjacent States appeared to have been not reported by Indonesia, The AAMA report noted that:

*2.2 Additionally, the AAMA observed what appeared to have been a reduction in reporting compared to previous years which could not be explained. As a result, the AAMA was unable to effectively validate monthly assessments with any confidence.*

5.33 The Indonesian reporting ratio had deteriorated substantially from 1:19,522 to 1:26,392. This was more than double that which might be expected in a mature reporting culture within higher density airspace. Moreover, the proportion of missing boundary reports indicates that the number of unreported events could be as much as six times more than those that were reported, underlining the lack of confidence by AAMA in Indonesia's reporting at times during the year. Recalling that both India and Indonesia were noted by RASMAG/20 as having problems with reporting, RASMAG/21 should discuss a means of encouraging an increase in safety reporting in these States.

5.34 Regarding Mongolian airspace, MAAR indicated that there was only one report at position NIXAL on the boundary with China, whereas the China RMA reported a second LHD at position INTIK which was apparently not reported to MAAR. The Mongolian reporting ratio was the most difficult to explain. While improved ATC surveillance and procedures partially account for the dramatic reduction in reported LHDs from 18 to only two, the ratio is still much worse than what might be expected, even accounting for a medium density airspace. Therefore some action should be taken by MAAR to discuss this with Mongolia, to assess if there were any systemic reporting issues.

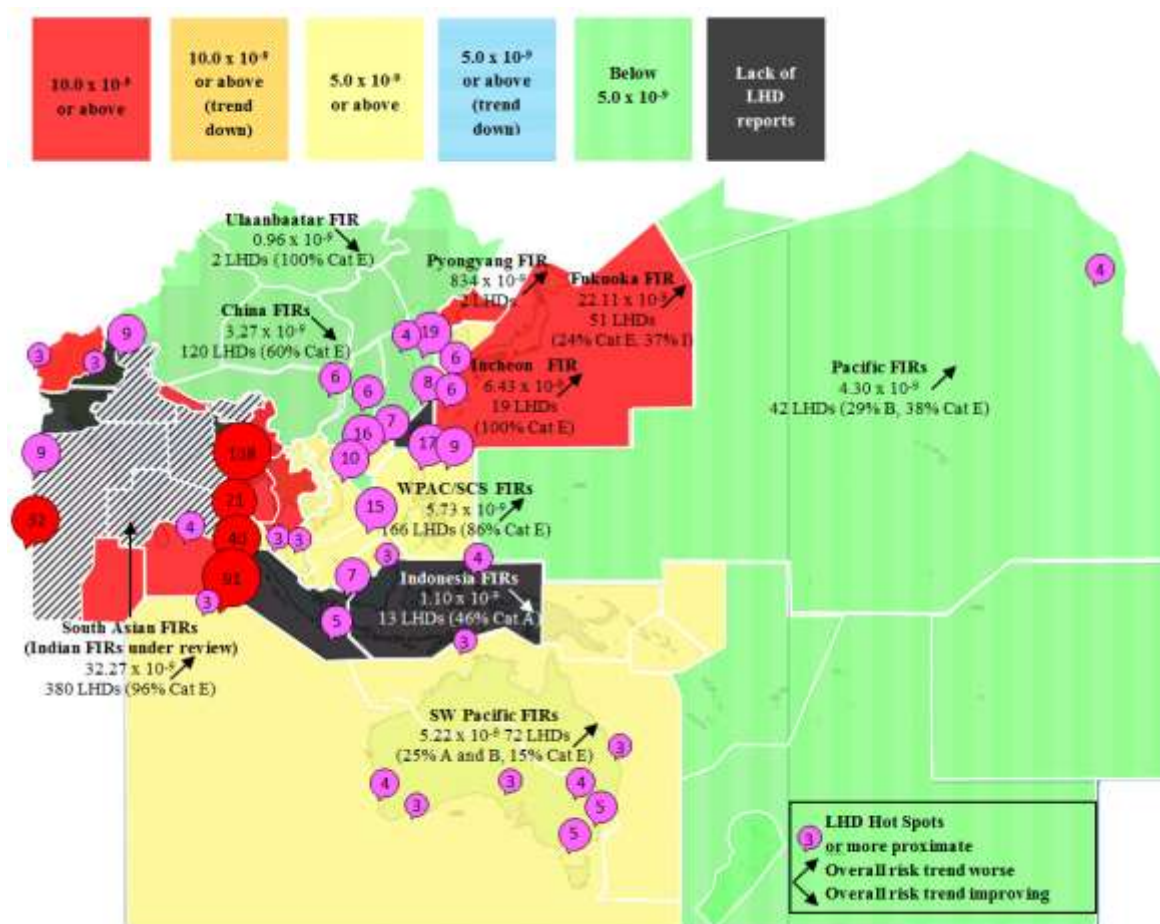
5.35 It was noted that despite the enhanced reporting from the Incheon FIR, China RMA reported four LHDs on the boundary with the Shanghai FIR at position AGAVO, which did not appear in the Incheon FIR analysis. Moreover, there were three LHDs reported by JASMA (two by China RMA) at position SALDI, which was within the Incheon FIR along the 'AKARA Corridor'. These were not reported by Incheon.

RASMAG/21  
Report of the Meeting

5.36 In the same AKARA corridor near position ONIKU another four LHDs were reported by JASMA, several of them caused by severe turbulence. Therefore it is probable that the operation of a Flight Level Orientation Scheme (FLAS) with three different ATC units providing services within the same airspace had the potential for very high risk levels if vertical separation could not be assured.

5.37 MAAR commented that the RMA had not received non-NIL LHD reports from both Bangladesh and Pakistan as they might expect; whereas they had received some reports on the boundary of the Dhaka and Karachi/Lahore FIRs from neighbouring States. RASMAG noted the lack of safety reporting from both Bangladesh (which had a current APANPIRG Deficiency for lack of safety reports) and Pakistan.

5.38 ICAO presented an overview of safety assessment results from a regional perspective. **Figure 9** is the RASMAG/21 regional RVSM Target Level of Safety (TLS) compliance:



**Figure 9:** 2015 Asia/Pacific TLS compliance reported to RASMAG/21

*Note: the regional picture has been developed from 2015 data and may not reflect the current risk picture in 2016. The data should be considered in conjunction with the analysis in paragraph 5.29.*

5.39 **Figure 9** indicated the following sub-regional regional RVSM trends.

- **South Asia:** The South Asian FIRs exhibited the highest risk area in the Asia/Pacific, with troubling estimated risk levels more than six times the TLS, and major hot spots between the Indian FIRs and Bangladesh, Myanmar, Malaysian and Indonesian FIRs. These hot spots had been previously identified in RASMAG/20, and had increased in risk since then, despite plans for operational improvement.

India has reportedly commenced plans for the installation of Automatic Dependent Surveillance (ADS-B) and Very High Frequency (VHF) communications in the Great Nicobar Islands but this would not solve the systemic issues evident in the interface between India and Bangladesh/Myanmar airspace in the northern Bay of Bengal (BOB) area. RASMAG needs to highlight this problem to the Director General of the States concerned to ensure the highest priority is given to urgent improvements in both system capability and human performance.

*Note: APANPRG Conclusion 26/28 Asia/Pacific LHD Hot Spot Action Plans refers – BOBASIO (Bay of Bengal Arabian Sea Indian Ocean) in agreement with MAAR has been identified as the scrutiny group leader for the Kolkata/Chennai FIRs interface with Yangon/Kuala Lumpur.*

The major hot spot on the western boundary of the Indian FIRs and the African FIRs (and to a lesser extent with the Muscat FIR) can be partly explained by the temporary closure of the Sana'a FIR and contingency routes during 2015. However, Large Height Deviation (LHDs) continues to be reported in this area, suggesting the need for closer collaboration between India and the concerned African States, including risk mitigation measures such as the implementation of AIDC.

- **Southeast Asia:** The Southeast Asian area has also not met the TLS, with a slow degradation in compliance that can largely be attributed to the poor performance of the Manila FIR, with numerous category E LHDs. The Philippines has had an improvement plan to modernize their Air Traffic Control (ATC) system for some years but this has not yet yielded any improvement in performance. RASMAG needs to highlight this problem to the Director General of the Philippines to ensure the highest priority is given to urgent changes within the Manila FIR.

*Note: APANPRG Conclusion 26/28 Asia/Pacific LHD Hot Spot Action Plans refers – MAAR has been identified as the scrutiny group leader for the Manila FIR interface with Fukuoka/Hong Kong China/ Singapore/Ujung Pandang FIRs.*

- **East Asia:** Chinese airspace had shown marked improvement to meet the TLS, even though a large increase in LHD reports was noted. It is evident that a concerted effort had been made by China to systematically mitigate identified hot spot risks. Notwithstanding this, there were several significant hot spots still evident – in the interface with the Lahore FIR (Pakistan), Fukuoka FIR (Japan), and Manila FIR (Philippines).

China RMA has again identified hot spot areas between mainland China and Hong Kong, China's airspace that were also evident in 2014.

*Note: APANPRG Conclusion 26/28 Asia/Pacific LHD Hot Spot Action Plans refers – China RMA has been identified as the scrutiny group leader for the Hong Kong FIR interface with Guangzhou/Sanya FIRs, and the Urumqi FIR interface with Lahore FIR.*

Japanese airspace had also been adversely affected by the poor performance of the Manila FIR so this has contributed to the TLS not being met within the Fukuoka FIR. However some 35% of LHDs were caused by turbulence in a localised area southwest of Japan, which suggested a greater emphasis on special meteorological forecasting in that area was required so that avoidance action may be taken, or a temporary reversion to 2,000ft separation made if appropriate.



Mongolian airspace met the TLS. However there was an absence of LHD reports that would typically be expected at a higher level in this airspace.

The Pyongyang FIR did not meet the TLS, although the number of LHDs was only two. It should be noted that these were the first LHD reports from this FIR for years, which indicates the successful coordination work being conducted with China.

The Incheon FIR did not meet the TLS, due to a number of reported LHDs between the Shanghai FIR and the Incheon FIR. Notably, analysis of seven LHDs reported by China and Japan indicated a severe safety risk in the AKARA corridor.

*Note: APANPRG Conclusion 26/28 Asia/Pacific LHD Hot Spot Action Plans refers – PARMO has been identified as a scrutiny group leader for Incheon FIR AKARA Corridor interface with Shanghai/Fukuoka/Taipei FIRs.*

- **Southwest Pacific:** Southwest Pacific FIRs did not meet the TLS by a very small margin. Category A and B flight crew errors were the predominant causes of LHDs, which had no specific pattern that could be identified by AAMA.
- **Pacific:** Pacific airspace met the TLS, although the compliance level was slowly deteriorating.

5.40 **Table 2** provides a comparison of Asia/Pacific RVSM risk as a measure against the TLS, either by RMA ‘sub-region’<sup>1</sup> (Conclusion 20/4 – *Asia/Pacific Performance Metrics* refers), or by FIRs. There had been significant degradation in the region’s performance meeting the TLS. The dramatic reduction in Asia/Pacific FIR TLS compliance can be largely explained by increased reporting, which is showing the ‘hot spot’ problem areas that had been previously unidentified.

	<b>RASMAG18</b>	<b>RASMAG19</b>	<b>RASMAG20</b>	<b>RASMAG21</b>
RMA ‘sub-regions’	89%	22%	67%	33%
FIRs	90%	16%	53%	32%

**Table 2:** Comparison of Sub-Regional and Regional RVSM TLS Achievement

*Non-RVSM Approved Aircraft*

5.41 **Table 3** compared the number of non-RVSM airframes reported by each RMA:

<b>Report</b>	<b>AAMA</b>	<b>China RMA</b>	<b>JASMA</b>	<b>MAAR</b>	<b>PARMO</b>
RASMAG/18	98	43	47	118	15
RASMAG/19	90	33	40	130	19
RASMAG/20	8	45	15	234	26
RASMAG/21	5	6	15	106	11

**Table 3:** Trend of Non-RVSM airframes Observed by Asia/Pacific RMAs

---

<sup>1</sup> (1) Melbourne, Brisbane, Nauru, Honiara FIRs (AAMA); (2) Port Moresby FIR (AAMA); (3) Indonesian FIRs (AAMA); (4) Sovereign airspaces of China (China RMA); (5) Fukuoka FIR (JASMA); (6) Bay of Bengal FIRs (MAAR); (7) Western Pacific/South China Sea FIRs (MAAR); (8) Pacific Area (PARMO); and (9) North-East Asia Incheon FIR (PARMO).



RASMAG/21  
Report of the Meeting

---

5.42 Aircraft from Asia/Pacific States that were observed for a significant length of time by the RMAs were as follows:

- China RMA: Republic of Korea registered aircraft HL8049, HL8050 (both Jeju Air) and HL8056 (T'way Air);
- JASMA: Republic of Korea registered aircraft HL8049, HL8050 and HL8056;
- MAAR: Indian registered aircraft totalled 60, of which 26 had expired approvals and 34 had no proof of RVSM approval, and the following aircraft from other States which were confirmed as being non-RVSM approved Australian registered aircraft VHFIX; and
- PARMO: Australian registered aircraft VHFPO).

5.43 Overall, the trend was rapidly dropping, with a 56.4% reduction in observed non-compliant airframes from 2014 to 2015. This suggests that the proactive work of State authorities, RMAs and APANPIRG *Conclusion 24/26 Repetitive Non-RVSM Approved Aircraft Operating as RVSM Approved Flights* were having a positive effect. RASMAG would recall that *Conclusion 24/26* urged Asia/Pacific States, except where a specific non-RVSM operation is authorized – to deny entry to operate within RVSM airspace for aircraft that have been confirmed as non-RVSM approved over a significant length of time, or by intensive checking, and was in accordance with Annex 6:

*7.2.8 All States that are responsible for airspace where RVSM has been implemented, or that have issued RVSM approvals to operators within their State, shall establish provisions and procedures which ensure that appropriate action will be taken in respect of aircraft and operators found to be operating in RVSM airspace without a valid RVSM approval.*

5.44 Notwithstanding the positive downward trend, the large number of Indian registered aircraft found to have no RVSM approval may indicate systemic issues. In 2014 India was observed to have 73 aircraft registrations found operating without proof of RVSM approval, so this appeared to be a long-term problem. Therefore, RASMAG/21 agreed that India should be reminded by State Letter of the need to meet the requirements of Annex 6 (paragraph 7.2.8) and APANPIRG Conclusion 23/16 (Safety Monitoring Data Provision).

*RMA Monitoring Burden*

5.45 **Table 4** compares the outstanding monitoring burden reported by each RMA:

<b>Report</b>	<b>AAMA</b>	<b>China RMA</b>	<b>JASMA</b>	<b>MAAR</b>	<b>PARMO</b>
RASMAG/19	79	87	16	200	37
RASMAG/20	113	105	14	176	20
RASMAG/21	85	72	14	172	20

**Table 4:** Outstanding Monitoring Burden of Asia/Pacific RMAs

5.46 **Table 5** indicates that all RMAs have been either reducing their monitoring burden or the burden is at the same level as 2015, with the overall Asia/Pacific burden reducing by 15.2% (428 to 363). The MAAR burden still constitutes approximately 47.4% of the Asia/Pacific's total, so it is clear that the States it serves need to take increased action to ensure aircraft are monitored in accordance with Annex 6 requirements.

