*International Civil Aviation Organization*

**The Twentieth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/20)**

Bangkok, Thailand, 26-29 May 2015

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

# MAWG/2 MEETING OUTCOMES

(Presented by the MAWG Chairman)

**SUMMARY**

This paper provides information of the 2nd RASMAG/Monitoring Agencies Working Group (MAWG/2) meeting held in San Francisco in December 2014.

## 1. INTRODUCTION

1.1 The Second Meeting of the Regional Airspace Safety Monitoring Advisory Group Monitoring Agencies Working Group (RASMAG/MAWG/2) was held from 1-4 December 2014 at San Francisco, California. The meeting was hosted by the Pacific Aircraft Registry and Monitoring Organisation (PARMO). Participants from 5 of the Asia/Pacific regional monitoring agencies (RMAs) and 4 enroute monitoring agencies (EMAs) attended the meeting.

## 2. DISCUSSION

2.1 During the RASMAG/MAWG/2 meeting the participants reviewed and discussed a number of papers covering a wide range of topics relevant to the work of the RMAs and EMAS within the region. In particular the meeting noted that there were a number of meetings by ICAO groups (RMACG/9, RASMAG/19, APANPIRG/25 and SASP/25) with outcomes that the MAWG/2 needed to review in terms of identifying actions for the regional monitoring agencies. The meeting undertook a detailed review of the identified outcomes and assessed the need for further actions by the MAWG/2.

2.2 In particular the meeting reviewed an action from RASMAG/19 related to whether or not Asia/Pac RMAs would participate in a global list of operators known to be incorrectly using ‘W’ in flight plan notifications when not approved to do so. The proposal was put forward by the European RMA and discussion among the MAWG/2 considered a range of problems related to ensuring correctly validated data and how efficiently the data would be refreshed. As a result the Asia/Pac RMAs at MAWG/2 agreed that the current processes that they have in place in providing information directly to regional approving authorities and operators is sufficient. Additionally the RMAs considered that the sharing of this information among RMAs globally through the ICAO RMACG or FAA KSN web site was preferable

2.3 The RMAs in particular also discussed reports of instances of State aircraft operating in RVSM airspace without authorisation. Both the AAMA and PARMO informed the meeting that they already maintained good working relationships with the relevant Military authorities and that this has resulted in many military aircraft types obtaining RVSM approvals and participating in the ongoing height-keeping monitoring program. However other RMAs advised that they were still developing relationships with military authorities with varying levels of success.

2.4 Topics discussed by the meeting included:

a) ADS-B height-keeping monitoring and the work being undertaken by the ICAO Aeronautical Surveillance Panel (ASP) Technical Subgroup (TSG) so that a Height Above Ellipsoid (HAE) requirement be made explicit in relevant global technical requirements so that the States and RMAs can provide standardised height-keeping performance monitoring to operators using ADS-B data;

b) A review of the successful implementation of ADS-B height-keeping monitoring by the China RMA;

c) Comparative height-keeping monitoring outputs between different RMAs and systems, particularly between JASMA using HMUs and MAAR using AHMS;

d) A number of procedural questions raised by China RMA in relation to the assessment of large height deviation (LHD) reports and risk estimation;

e) Development of guidance material for States covering the correct reporting of Category E LHDs;

f) Development of a consolidated report from the RMAs of comparisons between the monitoring data, for reporting to RASMAG and APANPIRG at a high level, to demonstrate the effectiveness by which the RMAs are using data from across the region to validate monitoring results;

g) Assessment of the future roles of EMAs in relation to the future implementation of performance-based communication and surveillance (PBCS) as a result of changes to ICAO documents such as Annex 6, Annex 11, Annex 15, Doc 4444 (PANS-ATM) and Doc 8400 (PANS-ABC), and Doc 9869 (PBCS Manual);

h) Review of the GOLD performance analysis tool (GPAT) and agreement to provide access to all Asia/Pacific EMAs;

i) Review of the minimum monitoring requirements (MMR) for RVSM; and

j) Ongoing review of non-RVSM approved airframes.