RASMAG/21  
Report of the Meeting

5.47 **Table 5** indicates the States that had relatively high remaining monitoring burdens:

State	2014%	Requirement	Burden	2015%
Solomon Is. (AAMA)	0%	1	1	<b>100%</b>
Tonga (PARMO)	0%	1	1	<b>100%</b>
Bhutan (MAAR)	75%	4	3	<b>75%</b>
Bangladesh (MAAR)	68%	20	13	<b>65%</b>
Pakistan (MAAR)	66%	42	27	<b>64%</b>
DPRK (China RMA)	89%	10	6	<b>60%</b>
Indonesia (AAMA)	61%	119	57	<b>48%</b>
Myanmar (MAAR)	0%	11	5	<b>46%</b>
Malaysia (MAAR)	39%	39	17	<b>44%</b>
Thailand (MAAR)*	41%	108	46	<b>43%</b>
Philippines (MAAR)	48%	49	15	<b>31%</b>

**Table 5:** Comparison of State Monitoring Burden

5.48 RASMAG/21 agreed that the need to comply with the requirements of Annex 6 (paragraph 7.2.7), in respect of a monitoring burden would be highlighted to the following States in **Table 5** at APANPIRG/27 and the DGCA/53 meetings:

- Bangladesh;
- Bhutan;
- DPRK;
- Indonesia;
- Malaysia;
- Pakistan;
- Thailand; and
- The Philippines.

5.49 Myanmar, the Solomon Islands and Tonga were not considered deficient in 2016 due to their small fleet size and the fact that this the burden had only occurred since 2015 (i.e.: it was not necessarily indicating a systemic problem). However all States with a systemic problem in this area would be recommended for an APANPIRG Deficiency in 2017 if the situation did not improve.

5.50 Although the Philippines had improved its burden since 2014 (from 48% to 31%), the percentage remained high for a nation with significant aviation activity.

5.51 In addition, India and Thailand should be urged to provide the required data to the MAAR as these States did not provide 2015 RVSM Approval Data. India also did not provide 2014 RVSM Approval Data, so RASMAG/21 agreed to recommend an APANPIRG Deficiency (Appendix C) for India in terms of Annex 6 (paragraph 7.2.6) and the following APANPIRG Conclusions:

- 19/15 (*Enhanced communications between States and RVSM RMAs*);
- 23/15 (*Long-Term Non- RVSM Approved Aircraft*); and
- 23/16 (*Safety Monitoring Data Provision*).

5.52 AAI reassured the meeting that they would take up the issue with the DGCA India to clarify the status of RVSM aircraft from India.

*Regional Horizontal TLS Compliance*

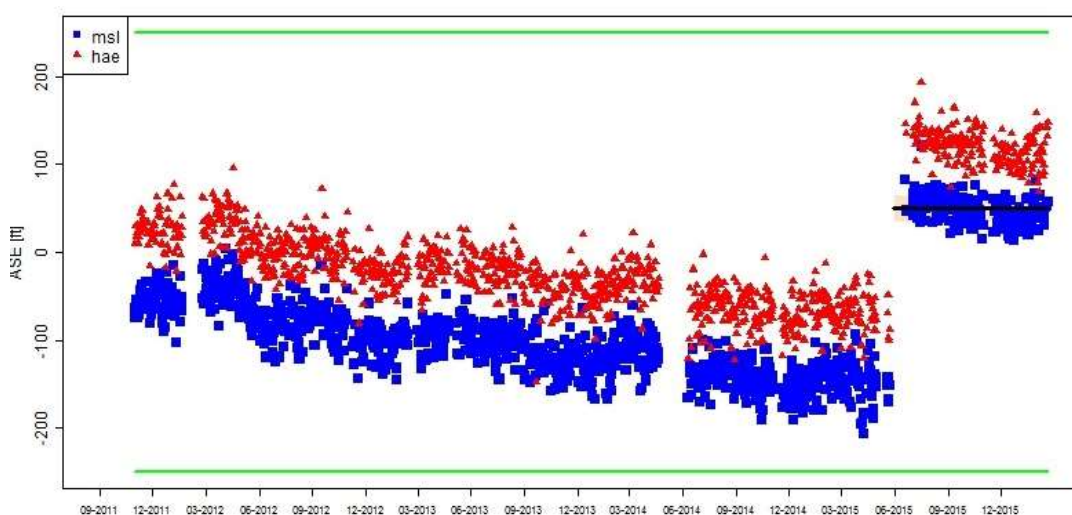
5.53 The Asia/Pacific En-Route Monitoring Agency (EMAs) reported horizontal risk assessments that all met the TLS of  $5.0 \times 10^{-9}$  (**Table 6**). The AAMA also provided risk assessments that met the TLS for both longitudinal and lateral implementations of 50 NM and 30 NM minima. These specific risk estimates are not included in Table 6 as a result of the three distinct airspace sampling methodology employed by the AAMA.

Separation Standard	EMA	Estimated Risk
50NM Lateral Risk	BOBASMA	$1.70 \times 10^{-9}$
	JASMA	$0.49 \times 10^{-9}$
	SEASMA	$0.66 \times 10^{-9}$
30NM Lateral Risk	PARMO	$0.51 \times 10^{-9}$
50NM Longitudinal Risk	BOBASMA	$3.97 \times 10^{-9}$
	PARMO	$2.32 \times 10^{-9}$
	SEASMA	$0.38 \times 10^{-9}$
30NM Longitudinal Risk	BOBASMA	$0.14 \times 10^{-9}$
	JASMA	$0.04 \times 10^{-9}$
	PARMO	$3.74 \times 10^{-9}$

**Table 6:** Comparison of Horizontal Risk Assessments

Recent Change in A320's Altimetry System Error (WP31)

5.54 The MAAR's study of ASE of 2,078 A320 aircraft observed by their AHMS indicated that there had been a deteriorating ASE for 49 A320 aircraft in recent years and a sudden change in ASE in 31 aircraft, presumably as a result of Airbus' maintenance programme (**Figure 10**).

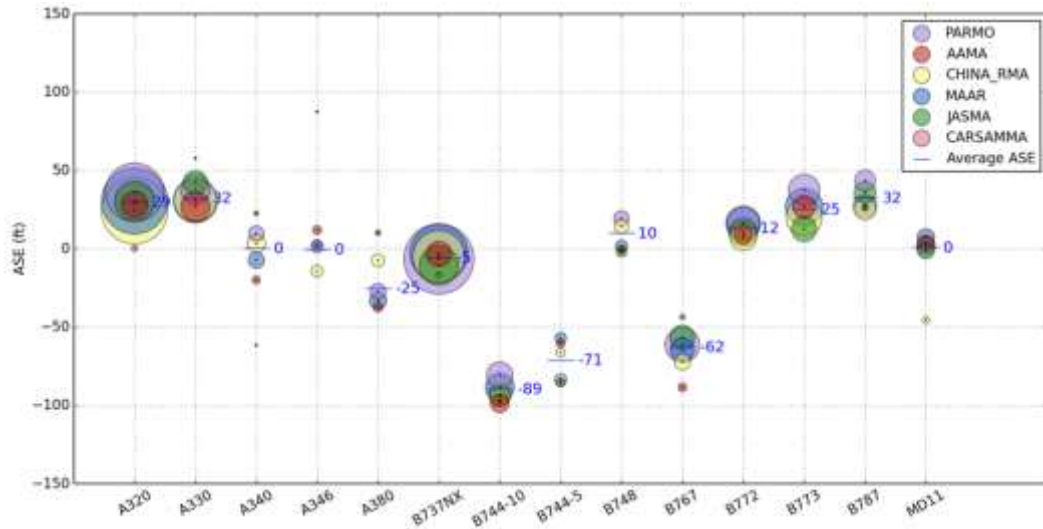


**Figure 10:** Degrading A320 ASE trend and Change in ASE Performance Example

5.55 MAAR noted that changes actually made the ASE value worse for some airframes since the old ASE value was close to zero and the change brought the ASE up to approximately 100 feet. The meeting discussed what the next steps were in this analysis, and it was informed that the RMACG has tasked RMAs globally to undertake further analysis to establish comparative data that analyses the global fleet. On the basis of that analysis if further action is required, the RMACG will coordinate directly with Airbus.

Comparison of Average ASE by Aircraft Group ASE & RMA (WP32)

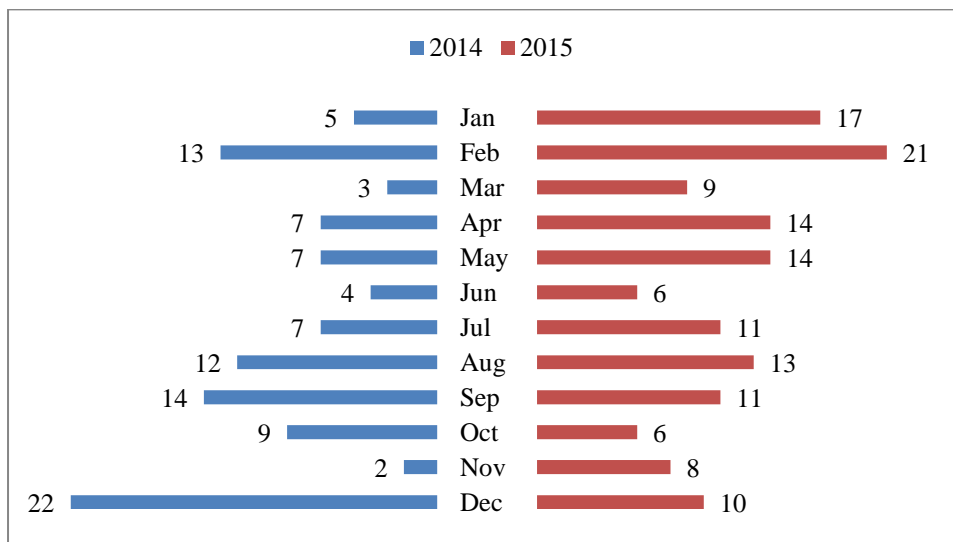
5.56 MAAR provided a very high-level summary of the ASE monitoring results within the Asia/Pacific region, which they suggested could be included in the Regional Safety Monitoring Assessment report to APANPIRG on an annual basis (**Figure 11**).



**Figure 11:** Comparison of Aircraft Group ASE by Aircraft Monitoring Group, 2015

Progress Made in China's LHD Reporting (WP33)

5.57 China presented information on progress made in LHD reporting by Chinese and DPRK ATS units and provided updates for 2015. The total number of non-nil LHDs received by China RMA in 2015 (140) increased, compared to 2014 (105, **Figure 12**).



**Figure 12:** Comparison of LHD Reports Received

5.58 China RMA conducted extensive coordination with ATS units in mainland China, and the DPRK and Hong Kong, China. In addition, China RMA had been heavily involved in the strengthening of ATS communications and surveillance systems supporting the interface between Urumqi and Lahore ATS units, and improving safety culture.

5.59 China noted that the Air Traffic Management Bureau (ATMB) and Civil Aviation Administration of China (CAAC) had completed the bidding work for relevant equipment and tests of the electromagnetic environment in Pakistan.

The Requirement for a BOBASIO RMA (WP34)

5.60 India presented WP34 on behalf of Bay of Bengal Arabian Sea Indian Ocean (BOBASIO) in accordance with the decision BOBASIO/5-05, requesting RASMAG to endorse the establishment of a new RMA to focus specifically on the BOBASIO airspace and to assist BOBASIO to address the significant and alarming LHD hotspots in the area. While acknowledging the good work carried out by MAAR, India felt a formally constituted BOBASIO RMA would be beneficial in addressing the LHD concerns.

5.61 The Paper also stated that the BOBASIO airspace and more particularly the Indian airspace lay at the boundary between three ICAO regions (Asia/Pacific, East and South Africa and Middle East), and identifying and resolving LHD hotspots between these regions required a sustained coordinated effort across ICAO regions.

5.62 The paper also noted the high workload for MAAR in comparison with other RMAs in the region and suggested that the proposed new RMA would complement the work of MAAR. Notwithstanding the volume of traffic, the meeting noted MAAR's outstanding work and that a number of single global RMAs such as the European RMA (EUR RMA) and South American RMA, CARSAMA, successfully monitored more than twice the flight hours covering twice the number of States, than MAAR currently did.

5.63 Moreover, the meeting noted that RASMAG had stated on several occasions that there would be no more RMAs established, which was a policy consistent with the provisions of Annex 11 given that it was the only global region which had more than one RMA established:

*3.3.5.1 For all airspace where a reduced vertical separation minimum of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, a programme shall be instituted, on a regional basis, for monitoring the height-keeping performance of aircraft operating at these levels, in order to ensure that the implementation and continued application of this vertical separation minimum meets the safety objectives. The coverage of the height-monitoring facilities provided under this programme shall be adequate to permit monitoring of the relevant aircraft types of all operators that operate in RVSM airspace.*

*Note.— The number of separate monitoring programmes should be restricted to the minimum necessary to effectively provide the required services for the region.*

5.64 IATA supported the general idea of India providing greater scrutiny services, given the serious safety problems reported in the South Asian and inter-regional areas. MAAR also agreed that BOBASMA should be supported in taking the lead for scrutiny of the BOBASIO airspace.

5.65 While appreciating the work done by BOBASMA, MAAR informed the meeting that with regard to the need for an exclusive RMA they would leave it to RASMAG to decide. India noted that as MAAR was the RMA for the region, they should take the lead for scrutiny of the BOBASIO airspace and BOBASMA would extend all possible support.

5.66 India noted that the removal of FLAS in the Arabian Sea will not be possible until the safety incidents on the western boundary of the Mumbai FIR are not so evident. ICAO undertook to raise the trans-regional safety problems identified by RASMAG to the MID (ICAO Cairo Office) and ESAF (ICAO Nairobi Office) as a matter of urgency.

5.67 The meeting agreed that the RASMAG-MAWG would, in light of the Annex 11 expectation, the pressing need for a less fragmented analysis picture and the sharing of resources/data, consider whether the current five RMAs and five EMAs might be able to be consolidated into two ‘virtual’ monitoring organisation, one for each region, supported by endorsed monitoring organisations:

- Asian Region: Asian Airspace Safety Monitoring Organisation; and
- Pacific Region: Pacific Airspace Safety Monitoring Organisation.

Competent Airspace Safety Monitoring Organizations List Review (WP35)

5.68 ICAO presented the RASMAG *List of Competent Airspace Safety Monitoring Organizations* for review and update (**Appendix G**).

**Agenda Item 6: Review and Update RASMAG Task List**

RASMAG Task List (WP36)

6.1 The meeting reviewed and updated the RASMAG Task List (**Appendix G** to this report).

---

**Agenda Item 7: Any Other Business**

7.1 There was no other business conducted under this item.

---

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

8.1 The next RASMAG meeting was tentatively planned to be held in June or July 2017 at Bangkok, Thailand.

8.2 The venue and dates for the next MAWG meeting would be advised by the RASMAG Chair, possibly during the first week of December 2016.

---

**Closing of the Meeting**

9.1 In closing, the Chairman thanked participants for their contributions to the meeting.

-----

RASMAG/21  
Appendix A to the Report

**List of Participants**

	<b>Name</b>	<b>Title/Organization</b>	<b>TEL/FAX/E-MAIL</b>
1.	<b>AUSTRALIA (1)</b>		
	1. Mr. Robert Butcher	Operational Analysis Manager Safety Systems, Risk and Analysis Branch Safety and Assurance Group Airservices Australia GPO Box 367 Canberra ACT 2601 Australia	Tel: +61-2-6268 4845 Fax: +61-2-6268 5695 E-mail: robert.butcher@airservicesaustralia.co m
2.	<b>BANGLADESH (4)</b>		
	2. Md. Nazrul Islam	Deputy Secretary Ministry of Civil Aviation and Tourism Bangladesh Secretariat Bldg 6 Room 1912, Dhaka Bangladesh	Tel: +880-2-954 0839 Fax: +880-2-951 5499 E-mail: <a href="mailto:vikrampur@ymail.com">vikrampur@ymail.com</a> Nazrul.parliament@gmail.com
	3. Mohammad Hamidul Haque	Director (Communication) Civil Aviation Authority of Bangladesh Headquarters Office Kurmitola, Dhaka 1229 Bangladesh	Tel: +880-2-890 1403 Fax: +880-2-890 1411 E-mail: dcom@caab.gov.bd
	4. Mohammad Abul Kalam Azad	Deputy Director Flight Safety and Regulation Civil Aviation Authority of Bangladesh Headquarters Office Kurmitola, Dhaka 1229 Bangladesh	Tel: +880-171-583 8022 Fax: +880-2-890 1418 E-mail: sato@bracnet.net

RASMAG/21  
Appendix A to the Report

	<b>Name</b>		<b>Title/Organization</b>	<b>TEL/FAX/E-MAIL</b>
	5.	Md. Saiful Haque Shah	Assistant Director Civil Aviation Authority of Bangladesh Room no. 418, Headquarters Office Kurmitola, Dhaka 1229 Bangladesh	Tel: +880-2-890 1406 Fax: +880-2-890 1418 E-mail: saif_aeld@yahoo.com Tel: +880-171-583 8022 Fax: +880-2-890 1418 E-mail: sato@bracnet.net
3.	<b>CHINA (2)</b>			
	6.	Mr. Li Jingwei	Assistant Director of Air Traffic Control Division of ATMB Civil Aviation Authority of China #12 East San-huan Road Middle, Chaoyang District, Beijing , China.	Tel: +86-10-8778 6828 Fax: +86-10-8778 6810 E-mail: lijingwei@atmb.net.cn
	7.	Mr. Chen Yongyue	Engineer, ADCC of ATMB, CAAC R&D Center Aviation Safety and Monitoring Department China Regional Monitoring Agency Floor 14, Bai Yan Building No. 238, Bei Si Huan Zhong Rd. Haidian District, Beijing China	Tel: +86-10-8232 5050 - 6973 Fax: +86-10-8232 5552 E-mail: chenyy@adcc.com.cn
4.	<b>DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA (DPRK) (4)</b>			
	8.	Mr. Rj Yong Chol	Chief of ATS, ATMD General Administration of Civil Aviation Sunan District, Pyongyang City DPR Korea	Tel: +850-2-18111 999 ext 8108 Fax: +850-2-381 4410 ext 4625 Email: gaca@silibank.net.kp



RASMAG/21  
Appendix A to the Report

	<b>Name</b>		<b>Title/Organization</b>	<b>TEL/FAX/E-MAIL</b>
	9.	Mr. Kim Jong Chol	Officer, Air Traffic Control Division, ATMD General Administration of Civil Aviation Sunan District, Pyongyang City DPR Korea	Tel: +850-2-18111 999 ext 8108 Fax: +850-2-381 4410 ext 4625 Email: gaca@silibank.net.kp
	10.	Mr. Jun Wi	Officer, Air Traffic Control Division, ATMD General Administration of Civil Aviation Sunan District, Pyongyang City DPR Korea	Tel: +850-2-18111 999 ext 8108 Fax: +850-2-381 4410 ext 4625 Email: gaca@silibank.net.kp
	11.	Mr. Jong Song Ho	Officer, Air Traffic Control Division, ATMD General Administration of Civil Aviation Sunan District, Pyongyang City DPR Korea	Tel: +850-2-18111 999 ext 8108 Fax: +850-2-381 4410 ext 4625 Email: gaca@silibank.net.kp
5.	<b>INDIA (2)</b>			
	12.	Mr. A P Udayanarayanan	Joint General Manager (ATM) Airport Authority of India New ATS Complex, Chennai Airport Chennai, India	Tel: +91 44 2256 1253 Fax: +91 44 2256 1740 Email: <a href="mailto:bobasma@aai.aero">bobasma@aai.aero</a> bobasmachennai@gmail.com
	13.	Mr. Sylvester Israel	General Manager (ATM) Airport Authority of India New ATS Complex, Chennai Airport Chennai, India	Tel: +91 44 2256 1740 Fax: +91 44 2256 1740 Email: sylvy197@gmail.com
6.	<b>INDONESIA (3)</b>			
	14.	Mrs. Novita Dwi Darmayani	Safety Information and Reporting System Manager – Airnav Indonesia Jl Ir. H. Juanda, Karanganyar, Neglasari, Tangerang 15121 Indonesia	Tel : +62 21 5591 5000 Fax : +62 21 5591 5100 E-mail: novita.dwi@airnavindonesia.co.id

RASMAG/21  
Appendix A to the Report

	<b>Name</b>	<b>Title/Organization</b>	<b>TEL/FAX/E-MAIL</b>
15.	Mr. Raden Triaswanto	ACC UK. Junior Manager Airnav Indonesia Building #611 ATC Tower, Soekarno-Hatta International Airport Tangerang, Banten Indonesia	Tel : +62 21 550 6150 Fax : +62 21 559 6122 E-mail: raden.triaswanto@airnavindonesia.co.id
16.	Mr. Hening Yogie Pradaka	ACC West Supervisor in MATSC Airnav Indonesia MATSC Building Jln Bandara baru Bandar udara Sultan Hasanuddin Makassar	Tel : +62 81 35492 4818 Fax : E-mail: hyogiep@gmail.com
7.	<b>JAPAN (2)</b>		
17.	Mr. Yuichi Maeda	Deputy Director Research and Study Service Air Traffic Control Association, Japan 2-1-3, Kasumigaseki, Chiyoda-ku Tokyo, 100-8918 Japan	Tel: +81-3-3747-1685 Fax: +81-3-3747-0856 Email: <a href="mailto:maeda@atcaj.or.jp">maeda@atcaj.or.jp</a>
18.	Mr. Masaki Kobayashi	Special Assistant to the Director JASMA 2-1-3, Kasumigaseki, Chiyoda-ku, Tokyo, 100-8918 Japan	Tel: +81-3-5253-8750 Fax: +81-3-5253-1664 Email: kobayahsi-m46z5@mlit.go.jp
8.	<b>MALAYSIA (1)</b>		

RASMAG/21  
Appendix A to the Report

	<b>Name</b>	<b>Title/Organization</b>	<b>TEL/FAX/E-MAIL</b>
	19. Ms. Hajjah Mohd Bujang	Senior Asst. Director of Air Traffic Inspectorate Department of Civil Aviation Air Traffic Control Center Level 3 Podium Block B No. 27 Persiaran Perdana Precinct 4, 62618 Putrajaya Malaysia	Tel: +603 8871 4270 Fax: +603 8871 4333 E-mail: hajjah@dca.gov.my
9.	<b>NEW ZEALAND (1)</b>		
	20. Mr. David Wills	Aeronautical Services Officer Civil Aviation Authority of New Zealand P.O Box 3555, Wellington 6140 New Zealand	Tel: +644-560 9583 Fax: E-mail: david.wills@caa.govt.nz
10.	<b>PHILIPPINES (2)</b>		
	21. Mr. Ariel J. Carabeo	Air Traffic Management Officer V Air Traffic Service Civil Aviation Authority of the Philippines Manila ACC, ATC Complex, CAAP Compound NAIA Road, Pasay City 1300 Metro Manila Philippines	Tel: +632 – 8799 - 182 Fax: +632 – 8799 - 182 E-mail: arielcarabeo@yahoo.com
	22. Mr. Ernesto P. Discaya Jr.	Assistant Chief, ATS Inspectorate Aerodrome and Air Navigation Safety Oversight Office Civil Aviation Authority of the Philippines Old MIA Road, Corner Ninoy Aquino Avenue Pasay City 1300 Metro Manila Philippines	Tel: +632 – 8799 – 118 Fax: +632 – 8799 – 118 E-mail: epdiscayajr@gmail.com

RASMAG/21  
Appendix A to the Report

	<b>Name</b>	<b>Title/Organization</b>	<b>TEL/FAX/E-MAIL</b>
<b>11.</b>	<b>SINGAPORE (3)</b>		
	23. Mr. Andrew Wee	Head (ANS SSB) Civil Aviation Authority of Singapore Singapore Changi Airport P.O. Box 1 Singapore 918141	Tel: +65 6541 3467 Fax: E-mail: Andrew_wei@caas.gov.sg
	24. Ms. Valerie Sim	ATCM (ANS SSB) Civil Aviation Authority of Singapore Singapore Changi Airport P.O. Box 1 Singapore 918141	Tel: +65 6541 2683 Fax: E-mail: Valerie_sim@caas.gov.sg
	25. Mr. Ying Weng Kit	ATCM (ANS SSB) Civil Aviation Authority of Singapore Singapore Changi Airport P.O. Box 1 Singapore 918141	Tel: +65 6595 6763 Fax: E-mail: ying_weng_kit@caas.gov.sg
<b>12.</b>	<b>THAILAND (10)</b>		
	26. Ms. Vanatta Noipan	Transport Technical Officer Civil Aviation Authority of Thailand 72 Ngamduplee, Rama IV Road Thungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-286 8159 Fax: +66-2-286 8159 E-mail: vanatta.n@aviation.go.th
	27. Ms. Vichuporn Bunyasiriphant	Safety Management System Manager Aeronautical Radio of Thailand Limited 102 Ngamduplee, Rama IV Road Thungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-287 8154 Fax: +662-287-8155 E-mail: vichuporn.bu@aerothai.co.th

RASMAG/21  
Appendix A to the Report

	<b>Name</b>	<b>Title/Organization</b>	<b>TEL/FAX/E-MAIL</b>
28.	Ms. Saifon Obromsook	Engineering Manager Aeronautical Radio of Thailand Limited 102 Ngamduplee, Rama IV Road Thungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-287 8291 Fax: +662-287-8155 E-mail: saifon.ob@aerothai.co.th
29.	Ms. Rinthida Jorntes	Executive Safety Management System Officer Aeronautical Radio of Thailand Limited 102 Ngarmduplee, Rama IV Road Tungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-287 8608 Fax: +662-287-8155 E-mail rinthida.jo@aerothai.co.th
30.	Mr. Dolsarit Somseang	System Engineer (Safety Management System) Aeronautical Radio of Thailand Limited 102 Ngarmduplee, Rama IV Road Tungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-287 8918 Fax: +662-287-8155 E-mail: dolsarit.so@aerothai.co.th
31.	Ms. Nattamon Thavornpitak	Engineer (Safety Management System) Aeronautical Radio of Thailand Limited 102 Ngarmduplee, Rama IV Road Tungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-287 8918 Fax: +662-287-8155 E-mail: <a href="mailto:nattamon.th@aerothai.co.th">nattamon.th@aerothai.co.th</a>
32.	Mr. Pongpob Mongkolpiyathana	Executive Air Traffic Systems Engineer Aeronautical Radio of Thailand Limited 102 Ngarmduplee, Rama IV Road Tungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-287 8704 Fax: +66-2-287 8645 E-mail: pongpob.mo@aerothai.co.th

RASMAG/21  
Appendix A to the Report

	<b>Name</b>	<b>Title/Organization</b>	<b>TEL/FAX/E-MAIL</b>
	33. Ms. Chantima Sritiapetch	Engineer (Safety Management System) Aeronautical Radio of Thailand Limited 102 Ngarmduplee, Rama IV Road Tungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-287 8078 Fax: +662-287-8155 E-mail: chantima.sr@aerothai.co.th
	34. Ms. Kunthinee Karumratanakul	Senior Strategic Planning Officer Aeronautical Radio of Thailand Limited 102 Ngarmduplee, Rama IV Road Tungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-285 9689 Fax: +66-2-287 8645 E-mail: kunthinee.ka@aerothai.co.th
	35. Mr. Somkiat Prakitsuvan	Chief Flight Operations Officer Thai Airway International Public Company Limited 8th Floor OPC Building Suvarnabhumi International Airport Bangphli, Samut Prakarn, 10540 Thailand	Tel: +66 2 137 1235 Fax: +66 2 137 1244 Email: somkiat.p@thaiairways.com
13.	<b>UNITED STATES OF AMERICA (3)</b>		
	36. Ms. Christine Falk	Separation Standards Analysis Branch Safety Analysis Subject Matter Expert Federal Aviation Administration William J. Hughes Technical Center Atlantic City, NJ United States	Tel: +1-609-485-6877 Fax: Email: Christine.falk@faa.gov
	37. Mr. John Warburton	Operation Research Analyst Federal Aviation Administration William J. Hughes Technical Center Atlantic City, NJ United States	Tel: +1-609-485-6603 Fax: Email: john.warburton@faa.gov

RASMAG/21  
Appendix A to the Report

	Name		Title/Organization	TEL/FAX/E-MAIL
	38.	Mr. Michael Watkins	Senior ATO Representative, Asia and Pacific Region Air Traffic Organization, International Office Federal Aviation Administration c/o US Embassy Singapore 27 Napier Road Singapore 258508	Tel: +65-6476 9462 E-mail: <a href="mailto:michael.watkins@faa.gov">michael.watkins@faa.gov</a>
14.	<b>IATA (1)</b>			
	39.	Mr. David Rollo	Assistant Director Safety and Flight Operations International Air Transport Administration 111 Somerset Road, #14-05 TripetONE Somerset Singapore	Tel: +65-6499-2251 Fax: +65-6233-9286 E-mail: rollod@iata.org
15.	<b>IFALPA (1)</b>			
	40.	Capt. Amornvaj Mansumitchai	Executive Vice President, Asia/Pacific Region IFALPA 484 Ratchadaniwet Soi 12 Huaikhwang District Bangkok	Tel: +66 888 5888 25 Fax: Email: amornvaj@gmail.com
16.	<b>ICAO (5)</b>			
	41.	Mr. Len Wicks	Regional Officer, Air Traffic Management ICAO Asia & Pacific Office 252/1 Vibhavadi Rangsit Rd Ladyao, Chatuchak Bangkok 10900, Thailand	Tel: +66-2-5378189 ext 152 Fax: +66-2-5378199 E-mail: LWicks@icao.int