## 3. ACTION BY THE MEETING

3.1 The meeting is invited to note the information provided in regards to the successful MAWG/2 meeting.

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**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

# REPORT OF THE 2nd MEETING OF THE REGONAL AIRSPACE SAFETY MONITORING ADVISORY GROUP MONITORING AGENCY WORKING GROUP (RASMAG/MAWG/2)

SAN FRANCISCO, CALIFORNIA, USA, 1 – 4 DECEMBER 2014

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

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**ATTACHMENTS TO THE REPORT**

# INTRODUCTION

## Meetings

1.1 The Second Meeting of the Regional Airspace Safety Monitoring Advisory Group Monitoring Agencies Working Group (RASMAG/MAWG/2) was held from 1-4 December2014 at San Francisco, California. The meeting was hosted by the Pacific Aircraft Registry and Monitoring Organisation (PARMO).

## Attendance

2.1 Sixteen (16) participants attended the meetings from Australia, China, Japan, Singapore, Thailand, and the United States. The list of participants is at **Attachment 1** to this report.

## Officer and Secretariat

3.1 Mr. Robert Butcher from the Australian Airspace Monitoring Agency (AAMA) chaired the meeting.

## Opening of the Meeting

4.1 Mr Dale Livingston, on behalf of PARMO welcomed the participants to the meeting. Mr Butcher thanked PARMO for hosting the meeting and also welcomed the monitoring agency representatives who had travelled significant distances to attend. The meeting noted that it was unfortunate that Mr Toby Farmer (New Zealand) and Mr Udayanarayanan (BOBASMA) were unable to attend.

## Documentation and Working Language

5.1 The working language of the meeting and the language for all documentation was English. 13 working papers (WPs) 18 information paper (IPs) and 1 Flimsy (FL) were reviewed by the meeting. The list of papers and presentations is shown at **Attachment 2** to this report.

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## REPORT ON AGENDA ITEMS

### Agenda Item 1: Adoption of Agenda

1.1 The provisional agenda (WP1) was adopted by the meeting

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

2.1 .Mr Butcher presented WP/12 which reminded the meeting that during 2014 a number of meetings have taken place of various ICAO groups that have specific relevance to the Asia/Pacific Regional Monitoring Agencies (RMAs) and Enroute Monitoring Agencies (EMAs). The significant outcomes from these meetings, namely the RMACG/9, RASMAG/19, APANPIRG/25 and SASP/25 were detailed in the paper and reviewed in detail by the meeting.

2.2 In relation to the identified action items from the RMACG/9 meeting, the meeting agreed as follows:

| Action No. | Task | Date Due | MAWG/2 comment |
|---|---|---|---|
| 1 | Provide more complete feedback to NATCMA on their own validation of the proposed data rules using Eurasia's online application. | 31 October 2014 | Completed |
| 3 | Traffic scrutiny to continue and results to be included in information papers submitted to RMACG10 but may be not specifically discussed. | RMACG10 | Agreed the scrutiny work is important particularly for the regions and to provide information to APANPIRG. Regardless of the comment re the information presented at RMACG/10 should be information papers, the MAWG agreed that the ongoing work was important from the Asia/Pac perspective. |
| 4 | Provide feedback regarding approval status of the airframes identified by the RMAs in their scrutiny work. | ASAP | Completed |
| 5 | Provide copy to the RMAs of ICAO State Letter addressing non-compliant aircraft operating in RVSM airspace as soon as approved by the ICAO Secretary General. | ASAP | Noted the letter had been sent out by ICAO. Mr Butcher to provide copy. |
| 6 | Provide to RMAs the Circular on SLOP application as soon as approved for publication by ICAO. | ASAP | Noted Circular is published. Mr Butcher to provide copy. |

| | | | |
|---|---|---|---|
| 7 | Provide rationale on how LHD are defined for safety assessment purposes. | RMACG/10 | Noted a number of WPs to be presented at MAWG/2 that could determine RMACG/10 response. |
| 9 | Compare the crossing-track model against the local RMA version and adopt a preferred crossing track model as a global standard. | RMACG10 | MAAR commented that EurRMA computes crossing risk based on the actual angles instead of a conservative value. PARMO commented that in Asia/Pac we use a standard 45 degrees that is considered most conservative. RMAs to provide papers as required to RMACG/10. |
| 10 | The RMACG is invited to analyse if reported LHDs due to operation of non-RVSM approved aircraft should be put under technical risk. | RMACG10 | Papers presented at MAWG/2 and being progressed at SASP. Expect papers at RMACG/10. |
| 11 | Provide feedback to EURRMA and NAARMO regarding the proposed changes to the MMR. | 9 June 2014 | Completed and paper to be further reviewed at MAWG/2. |
| 13 | The meeting agreed that all RMAs should review the table of FIRs to guarantee that the naming convention are aligned with the respective Air navigation Plans. | RMACG10 | Agreed that RMAs/EMAs will review against the A/Pac Air Nav Plan and provide advice to RMACG/10. |
| 15 | Provide feedback to EURRMA on the proposal to create a global registry of non-RVSM approved aircraft. | February 2015 | Discussed by MAWG/2 and agreed that there was no support for a global list. |
| 16 | Discuss with the SASP the implications of non-compliance with Annex 6 operator long term monitoring targets. | November 2014 | Mr. Butcher to complete action at SASP/26. |
| 17 | Inform CAAs when approved aircraft does not comply with the long term monitoring requirements. | 30 June 2014 | MAAR presented paper on this subject at MAWG/2. RMAs agreed they had undertaken this action. |
| 19 | Investigate the feasibility of hosting the RMACG/10 meeting and inform the Secretary | December 2014 | MAAR agreed this was being confirmed. Dates now proposed to be 18-22 May. |

2.3 In relation to the identified action items from RASMAG/19, the meeting specifically discussed the issue related to whether or not Asia/Pac RMAs would participate in a global list of operators known to be incorrectly using 'W' in flight plan notifications when not approved to do so. The proposal was put forward by the European RMA and discussion among the MAWG/2 considered a range of problems related to ensuring correctly validated data and how efficiently the data would be refreshed. As a result the Asia/Pac RMAs at MAWG/2 agreed that the current processes that they have in place in providing information directly to regional approving authorities and operators is sufficient. Additionally the RMAs considered that the sharing of this information among RMAs globally through the ICAO RMACG or FAA KSN web site was preferable. Mr Butcher agreed to advise Mr Lewis at European RMA of the meetings decision.

***Action: Mr Butcher to advise Mr Lewis at European RMA of the decision not to participate in a centrally published list of operators that incorrectly use 'W' on a continuing basis.***

2.4 The meeting also reviewed discussions from RASMAG/19 relating to Asia/Pacific RMAs reports of instances of State aircraft operating in RVSM airspace without authorisation. The meeting noted the view of RASMAG that a consistent policy within the Asia/Pacific Region would help to alleviate the problem and that this should be supported by improved coordination between civil and military authorities, particularly on RVSM operational requirements. The meeting noted the Draft Conclusion on this subject developed by RASMAG/19 for APANPIRG's consideration.

2.5 In relation to this subject Mr Butcher pointed out that the AAMA has a good relationship with Defence airworthiness authorities in Australia who actively participate in the Annex 6 based monitoring program for specific aircraft fleets. Mr Livingston commented that both NAARMO and PARMO maintain a single point of contact with relevant authorities at the Pentagon and interaction is good particularly with Air Mobility Command. He commented that many of the tactical fighter type aircraft of the United States military do not have some of the dual autopilot systems required for RVSM approval even though the approving authorities give approval. NAARMO and PARMO accept these approvals but he acknowledged that some RMAs do not. Other RMAs present commented that their relationships with military RVSM approving authorities and coordination regarding State aircraft operating in RVSM airspace was an on-going activity.

2.6 The meeting then reviewed a number of action items from the RASMAG/19 meeting report. In regard to Action 19/2, China RMA reported that there had been discussions internally regarding this issue related to the hot spot between Ulaanbaata FIR and Beijing FIR. He informed the meeting that some of the coordination issues related to lost flight plans and that these issues were still being actively resolved.

2.7 In relation to Action 19/6 that a Special Coordination Meeting (SCM) be conducted involving Bangladesh, India, Indonesia, Malaysia, and Myanmar to, *inter alia*, 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. MAAR informed the meeting that the SCM took place in August and that good progress was made.