RASMAG/21  
Appendix A to the Report

	<b>Name</b>	<b>Title/Organization</b>	<b>TEL/FAX/E-MAIL</b>
42.	Mr. Shane Sumner	Regional Officer, Air Traffic Management ICAO Asia & Pacific Office 252/1 Vibhavadi Rangsit Rd Ladyao, Chatuchak Bangkok 10900, Thailand	Tel: +66-2-5378189 ext 159 Fax: +66-2-5378199 E-mail: SSumner@icao.int
43.	Mr. Keok Heng Seah (Raymond)	Regional Officer, Flight Safety ICAO Asia & Pacific Office 252/1 Vibhavadi Rangsit Rd Ladyao, Chatuchak Bangkok 10900, Thailand	Tel: +66-2-5378189 Fax: +66-2-5378199 E-mail: kseah@icao.int
44.	Mr. Amal Hewawasam	Regional Officer, Flight Safety ICAO Asia & Pacific Office 252/1 Vibhavadi Rangsit Rd Ladyao, Chatuchak Bangkok 10900, Thailand	Tel: +66-2-5378189 Fax: +66-2-5378199 E-mail: ahewawasam@icao.int
45.	Mr. Kong Cheong Tuck	Regional Officer, Flight Safety ICAO Asia & Pacific Office 252/1 Vibhavadi Rangsit Rd Ladyao, Chatuchak Bangkok 10900, Thailand	Tel: +66-2-5378189 Fax: +66-2-5378199 E-mail: ckong@icao.int



**LIST OF WORKING AND INFORMATION PAPERS**

**WORKING PAPERS**

<b>NUMBER</b>	<b>AGENDA</b>	<b>TITLE</b>	<b>PRESENTED BY</b>
WP01	1	Provisional Agenda	Secretariat
WP02	2	Relevant Meeting Outcomes	Secretariat
WP03	2	FIT-Asia5 Meeting Outcomes	Secretariat
WP04	2	RASMAG/MAWG/2 Report	Australia
WP05	3	AAMA Vertical Safety Report	Australia
WP06	3	China RMA Vertical Safety Report	China
WP07	3	JASMA Vertical Safety Report	Japan
WP08	3	MAAR Safety Report	Thailand
WP09	3	Hot Spot Analysis	Thailand
WP10	3	Estimation of Vertical Overlap Probability for BOB and WPAC/SCS Regions	Thailand
WP11	3	PARMO Vertical Safety Report	USA
WP12	3	AKARA Safety Assessment	USA
WP13	3	Vertical Overlap Probability Parameter Re-Estimation	USA
WP14	3	Horizontal Risk Assessment for Brisbane and Melbourne FIRs	Australia
WP15	3	BOBASMA Horizontal Safety Report	India
WP16	3	JASMA Horizontal Safety Report	Japan
WP17	3	PARMO Horizontal Safety Report	USA
WP18	3	SEASMA Horizontal Safety Report	Singapore
WP19	4	LHD Material Package 2016	Thailand
WP20	5	AAMA Assessment of Non-RVSM Approved Aircraft	Australia
WP21	5	China RMA Assessment of Non-RVSM Approved Aircraft	China
WP22	5	JASMA Assessment of Non-RVSM Approved Aircraft	Japan
WP23	5	MAAR Assessment of Non-RVSM Approved Aircraft	Thailand
WP24	5	PARMO Assessment of Non-RVSM Approved Aircraft	USA
WP25	5	AAMA LTHM Burden Estimate Update	Australia
WP26	5	China RMA LTHM Burden Estimate Update	China
WP27	5	JASMA LTHM Burden Estimate Update	Japan
WP28	5	MAAR LTHM Burden Estimate Update	Thailand
WP29	5	PARMO LTHM Burden Estimate Update	USA

RASMAG/21  
Appendix B to the Report

<b>NUMBER</b>	<b>AGENDA</b>	<b>TITLE</b>	<b>PRESENTED BY</b>
WP30	5	Regional Safety Monitoring Assessment	Secretariat
WP31	5	Recent Change In A320's Altimetry System Error	Thailand
WP32	5	Comparison of Average ASE by Aircraft Group ASE & RMA	Thailand
WP33	5	Progress Made In China's LHD Reporting	China
WP34	5	The Requirement for a BOBASIO RMA	India
WP35	5	Competent Airspace Safety Monitoring Organizations List Review	Secretariat
WP36	6	RASMAG Task List	Secretariat

**INFORMATION PAPERS**

<b>NUMBER</b>	<b>AGENDA</b>	<b>TITLE</b>	<b>PRESENTED BY</b>
IP01	-	List of Working Papers (WPs) and Information Papers (IPs)	Secretariat
IP02	2	RMACG/11 Report	Australia
IP03	2	Role and responsibilities of EMA regarding PBCS	Japan
IP04	3	China RMA'S Attendance at APRAST/8	China
IP05	5	Integration of Unmanned Aircraft Systems	United States
IP06	5	Updating the Global Aviation Safety Plan	United States
IP07	5	Latest Monitoring Results from the Setouchi HMU	Japan

.....

RASMAG/21  
Appendix C to the Report

**ATM/AIM/SAR Deficiencies List (Updated 16 June 2016)**

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>WGS-84</u>								
Requirements of Paragraph 3.7.1 of Annex 15	Afghanistan	WGS-84 - Not implemented	24/6/2014			Afghanistan	TBD	A
	Bangladesh	WGS-84 - Not implemented	24/6/2014			Bangladesh	TBD	A
	Bhutan	WGS-84 - Not implemented	2/7/1999	Data conversion completed, but not published		Bhutan	TBD	A
	Brunei Darussalam	WGS-84 - Not implemented	24/6/2014			Brunei Darussalam	TBD	A
	Cook Islands	WGS-84 - Not implemented	24/6/2014			Cook Islands	TBD	A
	Kiribati	WGS-84 - Not implemented				Kiribati	TBD	A
	Marshall Islands	WGS-84 - Not implemented	24/6/2014			Marshall Islands	TBD	A
	Micronesia	WGS-84 - Not implemented	24/6/2014			Micronesia	TBD	A

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Nauru	WGS-84 - Not implemented		Conferring with consultant		Nauru	TBD	A
	Pakistan	WGS-84 - Not implemented	24/6/2014			Pakistan	TBD	A
	Palau	WGS-84 - Not implemented	24/6/2014			Palau	TBD	A
	Philippines	WGS-84 - Not implemented	24/6/2014			Philippines	TBD	A
	Samoa	WGS-84 - Not implemented	24/6/2014			Samoa	TBD	A
	Thailand	WGS-84 - Not implemented	24/6/2014			Thailand	TBD	A
	Vanuatu	WGS-84 - Implemented at main airports	2/7/1999			Vanuatu	1999	A
<u>Airspace Classification</u>								
Requirements of Paragraph 2.6 of Annex 11	China	Airspace Classification - Not implemented	7/7/99		Difference to Annex 11 is published in AIP, China.	China	APANPIRG/19 updated, implementation planned by end 2010.	A

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Kiribati	Airspace Classification - Not implemented	7/7/99			Kiribati	TBD	A
	Nauru	Airspace Classification - Not implemented	7/7/99			Nauru	TBD	A
	Papua New Guinea	Airspace Classification - Not implemented	7/7/99			Papua New Guinea	Project in place	A
	Solomon Islands	Airspace Classification - Not implemented	7/7/99			Solomon Islands	TBD	A
<u>AIP Format</u>								
Requirements of Chapter 4 of Annex 15	Cook Islands	AIP Format - Not implemented	7/7/99			Cook Islands	ATM/AIS/SAR/G/1 6 (June 2006) updated - AIP COOK ISLANDS in new format in progress with assistance of New Zealand	A

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Kiribati	AIP Format - Not implemented	7/7/99			Kiribati	ATM/AIS/SAR/SG/18 (June 2009) was advised AIP in draft stage	A
	Nauru	AIP Format - Not implemented	7/7/99			Nauru	ATM/AIS/SAR/SG/18 (June 2008) was advised work soon to start	A
	Papua New Guinea	AIP Format - Not implemented	7/7/99			Papua New Guinea	TBA	A
<u>AIS Quality Management System</u>								
Requirements of Paragraph 3.2.1 of Annex 15 Quality Management System - Not implemented	Afghanistan	AIS Quality Management System - Not implemented	24/6/2014			Afghanistan	TBD	A
	Bangladesh	AIS Quality Management System - Not implemented	24/6/2014			Bangladesh	TBD	A
	Bhutan	AIS Quality Management System - Not implemented	24/6/2014			Bhutan	TBD	A
	Brunei	AIS Quality Management	24/6/2014			Brunei	TBD	A

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Darussalam	System - Not implemented				Darussalam		
	Cambodia	AIS Quality Management System - Not implemented	24/6/2014			Cambodia	TBD	A
	Cook Islands	AIS Quality Management System - Not implemented	24/6/2014			Cook Islands	TBD	A
	DPR Korea	AIS Quality Management System - Not implemented	24/6/2014			DPR Korea	TBD	A
	Indonesia	AIS Quality Management System - Not implemented	24/6/2014			Indonesia	TBD	A
	Kiribati	AIS Quality Management System - Not implemented	24/6/2014			Kiribati	TBD	A

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Lao PDR	AIS Quality Management System - Not implemented	24/6/2014			Lao PDR	TBD	A
	Maldives	AIS Quality Management System - Not implemented	24/6/2014			Maldives	TBD	A
	Marshall Islands	AIS Quality Management System - Not implemented	24/6/2014			Marshall Islands	TBD	A
	Micronesia	AIS Quality Management System - Not implemented	24/6/2014			Micronesia	TBD	A
	Nauru	AIS Quality Management System - Not implemented	24/6/2014			Nauru	TBD	A
	Nepal	AIS Quality Management System - Not	24/6/2014			Nepal	TBD	A



RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
		implemented						
	Pakistan	AIS Quality Management System - Not implemented	24/6/2014			Pakistan	TBD	A
	Palau	AIS Quality Management System - Not implemented	24/6/2014			Palau	TBD	A
	Papua New Guinea	AIS Quality Management System - Not implemented	24/6/2014			Papua New Guinea	TBD	A
	Philippines	AIS Quality Management System - Not implemented	24/6/2014			Philippines	TBD	A
	Samoa	AIS Quality Management System - Not implemented	24/6/2014			Samoa	TBD	A
	Solomon Islands	AIS Quality Management System - Not implemented	24/6/2014			Solomon Islands	TBD	A

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
		implemented						
	Thailand	AIS Quality Management System - Not implemented	24/6/2014			Thailand	TBD	A
	Timor Leste	AIS Quality Management System - Not implemented	24/6/2014			Timor Leste	TBD	A
	Vanuatu	AIS Quality Management System - Not implemented	24/6/2014			Vanuatu	TBD	A
	Viet Nam	AIS Quality Management System - Not implemented	24/6/2014			Viet Nam	TBD	A

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>SAR capability</u>								
Requirements of Annex 12	Afghanistan	SAR Capability Matrix	6/07/2015	SAR Capability (no data)		Afghanistan	2016	U
	Bhutan	SAR Capability Matrix	6/07/2015	SAR Capability (no data)		Bhutan	2016	U
	Cambodia	SAR Capability Matrix	6/07/2015	SAR Capability (14 of 20)		Cambodia	2016	U
	Cook Islands	SAR Capability Matrix	6/07/2015	SAR Capability (19 of 20)		Cook Islands	2016	U
	Cook Islands	Annex 12 requirements not implemented. No agreements with adjacent States.	31/1/95		Cook Islands - implement Annex 12 requirements and co- ordinate LOA with adjacent States ICAO - assist to develop SAR capability and to co-ordinate with adjacent States	Cook Islands	2009. SAR agreement with New Zealand completed 2007.	U
	DPR Korea	SAR Capability Matrix	6/07/2015		SAR Capability (15 of 20 elements non- compliant)	DPR Korea	2016	U

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Fiji	SAR Capability Matrix	6/07/2015		SAR Capability (13 of 20 elements non-compliant)	Fiji	2016	U
	Kiribati	SAR Capability Matrix	6/07/2015		SAR Capability (no data)	Kiribati	2016	U
	Lao PDR	SAR Capability Matrix	6/07/2015		SAR Capability (10 of 20 elements non-compliant)	Lao PDR	2016	U
	Macau, China	SAR Capability Matrix	6/07/2015		SAR Capability (10 of 20 elements non-compliant)	Macau, China	2016	U
	Maldives	SAR Capability Matrix	6/07/2015		SAR Capability (9 of 20 elements non-compliant)	Maldives	2016	U

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Maldives	Annex 12 requirements not implemented. No agreements with adjacent States.	24/4/97	SAR services and facilities provided (details to be confirmed). SAR agreements with neighbouring States under development	Maldives - implement Annex 12 requirements and co-ordinate LOA with adjacent States ICAO - assist to develop SAR capability and to co-ordinate with adjacent States	Maldives	2009	U
	Marshall Islands	SAR Capability Matrix	6/07/2015		SAR Capability (no data elements non-compliant)	Marshall Islands	2016	U
	Micronesia	SAR Capability Matrix	6/07/2015		SAR Capability (20 of 20 elements non-compliant)	Micronesia	2016	U
	Myanmar	SAR Capability Matrix	6/07/2015		SAR Capability (17 of 20 elements non-compliant)	Myanmar	2016	U
	Nauru	SAR Capability Matrix	6/07/2015		SAR Capability (no data elements non-compliant)	Nauru	2016	U
	Nepal	SAR Capability Matrix	6/07/2015		SAR Capability (12 of 20 elements non-compliant)	Nepal	2016	U
	New Caledonia	SAR Capability Matrix	6/07/2015		SAR Capability (8 of 20 elements non-compliant)	New Caledonia	2016	U

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Palau	SAR Capability Matrix	6/07/2015		SAR Capability (no data)	Palau	2016	U
	Papua New Guinea	SAR Capability Matrix	6/07/2015		SAR Capability (11 of 20 elements non-compliant)	Papua New Guinea	2016	U
	Philippines	SAR Capability Matrix	6/07/2015		SAR Capability (12 of 20 elements non-compliant)	Philippines	2016	U
	Samoa	SAR Capability Matrix	6/07/2015		SAR Capability (no data elements non-compliant)	Samoa	2016	U
	Solomon Islands	SAR Capability Matrix	6/07/2015		SAR Capability (no data)	Solomon Islands	2016	U
	Timor Leste	SAR Capability Matrix	6/07/2015		SAR Capability (no data)	Timor Leste	2016	U
	Tonga	SAR Capability Matrix	6/07/2015		SAR Capability (18 of 20 elements non-compliant)	Tonga	2016	U
	Vanuatu	SAR Capability Matrix	6/07/2015		SAR Capability (no data)	Vanuatu	2016	U