2.8 In relation to Action 19/8 that called out an investigation of LHDs prevalent in the Kabul FIR, MAAR informed the meeting that advice on these LHDs was included in a working paper to be presented to MAWG/2.

2.9 Mr Butcher also provided the meeting with an overview of outcomes from the recently concluded SASP/25 meeting. The meeting was informed of a number of new separation minima developed by the SASP that have specific RNP, RCP and RSP requirements and in addition would require formalised ongoing monitoring of a range of parameters to ensure that safety criteria continue to be met. Mr Butcher commented that there would obviously be greater need for EMAs to participate in this required monitoring to support the use of such reduced minima in the Asia/Pacific region.

**Agenda Item 3: ADS-B Height Monitoring**

3.1 The PARMO presented IP/1 which presented a summary of activity initiated to establish a requirement for aircraft geometric height in ADS-B Out data to be provided in the Height Above Ellipsoid (HAE) reference frame.

3.2 At its June 2014 meeting, the ICAO Aeronautical Surveillance Panel (ASP) Technical Subgroup (TSG) meeting was asked to consider that a HAE requirement be made explicit so that the States and RMAs can provide height-keeping performance monitoring to operators using ADS-B data. The TSG determined that modifications would be needed in RTCA DO-260B and ICAO Doc 9871. The recommendation was then forwarded to the Seventeenth Meeting of the ICAO ASP, held in September 2014. The ICAO ASP/17 WP/17 was provided as an attachment to MAWG/2 IP/1.

3.3 The ASP/17 Meeting Report stated that considerable discussion took place on the maturity of the proposed changes. This lead to an action item for the TSG to further refine the change proposal, present an update at the next Working Group meeting in April 2015, and to connect with RTCA/EUROCAE before the ADS-B Minimum Operational Performance Standards (MOPS) (DO-260B/ED-102A) are finalized.

3.4 The necessary changes to ICAO Doc 9871 and RTCA DO-260B will likely take a few years to become effective. Therefore, in the short term, RMAs using ADS-B out for monitoring aircraft ASE should continue without the certainty of reference frame.

3.5 The meeting acknowledged that until the relevant documents are changed and the requirements implemented, the RMAs are left with current techniques to determine which reference aircraft are using when transmitting geo-altitude. However Ms Falk commented that the technique currently used is not effective where there is no significant change in geoid gradient across the airspace being monitored. Mr Livingston reminded the meeting that B787 monitoring data from onboard the aircraft was available if RMAs needed to access this and that PARMO could assist in accessing this information. Additionally, he encouraged RMAs to discuss with State authorities opportunities to implement requirements to standardize on HAE as a reference for geo-altitude. In addition Mr Butcher commented that the AAMA already has significant B787 ADSB data and could share this with RMAs if required.

***Action: RMAs to coordinate with State authorities under their jurisdiction to seek standardisation in the use of HAE as a reference for geo-altitude in ADS-B data.***

***Action: AAMA to make B787 monitoring data available to other RMAs.***

Progress update for the China RMA's evaluation of altimetry system error using ADS-B (IP/2)

3.6 China RMA recalled that during the RASMAG/18 meeting in April, 2013, China RMA presented WP/23 which introduced the method for the ADS-B ASE calculation and the data comparison results. RASMAG endorsed the China RMA ADS-B ASE Monitoring method and agreed China RMA’s aircraft ASE results should be included in future aircraft height keeping performance analysis and comparisons for the APAC Region. As a result, China RMA informed the meeting that up to October 2014, they have monitored 6,734 aircraft with 4.2 billion (4,188,951,880) separate data points. The data resulted in 151.7 million (151,680,844) minutes of monitoring output.