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>Non Provision of Safety-related Data</u>								
Requirement of Paragraph 3.3.5.1 of Annex 11 (provision of data for monitoring the height-keeping performance of aircraft)	India	Annex 11 requirement not implemented.		Established by RASMAG/20- failure to provide RVSM approvals summary data	Lack of	India		U
Requirement of Paragraph 3.3.5.1 of Annex 11 (provision of data for monitoring the height-keeping performance of aircraft)	Philippines	Annex 11 requirement not implemented.		Established by RASMAG/20- failure to provide RVSM approvals summary data		Philippines		U
Failure to provide RVSM Approval Data to the RMA	India	Annex 6 paragraph 7.2.6	RASMAG/20 and 21	Established by RASMAG/21 - Relevant APANPIRG Conclusions: 19/15 (Enhanced communications between States and RVSM RMAs); 23/15 (Long-Term Non-RVSM Approved Aircraft); and 23/16 (Safety Monitoring Data Provision).		India		U

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>Data Link Performance</u> <u>Monitoring and Analysis</u>								
Requirements of Paragraph 2.27.5 of Annex 11 not met.	China	Post-implementation monitoring not implemented	29/5/2015	Problem Reports not provided to CRA		China	TBD	A
	Indonesia	Post-implementation monitoring not implemented	29/5/2015	Problem Reports not provided to CRA. Performance monitoring and analysis not reported to FIT.		Indonesia	TBD	A
	Malaysia	Post-implementation monitoring not implemented	29/5/2015	Problem Reports not provided to CRA.  Performance monitoring and analysis not reported to FIT.		Malaysia	TBD	A



RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Myanmar	Post-implementation monitoring not implemented	29/5/2015	Problem Reports not provided to CRA. Performance monitoring and analysis not reported to FIT.		Myanmar	TBD	A
	Maldives	Post-implementation monitoring not implemented	29/5/2015	Problem Reports not provided to CRA. Performance monitoring and analysis not reported to FIT.		Maldives	TBD	A
	Sri Lanka	Post-implementation monitoring not implemented	29/5/2015	<del>Not registered with competent CRA.</del> Problem Reports not provided to CRA. Performance monitoring and analysis not reported to FIT.	Agreed by FIT-Asia/5, endorsed by RASMAG/21	Sri Lanka	TBD	A

RASMAG/21  
Appendix C to the Report

Identification		Deficiencies			Corrective Action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Viet Nam	Post-implementation monitoring not implemented	29/5/2015	Problem Reports not provided to CRA. Performance monitoring and analysis not reported to FIT.	Agreed by FIT-Asia/5, endorsed by RASMAG/21	Viet Nam	TBD	A

**DRAFT**

**PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE (PBCS)  
IMPLEMENTATION STRATEGY FOR THE ASIA/PACIFIC (APAC) REGIONS**

**Considering that:**

1. The ICAO Provisions for PBCS including new Standards and Recommended Practices (SARPS) and related guidance material are applicable from 10 November 2016;
2. Aircraft operators are not likely to be ready to file Required Communication Performance (RCP) and Required Surveillance Performance (RSP) designators in flight plans<sup>i</sup>;
3. Some Asia/Pacific Region States providing Required Navigation Performance (RNP)-based horizontal separation minima requiring the use of Controller-Pilot Data Link Communications (CPDLC) and Automatic Dependent Surveillance – Contract (ADS-C) are not likely to be ready to implement separation minima based on PBCS designators in flight plans;
4. Some States outside the APAC Regions may require the filing of PBCS designators in flight plans for the provision of 50 NM and 30 NM longitudinal and 23 NM (formerly 30 NM) lateral separation minima on or soon after the applicability date of the PBCS provisions;
5. Area Navigation (RNAV) and Required Navigation Performance (RNP)-based 50 NM and 30NM longitudinal 30NM lateral separation minima are currently being applied in some APAC Region FIRs, normally between a relatively small proportion of eligible aircraft pairs;
6. RNAV and RNP-based horizontal separation minima should already be supported by data link performance monitoring in accordance with Annex 11 requirements;
7. RASMAG have noted that horizontal PBN separation standards (30NM and 50NM) have consistently met Target Level of Safety for many years; and
8. ATM automation systems should, as a minimum, currently be configured to accept without processing PBCS indicators in received flight plans<sup>ii</sup>.

**The APAC Regional PBCS Implementation Strategy is as follows:**

1. States are urged to take appropriate measures to develop, establish, implement and promulgate, through advisory circular or other relevant State instruments, necessary policies and procedures to enable operators conducting flights in airspace where separations are dependent on Performance-Based Communication and Surveillance (PBCS) to start using required communication performance (RCP) / required surveillance performance (RSP) indicators in the flight plan as soon as possible.

This should take into account:

- a. time for the operator to comply with the States' policies; and
- b. the need for the State to distribute data from PBCS monitoring programs, as necessary.

2. The application of existing and planned RNAV and RNP-based 50 NM and 30NM longitudinal and 30NM lateral separation minima should continue, subject to the conditions that:
  - a. PBCS monitoring is in place; and
  - b. Performance-based horizontal separation using PBCS designators in flight plans is implemented as soon as practically possible;
3. Common implementation dates are applied by States using PBCS indicators to establish performance-based separation in adjacent airspace, supported by joint submission of Proposals for Amendment (PfA) to ICAO Doc 7030 – Regional Supplementary Procedures; and
4. States that apply or plan to apply 30 NM and/or 50 NM longitudinal separation minima and/or 30 NM or 23 NM lateral separation minimum are urged to implement the ATM system capability to process and use ICAO PBCS flight plan indicators to determine aircraft eligibility for performance-based horizontal separation by **not later than 29 March 2018**; and
5. States applying performance-based horizontal separation minima, whether RNAV/RNP or PBCS based, should report their implementation status to the FANS-Interoperability Team – Asia (FIT-Asia) at least once annually, and upon any change of implementation status<sup>iii</sup>.

---

<sup>i</sup> RCP and RSP designators in the flight plan complement existing Required Navigation Performance (RNP) designators

<sup>ii</sup> As described in the *Asia/Pacific Guidance Material for the Implementation of Amendment 1 to the 15<sup>th</sup> Edition of the Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444)*.

<sup>iii</sup> Reporting form to be developed and distributed by the FIT-Asia Secretary.

**RVSM MINIMUM MONITORING REQUIREMENTS:**

**AS OF: 20 May 2016**

**Version: 2016.0**

1. UPDATE OF MONITORING REQUIREMENTS TABLE AND WEBSITE. As significant data is obtained, monitoring requirements for specific aircraft types may change. When Table 1 below, is updated, a letter will be distributed by the Regional Monitoring Agencies (RMAs) to the States concerned. The updated table will be posted on the RMA website being maintained by the International Civil Aviation Organization (ICAO). The secure website address is: <http://portal.icao.int>
2. INITIAL MONITORING. All operators that operate or intend to operate in airspace where RVSM is applied are required to participate in the RVSM monitoring program. Table 1 establishes requirements for initial monitoring associated with the RVSM approval process. In their application to the appropriate State authority for RVSM approval, operators must show a plan for meeting the applicable initial monitoring requirements.
3. AIRCRAFT STATUS FOR MONITORING. Aircraft engineering work that is required for the aircraft to receive RVSM airworthiness approval must be completed prior to the aircraft being monitored. Any exception to this rule will be coordinated with the State authority.
4. APPLICABILITY OF MONITORING FROM OTHER REGIONS. Monitoring data obtained in conjunction with RVSM monitoring programs from other regions can be used to meet regional monitoring requirements. The RMAs, which are responsible for administering the monitoring program, have access to monitoring data from other regions and will coordinate with States and operators to inform them on the status of individual operator monitoring requirements.
5. MONITORING PRIOR TO THE ISSUE OF RVSM OPERATIONAL APPROVAL IS NOT A REQUIREMENT. Operators should submit monitoring plans to the responsible civil aviation authority and the RMA that show how they intend to meet the requirements specified in Table 1. Monitoring will be carried out in accordance with this table.
6. AIRCRAFT GROUPS NOT LISTED IN TABLE 1. Contact the RMA for clarification if an aircraft group is not listed in Table 1 or for clarification of other monitoring related issues. An aircraft group not listed in Table 1 will probably be subject to Category 2 monitoring requirements.
7. TABLE OF MONITORING GROUPS. Table 2 shows the aircraft types and series that are grouped together for operator monitoring purposes.
8. TABLE OF NON-GROUP AIRCRAFT: Table 3 shows the aircraft types and series that are Non-Group aircraft (i.e., Not certified under group approval requirements) for monitoring purposes.
9. TRAILING CONE DATA. Altimetry System Error estimations developed using Trailing Cone data collected during RVSM certification flights can be used to fulfill monitoring requirements. It must be documented, however, that aircraft RVSM systems were in the approved RVSM configuration for the flight.
10. MONITORING OF AIRFRAMES THAT ARE RVSM COMPLIANT ON DELIVERY. If an operator adds new RVSM compliant airframes of a type for which it already has RVSM operational approval and has completed monitoring requirements for the type in accordance with the attached table, the new airframes are not required to be monitored. If an operator adds new RVSM compliant airframes of an aircraft type for which it has NOT previously received RVSM operational approval, then the operator should complete monitoring in accordance with the attached table.
11. FOLLOW-ON MONITORING. Monitoring is an on-going program that will continue after the RVSM approval process. Long term minimum monitoring requirements are established in the Annex 6 to the Convention on International Civil Aviation. On a regional basis, a programme shall be instituted for monitoring the height-keeping performance of aircraft operating in RVSM airspace in order to ensure that continued application of this vertical separation minimum meets regional safety objectives.

**Table 1: MONITORING REQUIREMENTS TABLE (Civilian)**

<b>MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE</b>		
MONITORING PRIOR TO THE ISSUE OF RVSM APPROVAL IS <b><u>NOT</u></b> A REQUIREMENT		
CATEGORY	GROUP DESCRIPTOR	MINIMUM MONITORING REQUIREMENTS
<b>1</b>	GROUP APPROVED: DATA INDICATES COMPLIANCE WITH THE RVSM MASPS  A124, <b>A30B</b> , A306, A310-GE, A310-PW, A318, A320, A330, A340, A345, A346, A380, A3ST, AVRO, B712, B727, B737C, B737CL, B737NX, B747CL, B74S, B744-5, B744-10, B752, B753, B764, B767, B772, B773, BD100, BE40, C25A, C25B, C510, C525, C560, C56X, C650, C680, C750, CARJ, CL600, CL604, CL605, CRJ7, CRJ9, DC10, E135-145, E170-190, E50P, E55P, F100, F900, FA7X, GALX, GLEX, GLF4, GLF5, H25B-800, J328, LJ40, LJ45, LJ60, MD10, MD11, MD80, MD90, <b>PC12</b> , PRM1, T154	Operators of aircraft types contained in this category shall have a minimum of 2 airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring. Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each group in the fleet. In the event that an operator has a single airframe from a Group, then that aircraft shall be monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring.
<b>2</b>	GROUP APPROVED: INSUFFICIENT DATA ON APPROVED AIRCRAFT  Other group aircraft other than those listed above including: A148, A158, A350, AC90, AC95, AJ27, AN72, ASTR, ASTR-SPX, B701, B703, B731, B732, B744-LCF, B748, B787, BCS1, BD700, BE20, BE30, C25C, C441, C500, C550-B, C550-II, C550-SII, CRJ10, D328, DC85, DC86-87, DC91, DC93, DC94 DC95, E120, E45X, EA50, <b>E545-550</b> , F2TH, F70, FA10, FA20, FA50, G150, G280, GLF2, GLF2B, GLF3, GLF6, H25B-700, H25B-750, H25C, HA4T, HDJT, IL62, IL76, IL86, IL96, L101, L29B-2, L29B-731, LJ23, LJ24, LJ25, LJ28, LJ31, LJ35-36, LJ55, MU30, <b>PC24</b> , P180, PAY4, SB20, SBR1, SBR2, SU95, T134, T204, T334, TBM, WW24, YK42	Operators of aircraft types contained in this category shall have a minimum of 60% of airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring, (the number of airframes to be monitored shall be rounded up to the nearest whole integer). Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each Group in the fleet.
<b>3</b>	NON-GROUP  Aircraft types for which no generic compliance method exists: A225, AN12, AN26, B190, B462, B463, B74S-SOFIA, BA11, BE9L, GSPN, H25A, L29A, PAY3, R721, R722, SJ30, STAR	Operators of aircraft types contained in this category shall have 100% of airframes monitored every 2 years or 1,000 flight hours., whichever is longer calculated from the date of the last successful height monitoring.

RASMAG/21  
Appendix E to the Report

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

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
A124	A124	AN-124 RUSLAN	
A148	A148	AN-148	
A158	A158	AN-158	
A30B	A30B	A300	
A306	A306	A300	
A310-GE	A310	A310	Series: 200, 200F, 300, 300F
A310-PW	A310	A310	Series: 220, 220F, 320, 320F
A318	A318	A318	
A320	A319 A320 A321	A319 A320 A321	
A330	A332 A333	A330 A330	
A340	A342 A343	A340 A340	
A345	A345	A340	
A346	A346	A340	
A350	A359 A358	AIRBUS 350-900 AIRBUS 350-800	
A380	A388	A380	
A3ST	A3ST	A300	
AC90	AC90	COMMANDER 690 COMMANDER 840 COMMANDER 900	
AC95	AC95	AERO COMMANDER 695	
AJ27	AJ27	COMAC ARJ-21-700	
AN72	AN72	ANTONOV AN-72 ANTONOV AN-74	
ASTR	ASTR	1125 ASTRA	S/n 1-78, except 73
ASTR-SPX	ASTR	1125 ASTR SPX, G100	S/n 73, 79-145 S/n > 145
AVRO	RJ1H RJ70 RJ85	RJ100 Avroliner RJ70 Avroliner RJ85 Avroliner	
B701	B701	B707	
B703	B703	B707	Series 320, 320B, 320C
B712	B712	B717	
B727	B721 B722	B727 B727	
B731	B731	B737	
B732	B732	B737	

RASMAG/21  
Appendix E to the Report

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
B737CL	B733 B734 B735	B737-300 B737-400 B737-500	
B737NX	B736	B737-600	
	B737	B737-700	Series: 700, BBJ only
	B738	B737-800	
	B739	B737-900	
B737C	B737	B737-700	Series: 700C
B747CL	B741 B742 B743	B747-100 B747-200 B747-300	
B74S	B74S B74R	B747SP B747SR	
B744-5	B744 B74D	B747-400	5 inch Probes up to SN 25350
B744-10	B744 B74D	B747-400	10 inch Probes from SN 25351
B744-LCF	BLCF	B747-400	
B748	B748	B747-800	
B752	B752	B757-200	
B753	B753	B757-300	
B767	B762	B767-200	
	B763	B767-300	
B764	B764	B767-400	
B772	B772	B777-200	
	B77L	B777-F	
	B77L	B777-200LR	
B773	B773	B777-300	
	B77W	B777-300ER	
B787	B788	B787-8	
	B789	B787-9	
BCS1	BCS1	BOMBARDIER 500 C SERIES CS100	
	BCS3	BOMBARDIER 500 C SERIES CS300	
BD100	CL30	CHALLENGER 300	
	CL35	CHALLENGER 350	Begins at s/n 20501
BD700	GL5T	GLOBAL 5000	
BE20	BE20	200 KINGAIR	
BE30	BE30	B300 SUPER KINGAIR	
	B350	B300 SUPER KINGAIR 350	
BE40		BEECHJET 400	
		BEECHJET 400A	
		BEECHJET 400XP	
		HAWKER 400XP	
C441	C441	CONQUEST II	
C500	C500	500 CITATION	
	C500	500 CITATION I	
	C501	501 CITATION I SINGLE PILOT	