3.7 The main monitoring outcomes reported by China RMA included:

- 6,428 aircraft had ASE results successfully calculated;

- 1,839 aircraft were registered in the China RMA ( where the total number is 2,529);
- 4,204 aircraft were registered in other RMAs;
- 385 aircraft were not included in the global approval database updated in October, 2013;
- 3,849 aircraft (59.9%) used the MSL as a geoid reference;
- 1,690 aircraft (26.3%) used the HAE as a geoid reference;
- the geoid reference of 889 aircraft (13.8%) cannot be determined due to either the limited data volume or the single operation region of geoid;

3.8 The meeting thanked China RMA for the detailed paper noting China RMA's successful implementation of ADS-B based height monitoring. MAAR asked if China RMA would make these results available on the KSN. China RMA responded that they have not updated the data to the KSN at this time as it is not complete for recent observations. Specifically China RMA commented that for some of the aircraft it is not apparent what their reference for geo-altitude is so the ASEs still need correction. The intention is to make the data available when validated. The AAMA asked if the non referenced aircraft could be compared with other data available from other RMAs who have monitored the same aircraft and may already know the reference used. China RMA stated that they had already analysed the aircraft for which the geoid reference cannot be determined, and combined with data provided by the AAMA and MAAR were now able to determine the correct geoid reference. Additionally the result will be updated to the KSN shortly.

3.9 China RMA asked the meeting in regards to the level of flight testing that had been required for their ground system used in ADS-B monitoring. Mr Butcher provided advice that no specific flight test was undertaken for the Australian ADS-B systems as the ground station does no measurement and hence (unlike a radar) there is no integrity issue. The advice suggested that it was useful to baseline the coverage volume to establish if a radio link exists. In Australia this was achieved using targets of opportunity producing coverage charts. Additionally Mr Butcher advised that unlike a radar, there is little that can be done to change the coverage from an omni antenna such as an ADS-B. There is no ability to change the tilt, adjust gain/range, or tune geographic areas in or out. There is essentially nothing to adjust. Mr Livingston agreed with Mr Butcher's advice and stated that in the United States, they have used ADS-B to extend surveillance beyond radar, and have done a flight check to establish the areas of signal coverage.

Per-airframe ASE comparison between JASMA's HMUs and MAAR's AHMS (IP/7)

3.10 IP07 compares Altimetry System Error (ASE) values of airframes that have been measured by each of JASMA's Height Monitoring Units (HMUs) and MAAR's ADS-B Height Monitoring System (AHMS). For daily ASE values, 75% of Setouchi HMU measurements are higher than values obtained from MAAR's AHMS compared to 42% and 41% of Niigata and Sendai HMUs respectively. The mode of differences of ASEs measured by Setouchi HMU and MAAR's AHMS is between 25 - 50 feet, which shows that Setouchi HMU may give higher values than those from MAAR's AHMS.

3.11 For long-term ASE average of measurements from JASMA's HMUs and MAAR's AHMS, the data plot shows good correlation (R = 0.89). The discrepancies range from zero to 108 feet. While some of large discrepancy cases can be explained when plotting all data points together, some may need further investigation.