RASMAG/21  
Appendix E to the Report

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
C510	C510	MUSTANG	
C525	C525	525 CITATIONJET 525 CITATIONJET 1 525 CITATIONJET PLUS C525-M2	
C25A	C25A	525A CITATIONJET II	
C25B	C25B	CITATIONJET III 525B CITATIONJET III	
C25C	C25C	525C CITATIONJET IV	
C550-B	C550	550 CITATION BRAVO	s/n 550-0801 and on
C550-II	C550 C551	550 CITATION II 551 CITATION II SINGLE PILOT	s/n 550-0001 to 550-0800
C550-SII	C550	S550 CITATION SUPER II	s/n starts with "S"
C560	C560	560 CITATION V 560 CITATION V ULTRA 560 CITATION V ENCORE	
C56X	C56X	560 CITATION EXCEL 560 CITATION XLS	
C650	C650	650 CITATION III 650 CITATION VI 650 CITATION VII	
C680	C680	680 CITATION SOVEREIGN 680-A LATITUDE	"A" in s/n
C750	C750	750 CITATION X	
CARJ	CRJ1 CRJ2 CRJ2 CRJ2	CRJ-100 CRJ-200 CHALLENGER 800 CHALLENGER 850	
CRJ7	CRJ7	CRJ-700	
CRJ9	CRJ9	CRJ-900	
CRJ10	CRJX	CRJ-1000	
CL600	CL60	CL-600 CL-601	S/n < 5000
CL604	CL60	CL-604 CL-601-3A CL-601-3R	5000 < S/n < 5700 5001-5134 5135-5300
CL605	CL60	CL-605	S/n > 5700
DC10	DC10	DC-10	
D328	D328	328 TURBOPROP	
DC85	DC85	DC-8	
DC86-87	DC86 DC87	DC-8 DC-8	
DC91	DC91	DC-9	
DC93	DC93	DC-9	
DC94	DC94	DC-9	
DC95	DC95	DC-9	

RASMAG/21  
Appendix E to the Report

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
E120	E120	EMB-120 Brasilia	
E135-145	E135 E145 E35L	EMB-135 EMB-145 EMB-135BJ Legacy 600/650	
E45X	E45X	EMB-145 XR	
E170-190	E170 E170 E75S E190 E190	EMB-170 EMB-175 ERJ-170-200 (short wing) EMB-190 EMB-195	
E50P	E50P	PHENOM 100	
E545-550	E545 E550	EMB-545 Legacy 450 EMB-550 Legacy 500	
E55P	E55P	PHENOM 300	
EA50	EA50	ECLIPSE	
F100	F100	FOKKER 100	
F2TH	F2TH	FALCON 2000 FALCON 2000-EX FALSON 2000LX	
F70	F70	FOKKER 70	
F900	F900	FALCON 900 FALCON 900DX FALCON 900EX FALCON 900LX	
FA10	FA10	FALCON 10	
FA20	FA20	FALCON 20 FALCON 200	
FA50	FA50	FALCON 50 FALCON 50EX	
FA7X	FA7X FA8X	FALCON 7X FALCON 8X	
G150	G150	G150	
G280	G250 G280	G250 G280	
GALX	GALX	1126 GALAXY G200	
GLEX	GLEX	BD-700 GLOBAL EXPRESS	
GLF2	GLF2	GULFSTREAM II (G-1159)	
GLF2B	GLF2	GULFSTREAM IIB (G-1159B)	
GLF3	GLF3	GULFSTREAM III (G-1159A)	

RASMAG/21  
Appendix E to the Report

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
GLF4	GLF4	GULFSTREAM IV (G-1159C) G300 G350 G400 G450	
GLF5	GLF5	GULFSTREAM V (G-1159D) G500 G550	
GLF6	GLF6	G650	
H25B-700	H25B	BAE 125 / HS125	Series: 700A, 700B
H25B-750	H25B	HAWKER 750	
H25B-800	H25B	BAE 125 / HS125 HAWKER 800XP HAWKER 800XPI HAWKER 800 HAWKER 850XP HAWKER 900XP HAWKER 950XP	Series: 800A, 800B
H25C	H25C	HAWKER 1000	
HA4T	HA4T	HAWKER 4000	
HDJT	HDJT	HONDAJET HA-420	
IL62	IL62	ILYUSHIN-62	
IL76	IL76	ILYUSHIN-76	
IL86	IL86	ILYUSHIN-86	
IL96	IL96	ILYUSHIN-96	
J328	J328	328JET	
L101	L101	L-1011 TRISTAR	
L29B-2	L29B	L-1329 JETSTAR II	
L29B-731	L29B	L-1329 JETSTAR 731	
LJ23	LJ23	LEARJET 23	
LJ24	LJ24	LEARJET 24	
LJ25	LJ25	LEARJET 25	
LJ28	LJ28	LEARJET 28 LEARJET 29	
LJ31	LJ31	LEARJET 31	
LJ35-36	LJ35	LEARJET 35 LEARJET 36	
LJ40	LJ40 LJ70	LEARJET 40 LEARJET 70	
LJ45	LJ45 LJ75	LEARJET 45 LEARJET 75	
LJ55	LJ55	LEARJET 55	
LJ60	LJ60	LEARJET 60	
MD10	MD10	MD-10	
MD11	MD11	MD-11	

RASMAG/21  
Appendix E to the Report

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
MD80	MD81 MD82 MD83 MD87 MD88	MD-80 MD-80 MD-80 MD-80 MD-80	
MD90	MD90	MD-90	
MU30	MU30	MU-300 DIAMOND	
P180	P180	P-180 AVANTI P-180 AVANTI II	
PAY4	PAY4	PA-42 Cheyenne 400	Series: 1000 CHEYENNE
PC12	PC12	Pilatus PC-12	
PC24	PC24	Pilatus PC-24	
PRM1	PRM1	PREMIER 1	
SB20	SB20	SAAB 2000	
SBR1	SBR1	SABRELINER 40 SABRELINER 60 SABRELINER 65	
SBR2	SBR2	SABRELINER 80	
SU95	SU95	SUKHOI SUPERJET 100-95	
T134	T134	TU-134	
T154	T154	TU-154	
T204	T204	TU-204 TU-214 TU-224 TU-234	
T334	T334	TU-334	
TBM	TBM7 TBM8 TBM9	TBM-700 TBM-850 TBM-900	TBM8 with winglets, begins at s/n 1000
WW24	WW24	1124 WESTWIND	
YK42	YK42	Yakovlev YAK-42 Yakovlev YAK-40	

RASMAG/21  
Appendix E to the Report

**Table 3: Non-GROUP AIRCRAFT (i.e., Not certified under group approval requirements) (Civilian)**

<b>Non-Group Descriptor</b>	<b>A/C ICAO</b>	<b>Manufacturer Type</b>	<b>Additional Defining Criteria</b>
A225	A225	ANTONOV AN-225	Non-Group
AN12	AN12	ANTONOV AN-12	Non-Group
AN26	AN26	ANTONOV AN-26	Non-Group
B190	B190	BEECH 1900	Non-Group
B462	B462	BAe-146-200	Non-Group
B463	B463	BAe-146-300	Non-Group
B74S-SOFIA	B74S	NASA B74SP with Sofia telescope	Non-Group: N747NA (s/n 21441)
BA11	BA11	BAC-111	Non-Group
BE9L			Non-Group
GSPN	GSPN	GROB G-180 SPn Utility Jet	Non-Group
H25A	H25A	HS125-400, -600	Non-Group
L29A	L29A	L-1329 JETSTAR 6/8	Non-Group
PAY3	PAY3	PIPER Cheyenne 3	Non-Group
R721	R721	B-727-100: Re-engined	Non-Group
R722	R722	B-727-200: Re-engined	Non-Group
SJ30	SJ30	SWEARINGEN SJ-30	Non-Group
STAR	STAR	BEECH 2000 STARSHIP	Non-Group

**Table 1: MONITORING REQUIREMENTS TABLE (Military)**

<b>MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE</b>			
MONITORING PRIOR TO THE ISSUE OF RVSM APPROVAL IS <b><u>NOT</u></b> A REQUIREMENT			
<b>CATEGORY</b>		<b>GROUP DESCRIPTOR</b>	<b>MINIMUM MONITORING REQUIREMENTS</b>
<b>1</b>	GROUP APPROVED: DATA INDICATES COMPLIANCE WITH THE RVSM MASPS	C17, C130, KC135	Operators of aircraft types contained in this category shall have a minimum of 2 airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring. Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each group in the fleet. In the event that an operator has a single airframe from a Group, then that aircraft shall be monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring.
<b>2</b>	GROUP APPROVED: INSUFFICIENT DATA ON APPROVED AIRCRAFT	Other group aircraft other than those listed above including: A400, E3, C5, C550-552	Operators of aircraft types contained in this category shall have a minimum of 60% of airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring, (the number of airframes to be monitored shall be rounded up to the nearest whole integer). Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each Group in the fleet.
<b>3</b>	NON-GROUP	<b>Aircraft types for which no generic compliance method exists:</b>  GLF5-AEW, GLEX-ASTOR	Operators of aircraft types contained in this category shall have 100% of airframes monitored every 2 years or 1,000 flight hours., whichever is longer calculated from the date of the last successful height monitoring.

RASMAG/21  
Appendix E to the Report

**Table 2: MONITORING GROUPS FOR AIRCRAFT CERTIFIED UNDER GROUP APPROVAL REQUIREMENTS (Military)**

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
A30B-M	A30B	A300	B2-100 (Zero-G)
A310-M	A310	A310	MRT, MRTT
A332-M	A332	KC30-A KC45-A Voyager KC2, KC3	MRTT
A400	A400	A400M	
ASTR-M	ASTR	1125 ASTRA	NAV&COM
B737-AWACS	E737	B737	Series: 700W (AWACS)
E3	E3TF E3CF	E-3 Sentry	
E4	B742	E-4	
E6	E6	E-6 Mercury	
E8	B703	E-8 J-Stars	
C12	BE20	C-12	
C130	C130	C-130 Hercules	Series: H only
	C30J	C-130J Hercules	
C17	C17	C-17 Globemaster III	
C21	LJ35	C-21	
C32	B752	C-32	Series: A, B
C40	B737	C-40 Clipper	
C5	C5	C5 Galaxy	
C550-552	C550	552 CITATION II (USN)	
C550-B-M	C550	550 CITATION BRAVO	
C550-M	C550	550 CITATION II	
C35	C560	560 CITATION V UC-35	
C9	DC93	C-9	Series: A, B
		VC-9	Series: C
CL60-M	CL60	CL604	MPA
E135-M	E135	EMB-135	MRT
FA10-M	FA10	FALCON 10	MRT
FA20-M	FA20	FALCON 20	EW/ELINT, MRT, EXP
FA50-M	FA50	FALCON 50	MPA/SAR
GLF3-M	GLF3	C-20	Series: A, B, C, D, E
GLF4-M	GLF4	C-20	Series: F, G, H
		S102B TP102	
C37	GLF5	C-37 TP102D	
IL76-M	IL76	IL-76	MRT, T

RASMAG/21  
Appendix E to the Report

<b>Monitoring Group</b>	<b>A/C ICAO</b>	<b>Manufacturer Type</b>	<b>Additional Defining Criteria</b>
KC10	DC10	KC-10 Extender KDC-10 DC-10	
KC135	B703 K35E K35R	KC-135 Stratotanker KC-135 Stratotanker C-135 Stratotanker	
KC46		Boeing KC-46 Pegasus	
P180-M	P180	P-180 AVANTI	
R135	R135	RC-135	
VC25	B742	VC-25	

Abbreviations:

EW/ELINT

EXP

MPA

MRT

MRTT

SAR

T

Electronic Warfare/Electronic Intelligence

Experimental

Maritime Patrol Aircraft

Multi Role Transporter

Multi Role Transporter and Tanker

Search and Rescue

Transporter



RASMAG/21  
Appendix E to the Report

---

**Table 3: Non-GROUP AIRCRAFT (i.e., Not certified under group approval requirements) (Military)**

<b>Non-Group Descriptor</b>	<b>A/C ICAO</b>	<b>Manufacturer Type</b>	<b>Additional Defining Criteria</b>
GLEX-ASTOR	GLEX	Raytheon Sentinel aka RAF's ASTOR (Airborne Stand-Off Radar)	Non-Group
GLF5-AEW	GLF5	GULFSTREAM G550	Non-Group : AEW

Abbreviations:

AEW

Airborne Early Warning



**Appendix F: List of Operators and Aircraft Monitoring Group Never Height-Monitored**

<b>State Name"</b>	<b>Operator</b>	<b>MMR Group</b>	<b>Fleet Size</b>	<b>Total Outstanding Burden</b>
<b>Bangladesh</b>	<b>NOVOAIR</b>	E135-145	3	2
	<b>SKY CAPITAL AIRLINES LIMITED</b>	B732	1	1
	<b>UNITED AIRWAYS BANGLADESH</b>	A310-PW	2	2
		MD80	5	2
	<b>ZAINUL HAQUE SIKDER WOMENS MEDICAL COLLEGE &amp; HOSPITAL (PVT) LTD. (DBA): R &amp; R AVIATION</b>	H25B-800	1	1
<b>Bangladesh Total</b>				<b>8</b>
<b>Bhutan</b>	<b>BHUTAN AIRLINE</b>	A320	2	2
<b>Bhutan Total</b>				<b>2</b>
<b>China (Hong Kong)</b>	<b>GOVERNMENT OF THE HKSAR</b>	CL605	2	2
<b>China (Hong Kong) Total</b>				<b>2</b>
<b>India</b>	<b>AIRCAR AIRLINES PRIVATE LIMITED</b>	P180	1	1
	<b>KINGFISHER AIRLINES LTD.</b>	A320	2	2
	<b>PINNACLE AIR PVT LTD.</b>	P180	1	1
	<b>RELIANCE TRANSPORT &amp; TRAVELS PVT. LTD.</b>	E135-145	1	1
	<b>SPICE JET LTD.</b>	B737C	2	2
<b>India Total</b>				<b>7</b>
<b>Malaysia</b>	<b>BERJAYA AIR SDN. BHD.</b>	BD100	1	1
	<b>DEPARTMENT OF CIVIL AVIATION MALAYSIA</b>	LJ60	2	2
	<b>GADING SARI AVIATION SERVICES SDN BHD</b>	B737CL	2	2
	<b>GENERAL AVIATION</b>	B737CL	1	1
	<b>HORNBILL SKYWAYS SDN. BHD.</b>	CL605	1	1
	<b>NEPTUNE AIR</b>	B737CL	1	1
	<b>RAYA AIRWAYS</b>	B752	1	1
<b>Malaysia Total</b>				<b>9</b>
<b>Myanmar</b>	<b>AIR MANDALAY</b>	E135-145	2	2