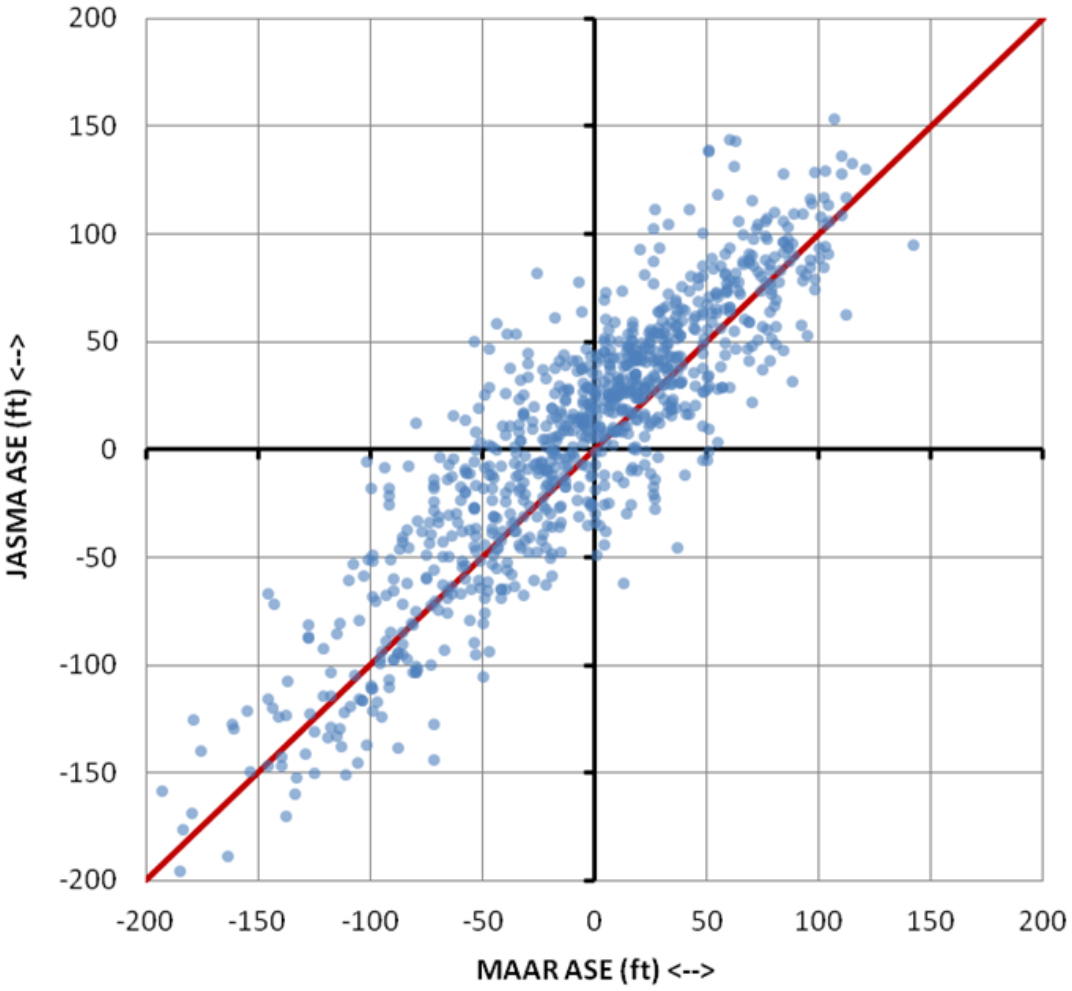


**Figure 1:** Scatter Plot of Long-Term Average ASE from MAAR's AHMS vs. JASMA's HMUs

3.12 The meeting thanked MAAR and JASMA for the excellent paper. In discussing the results consideration was given to whether the possibility of different weather models and the differences in exposure (ie the track length) may be factors in some of the differences observed in the data. Mr Livingston suggested that to assist in resolving some of these differences, the RMAs involved should note for each observation what some of the key differences could be between measuring using the AHMS and the HMU. These could include differences in the measuring system, for example MLAT v Geometric height directly from the aircraft. Other differences could include: post processing involving weather models used to determine the actual flight level; altimetry systems used by an aircraft may be different, ie left side v right side; angle of attack may have an influence if the flight envelope changes due to changes in gross weight, for example if the aircraft landed and took on fuel; and differences in the flight level the aircraft was maintaining for the observations. Mr Livingston commented that once we know these differences we can take action to control these to the extent possible and account for them in the measurements.

3.13 Mr Livingston also observed that in Figure 3 in the paper, there appeared to be some issues with a sub-set of the data shown below the diagonal. He proposed that this could be a result of the angle of the aircraft away from the HMU. He also stated that in considering the variations in the data, looking at the number of observations that contribute to the mean on one system as opposed to the other may give some explanation of the uncertainty for some of the differences observed. Both MAAR and JASMA agreed to take Mr Livingston's comments into consideration when undertaking

future data comparisons.

Distribution of Altimetry System Error Results from the US ADS-B Data (IP/8)

3.14 Mr Perez presented IP/8 on behalf of PARMO and advised that the purpose of the information paper is to provide the meeting with an update to the information presented in RASMAG MAWG/1-WP/3 in Honolulu, Hawaii, USA. In relation to the information provided in the paper Mr Perez advised:

- **US ADS-B Data Coverage and Distribution** – As of October 21, 2014 the FAA has 794 ADS-B ground stations to cover the United States, Gulf of Mexico and Alaska. A total of 643 were operational and available to generate the data for this study. In September 2014, the US began to observe ADS-B data from three new sites: Hawaii, Guam and Puerto Rico.