State Name"	Operator	MMR Group	Fleet Size	Total Outstanding Burden
	<b>FMI AIR</b>	CARJ	3	2
<b>Myanmar Total</b>				<b>4</b>
<b>Nepal</b>	<b>HIMALAYA AIRLINES</b>	A320	1	1
<b>Nepal Total</b>				<b>1</b>
<b>Pakistan</b>	<b>AIR INDUS</b>	B737CL	3	2
	<b>K K AVIATION PVT LIMITED</b>	HA4T	1	1
	<b>LUCKY AIR PRIVATE LIMITED</b>	LJ60	1	1
	<b>PAK ARAB FERTILIZERS LTD. MULTAN</b>	C25B	1	1
	<b>PAKISTAN AIRLINES</b>	A320	11	2
		B747CL	1	1
	<b>PAKISTAN AVIATORS &amp; AVIATION</b>	BE20	1	1
		G150	1	1
		GALX	1	1
	<b>SHAHEEN INTERNATIONAL</b>	B737CL	9	2
	<b>VIP FLIGHT GOVERNMENT OF BALOCHISTAN</b>	LJ45	1	1
	<b>VIP SINDH</b>	LJ45	1	1
	<b>VISION AIR INTERNATIONAL PRIVATE LIMITED</b>	B732	1	1
		B737CL	1	1
<b>Pakistan Total</b>				<b>17</b>
<b>Singapore</b>	<b>SINGAPORE AIRLINES LTD.</b>	A350	2	2
<b>Singapore Total</b>				<b>2</b>
<b>Taiwan</b>	<b>AVANTI AVIATION CORP.</b>	GALX	1	1
	<b>EXECUTIVE AVIATION TAIWAN CORP</b>	B737NX	1	1
	<b>WIN AIR BUSINESS JET</b>	GLF6	1	1
<b>Taiwan Total</b>				<b>3</b>
<b>Thailand</b>	<b>ANUTIN CHARNVEERAKUL</b>	TBM	1	1
	<b>BUSINESS AIR CENTRE</b>	B767	1	1
	<b>CITY AIRWAYS COMPANY LIMITED</b>	B737NX	1	1

<b>State Name"</b>	<b>Operator</b>	<b>MMR Group</b>	<b>Fleet Size</b>	<b>Total Outstanding Burden</b>
	<b>KANNITHI AVIATION COMPANY LIMITED</b>	PRM1	1	1
	<b>KING POWER INTERNATIONAL COMPANY LIMITED</b>	F2TH	1	1
		G280	1	1
	<b>K-MILE AIR CO. LTD</b>	B737CL	1	1
	<b>ORIENT THAI AIRLINE</b>	B744-5	1	1
		B747CL	2	2
	<b>P.C. AIR COMPANY LIMITED</b>	A310-GE	1	1
	<b>SABAIDEE AIRWAYS</b>	B737CL	4	2
		B737NX	2	2
	<b>SIAM AIRNET COMPANY LIMITED</b>	C750	1	1
	<b>SUNNY AIRWAYS</b>	B767	1	1
	<b>THAI AIRWAYS INTERNATIONAL LTD.</b>	A306	3	2
		A310-PW	1	1
	<b>THAI EXPRESS AIR COMPANY LIMITED</b>	B737CL	1	1
	<b>THAI FLYING SERVICE</b>	C650	1	1
	<b>THAI VIETJET AIR</b>	A320	1	1
	<b>VIP JETS LIMITED</b>	C510	1	1
<b>Thailand Total</b>				<b>24</b>
<b>Grand Total</b>				<b>79</b>

**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 30 August 2012)*

<b>Organisation (including contact officer)</b>	<b>State</b>	<b>Competency</b>	<b>Status</b>	<b>Airspace assessed (FIRs)</b>
<b>Australian Airspace Monitoring Agency (AAMA) - Airservices</b>  <a href="http://www.airservicesaustralia.com/organisations/aama/default.asp">http://www.airservicesaustralia.com/organisations/aama/default.asp</a>  Mr. Robert Butcher, Systemic Analysis, Monitoring and Review Manager, Safety Improvement Branch Safety, Environment and Assurance Group Airservices Australia email: <a href="mailto:robert.butcher@airservicesaustralia.com">robert.butcher@airservicesaustralia.com</a> or <a href="mailto:aama@airservicesaustralia.com">aama@airservicesaustralia.com</a>	Australia	RMA	Current	Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby and Ujung Pandang (including Timor-Leste) FIRs
		EMA	Current	Brisbane, Melbourne, Honiara and Nauru FIRs

RASMAG/21  
Appendix G to the Report

<b>Organisation (including contact officer)</b>	<b>State</b>	<b>Competency</b>	<b>Status</b>	<b>Airspace assessed (FIRs)</b>
<p><b>China RMA - Air Traffic Management Bureau, (ATMB) of Civil Aviation Administration of China (CAAC)</b></p> <p><a href="http://www.chinarma.cn">http://www.chinarma.cn</a></p> <p>Ms. Susan Jun Zhao, Coordinator of China RMA, ADCC, ATMB of CAAC email: <a href="mailto:rmachina@rmachina.cn">rmachina@rmachina.cn</a></p>	China	RMA	Current	Beijing, Guangzhou, Kunming, Lanzhou, Pyongyang, Sanya, Shanghai, Shenyang, Urumqi, and Wuhan FIRs.
<p><b>India Bay of Bengal Arabian Sea Indian Ocean Safety Monitoring Agency (BOBASMA)</b></p> <p><a href="http://www.aai.aero/public_notices/aaisite_test/bobasma_index.jsp">http://www.aai.aero/public_notices/aaisite_test/bobasma_index.jsp</a></p> <p>Mr. A. P. Udayanarayanan Joint General Manager (ATM) Phone No:+ 91 44 22561253 Fax No: +91 44 22561740 Email: <a href="mailto:bobasmachennai@gmail.com">bobasmachennai@gmail.com</a> : <a href="mailto:bobasma@aai.aero">bobasma@aai.aero</a></p>	India	EMA	Current	Chennai, Colombo, Delhi, Dhaka, Kabul, Karachi, Kolkata, Lahore, Male, Mumbai, Yangon,
<p><b>Japan Airspace Safety Monitoring Agency (JASMA)</b></p> <p>Mr. <del>Takashi Imuta</del>, Masaki Kobayashi, Special Assistant to the Director, Flight Procedures and Airspace Program Office, Japan Civil Aviation Bureau, email: <del>imuta-t07j7@mlit.go.jp</del> <a href="mailto:kobayashi-m46z5mlit@mlit.go.jp">kobayashi-m46z5mlit@mlit.go.jp</a></p> <p><u>CRA function:</u> Mr. Natsuki IBE, Special Assistant to the Director, Air Navigation Services Planning Division, Civil Aviation Bureau of Japan</p>	Japan	RMA, EMA and CRA	Current	Fukuoka FIR

RASMAG/21  
Appendix G to the Report

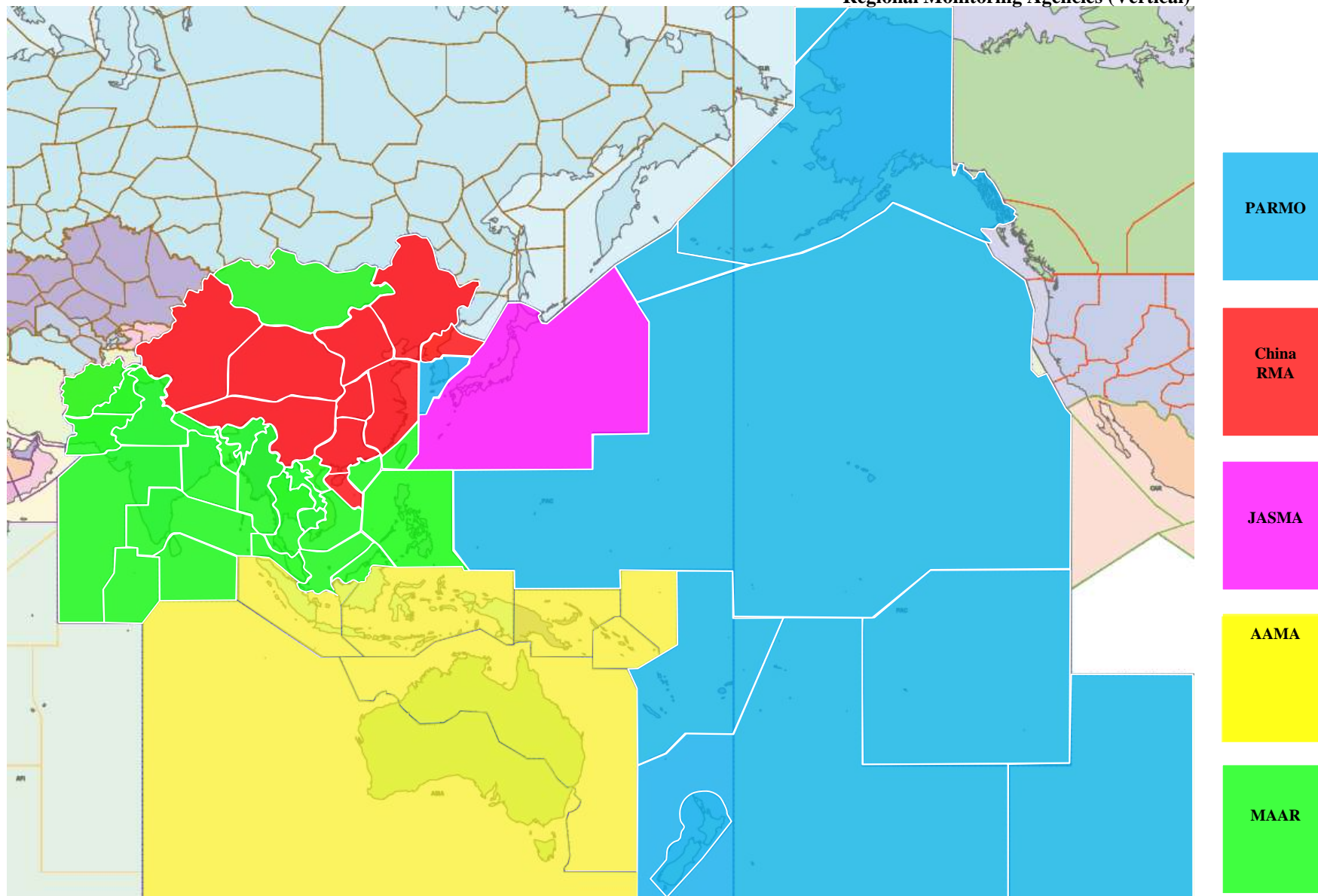
<b>Organisation (including contact officer)</b>	<b>State</b>	<b>Competency</b>	<b>Status</b>	<b>Airspace assessed (FIRs)</b>
email: <a href="mailto:ibe-n24hy@mlit.go.jp">ibe-n24hy@mlit.go.jp</a> web site: <a href="http://www.jasma.jp">http://www.jasma.jp</a>				
<b>Monitoring Agency for the Asia Region (MAAR) Aeronautical Radio of Thailand LTD (AEROTHAI)</b>  <a href="http://www.aerothai.co.th/maar">http://www.aerothai.co.th/maar</a>  Mr. <del>Chumnan Ruechai</del> Mr. Theeravut Sungseemek Director, Safety Management Department & MAAR AEROTHAI Email: <a href="mailto:maar@aerothai.co.th">maar@aerothai.co.th</a>	Thailand	RMA	Current	Bangkok, Kolkata, Chennai, Colombo, Delhi, Dhaka, Hanoi, Ho Chi Minh, Hong Kong, Kabul, Karachi, Kathmandu, Kota Kinabalu, Kuala Lumpur, Lahore, Male, Manila, Mumbai, Phnom Penh, Singapore, Taibei, Ulaan Bataar, Vientiane, Yangon FIRs
<b>Pacific Approvals Registry and Monitoring Organization (PARMO) – Federal Aviation Administration (US FAA)</b>  <a href="http://www.faa.gov/air_traffic/separation_standards/parmo/">http://www.faa.gov/air_traffic/separation_standards/parmo/</a>  Christine Falk Federal Aviation Administration Separation Standards Analysis Branch Safety Analysis Subject Matter Expert <a href="mailto:parmo@faa.gov">parmo@faa.gov</a>	USA	RMA and EMA	Current	<u>RMA</u> for Anchorage Oceanic, Auckland Oceanic, Incheon, Nadi, Oakland Oceanic, New Zealand, Tahiti FIRs  <u>EMA</u> for Anchorage Oceanic, Oakland Oceanic
<b>South East Asia Safety Monitoring Agency (SEASMA) - Civil Aviation Authority of Singapore (CAAS)</b>  <del>Mr. Kuah Kong Beng, Director Air Traffic Services,</del> email: <a href="mailto:KUAH_Kong_Beng@caas.gov.sg">KUAH_Kong_Beng@caas.gov.sg</a> <del>Ms Valerie Sim, Air Traffic Manger (ANS Safety &amp; Security), Air Navigation Group</del> Email: <a href="mailto:Valerie_sim@caas.gov.sg">Valerie_sim@caas.gov.sg</a>	Singapore	EMA and CRA	Current	<u>EMA</u> for Hong Kong, Ho Chi Minh, Kota Kinabalu, Kuala Lumpur, Manila, Jakarta, Sanya and Singapore FIRs  <u>CRA</u> for Singapore, Viet Nam and Philippines



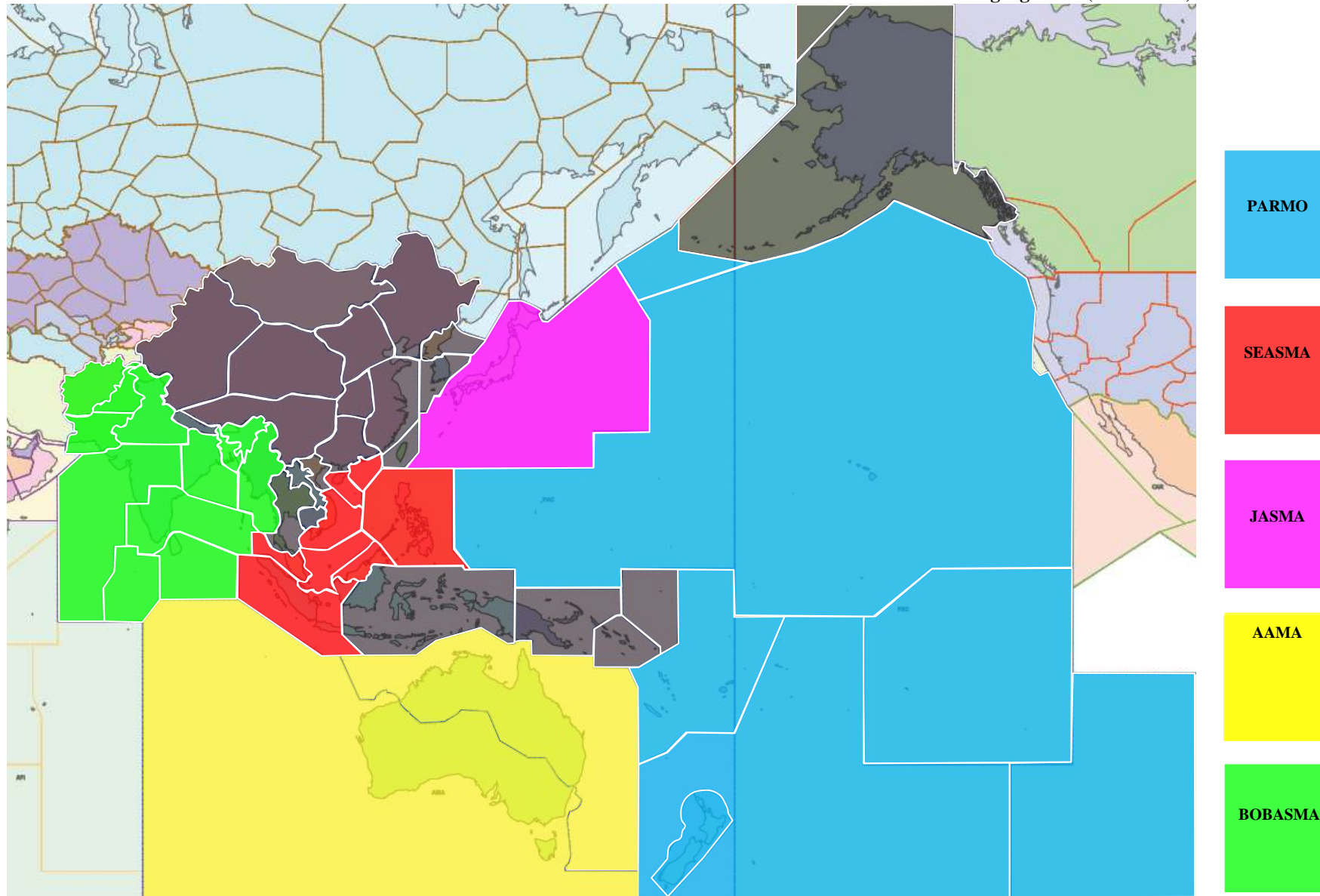
RASMAG/21  
Appendix G to the Report

<b>Organisation (including contact officer)</b>	<b>State</b>	<b>Competency</b>	<b>Status</b>	<b>Airspace assessed (FIRs)</b>
<b>FIT-ASIA</b>  Mr. Bradley Cornell, Boeing Engineering email: <a href="mailto:Bradley.D.Cornell@Boeing.Com">Bradley.D.Cornell@Boeing.Com</a>	Boeing USA	FIT	Current	FIRs in the Asian Region not covered by IPACG/FIT and ISPACG/FIT
<b>IPACG/FIT</b>  Mr. Natsuki IBE, JCAB Co-Chair, email: <a href="mailto:ibe-n24hy@mlit.go.jp">ibe-n24hy@mlit.go.jp</a> and To be advised (FAA Co-Chair) email: to be advised	Japan and USA	FIT & CRA	Current	North & Central Pacific (Oceanic airspace within Fukuoka FIR, and Anchorage & Oakland FIRs)
<b>ISPACG/FIT</b>  Mr. Bradley Cornell, Boeing Engineering email: <a href="mailto:Bradley.D.Cornell@Boeing.Com">Bradley.D.Cornell@Boeing.Com</a>	Boeing USA	FIT & CRA	Current	South Pacific FIRs and members of the Informal South Pacific ATS Coordination Group (ISPACG)

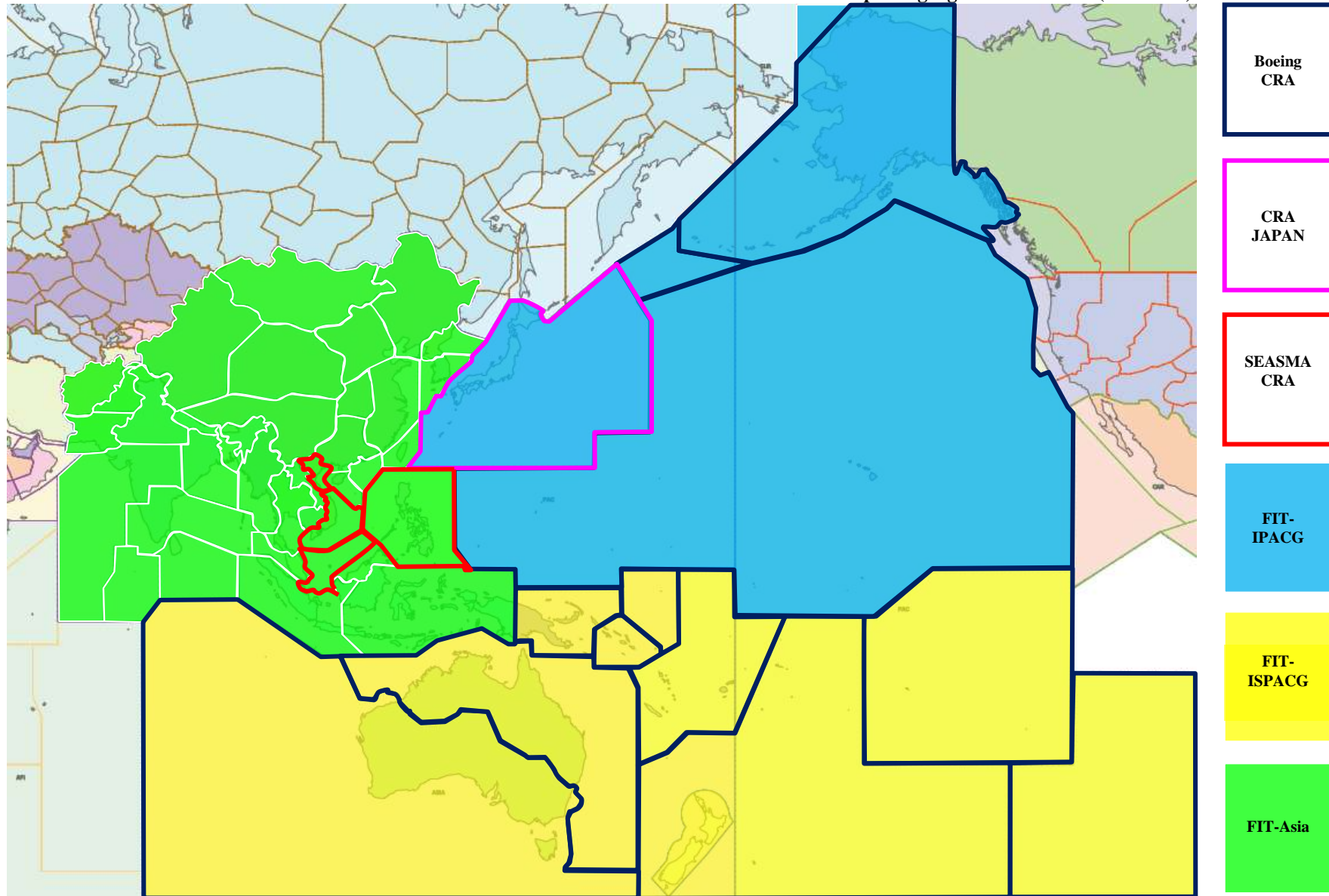
**Regional Monitoring Agencies (Vertical)**



En-route Monitoring Agencies (Horizontal)



Central Reporting Agencies and FITs (Data-link)



RASMAG/21  
Appendix H to the Report

**RASMAG — TASK LIST**

*(last updated 16 June 2016)*

<b>ACTION ITEM</b>	<b>DESCRIPTION</b>	<b>TIME FRAME</b>	<b>RESPONSIBLE PARTY</b>	<b>STATUS</b>	<b>REMARKS</b>
16/7	Assist in the development of generic educational material regarding LHD reporting that could be used in other States	RASMAG/18	All RMAs, initially China RMA, India	Closed	RASMAG/19 WP12 new task 19/3
17/2	Undertake a study to identify shortcomings in the quality of meteorological data	RASMAG/22	Australia (Lead), Thailand, China	Open	
17/3	Re-evaluation of the vertical overlap probability to provide parameters that more accurately represent the characteristics of aircraft types employed in the airspace and reveal the effectiveness of the recently imposed ICAO LTHM requirements.	RASMAG/20 (Progress report to RASMAG/20) WP10 and WP13	PARMO (Lead), AAMA, JASMA, MAAR	Closed	
17/4	An analysis of material and processes required from RMAs to assist airline/ATC education and responses on minimisation of operational errors, including information on hot spots and recommended operational responses. Task overtaken by the use of scrutiny groups	RASMAG/19 20	AAMA and PARMO, IATA, IFALPA	Closed	
17/5	Request an amendment to Annex B of Doc 9937 regarding Brunei Darussalam and Vanuatu	RASMAG/20	ICAO	Closed	
18/1	Pakistan-China ATS unit communications problem	December 2014	ICAO, Pakistan, China	Closed	Follow up at a side meeting at the ATM or CNS Sub-Group
18/2	RO letter to support reporting to MAAR Overtaken by PIRG Conclusions	1 May 2013	MAAR, ICAO	Closed	
18/3	RMAs to undertake to identify systemic safety issues and provide feedback to RASMAG on similar analyses of airspace issues.	RASMAG/19	All RMAs	Closed	
19/1	Update RASMAG on the outcome of further investigations of coordination problems between India and Myanmar, which resulted in the receiving controller not acknowledging the same information provided by the transferring controller.	RASMAG/22	MAAR	Open	
19/2	Hot spot between the Ulaanbaatar FIR and the Beijing FIR at positions NIXAL and INTIK, where	September 2014	China RMA	Closed	



RASMAG/21  
Appendix H to the Report

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
	LHDs had not been reported by Beijing so this needed to be investigated.				
19/3	(WP12) Cat E LHD illustration developed by MAAR distribution by RMAs and possibly included in the RMA Manual	RASMAG/22	RASMAG Chair, RMAs	Open	
19/4	(WP13) LLE definition incorporation into the Asia/Pac EMA manual (MAWG to review the EMA Manual prior to update) and the global EMA document that the ICAO Separation and Airspace Safety Panel (SASP) was developing. LHD definition for CAT E incorporation into the global RMA manual Overtaken by the new PBHSM Manual	RASMAG/20	RASMAG Chair; MAWG	Closed	
19/5	Consider the manner in which a system for listing non-RVSM approved aircraft could be implemented in Asia/Pacific and report to APANPIRG in this respect as a follow-up to APANPIRG Conclusion 24/6	September 2014	RASMAG Chair	Closed	
19/6	Special Coordination Meeting (SCM) to be conducted involving Bangladesh, India, Indonesia, Malaysia, and Myanmar to, <i>inter alia</i> , investigate the installation of ADS-B, VHF communications and sharing data from a site on Great Nicobar Island and other COM/SUR upgrades to mitigate risk	September 2014	India, Indonesia, Malaysia, and Myanmar, ICAO, possibly IATA and IFATCA	Closed	
19/7	China to improve its mechanism of LHD reporting and establish an open reporting culture as part of a 'just culture' environment by conducting a review, and requested China to report to APANPIRG of progress made	September 2014	China	Closed	
19/8	Investigation of LHDs prevalent in the Kabul FIR. Since the Kabul FIR had military level restrictions, most LHDs involved a neighbouring ACC (Samarkand, Uzbekistan, at position AMDAR)	September 2014	MAAR, ICAO Regional Office	Closed	

RASMAG/21  
Appendix H to the Report

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
	releasing aircraft at flight levels that were not allowed as specified in the Air Traffic Service (ATS) Letter of Agreement (LOA).				
20/1	When the new <i>Manual on Monitoring the Application of Performance-Based Horizontal Separation Minima</i> (PBHSM) manual was endorsed the Asia/Pacific EMA Manual should have to be deleted from the Asia/Pacific website.	Unknown	ICAO	Open	
20/2	Meeting provided feedback on format and content for amendment of the draft Non-RVSM aircraft reporting templates for use by Asia/Pacific RMAs.		RASMAG Chair	Closed	
20/3	At the next MAWG, the RMAs and EMAs would discuss how to share capabilities to better support those that have a higher workload. Overtaken by larger discussion on future shape of monitoring organisations.	December 2015	MAWG	Closed	
21/1	The MAWG should discuss the assignment of PBCS oversight for each FIR to an established Asia/Pacific EMA	December 2016	MAWG	Open	
21/2	A small team led by the RASMAG Chair would review the European document (EUR Document.34, which contains guidance material related to the continued monitoring of RVSM airspace in Europe) and report back to RASMAG	June 2017	Australia, other key Asia/Pacific States	Open	
21/3	RASMAG/21 agreed that the RASMAG-MAWG would discuss the matter of RMA/EMA empowerment and a widening of their scope, to ensure that when significant safety problems were identified, an emphasis would be placed on scrutiny group follow-up as a normal part of business.	December 2016	MAWG	Open	
21/4	RASMAG/21 agreed that the RMAs and EMAs at the next MAWG meeting should develop a document that contained examples of best practice actions taken to resolve identified hot spot risks	December 2016	MAWG	Open	

RASMAG/21  
Appendix H to the Report

ACTION ITEM	DESCRIPTION	TIME FRAME	RESPONSIBLE PARTY	STATUS	REMARKS
	and other risk bearing scenarios within the Region. This material could then be made available to States and other groups to provide awareness of lessons learned and options to control risks.				
21/5	The MAWG would consider the resources needed to process ADS-B data within the Region for ASE monitoring.	December 2016	MAWG	Open	
21/6	In 2014 India was observed to have 73 aircraft registrations found operating without proof of RVSM approval compared to 60 in 2015, so this appeared to be a long-term problem. Therefore, RASMAG/21 agreed that India should be reminded by State Letter of the need to meet the requirements of Annex 6 (paragraph 7.2.8).	July 2016	ICAO RO	Open	
21/7	ICAO undertook to raise the trans-regional safety problems associated with the Mumbai FIR identified by RASMAG/21 to the MID (ICAO Cairo Office) and ESAF (ICAO Nairobi Office) as a matter of urgency.	July 2016	ICAO RO	Open	
21/8	RASMAG/21 agreed that the RASMAG-MAWG would, in light of the Annex 11 expectation, the pressing need for a less fragmented analysis picture and the sharing of resources/data, consider whether the current five RMAs and five EMAs might be able to be consolidated into two 'virtual' monitoring organisation, one for each region.	December 2016	MAWG	Open	