- **US ADS-B ASE Data Sample Results –** The US ADS-B sample contains data from 1 January 2014 to 31 October 2014. The sample was filtered for flight levels within RVSM, FL290-410.

- **Link Technology –**The sample taken contains only aircraft using 1090ES with DO-260B. The sample contained a total of 1,593 individual aircraft with valid ASE segments.

- **Distribution of ASE Results** – As a result of the filtering process, 466,453 observations were considered as valid ASE segments for 1,593 individual aircraft.

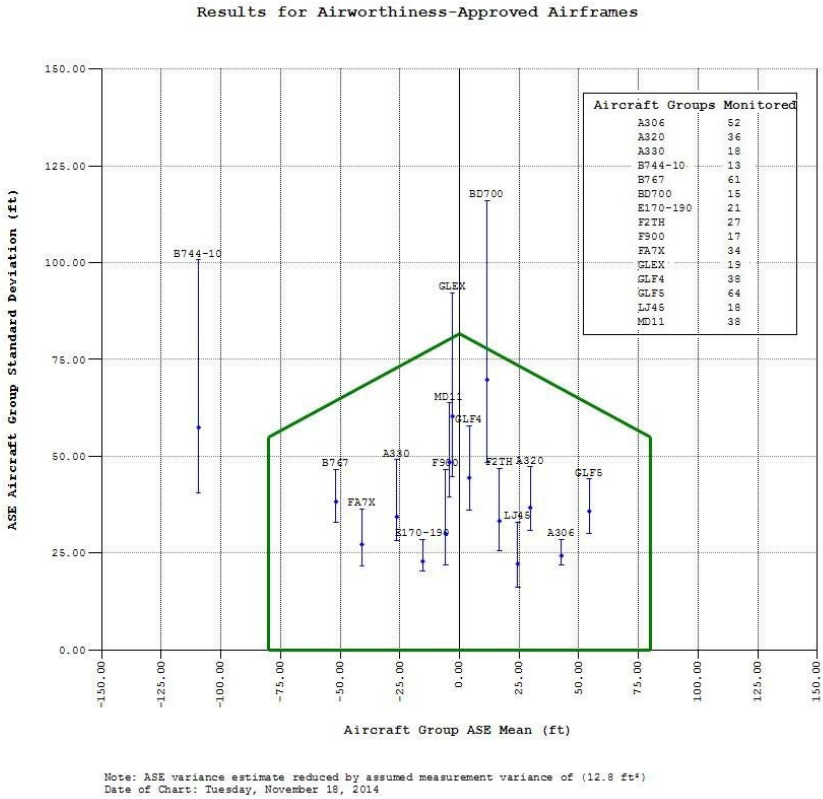


**Figure 2** ASE Performance for the aircraft using ADS-B in the US.

3.15 The meeting thanked PARMO for the valuable information contained in the paper. Mr Livingston commented that all new airframes manufactured in the USA have ADS-B Do260B fitted

and some operators such as UPS and FedEx have specifically fitted this system to enable use of lower separation minima. As a result the available number of airframes utilising ADS-B monitoring in the United States is increasing significantly.

3.16 MAAR noted that the data for B744 aircraft shows an ASE of -109 and questioned whether there was any information from Boeing on this result. Mr Livingston noted that in Europe the mean ASE for B744s with 10inch probe was increasing. Boeing is looking into the issue but has suggested it might be a result of erosion in the sensing probes on the aircraft but this is not confirmed. Also he stated that with the withdrawal of much of the B744 fleet in the short to medium term any fix may not be cost effective.

JASMA Comparison Results of 3 HMUs (IP/9)

3.17 JASMA presented information regarding a comparison of results obtained from Setouchi (HMU1), Niigata (HMU2) and Sendai (HMU3) for the period between 16 May 2014 and 15 October 2014. Mr Imuta informed the meeting that JASMA is studying how magnitude of measurement difference is acceptable for the height keeping performance monitoring obtained from the different HMUs.

3.18 Mr Imuta advised that the average ASEs of each monitoring group measured by Setouchi HMU tend to be biased to the positive while those measured by the other two HMUs are biased to the negative. The trends of each monitoring group are similar. These results were found even though the data is strongly correlated to at least 0.9.

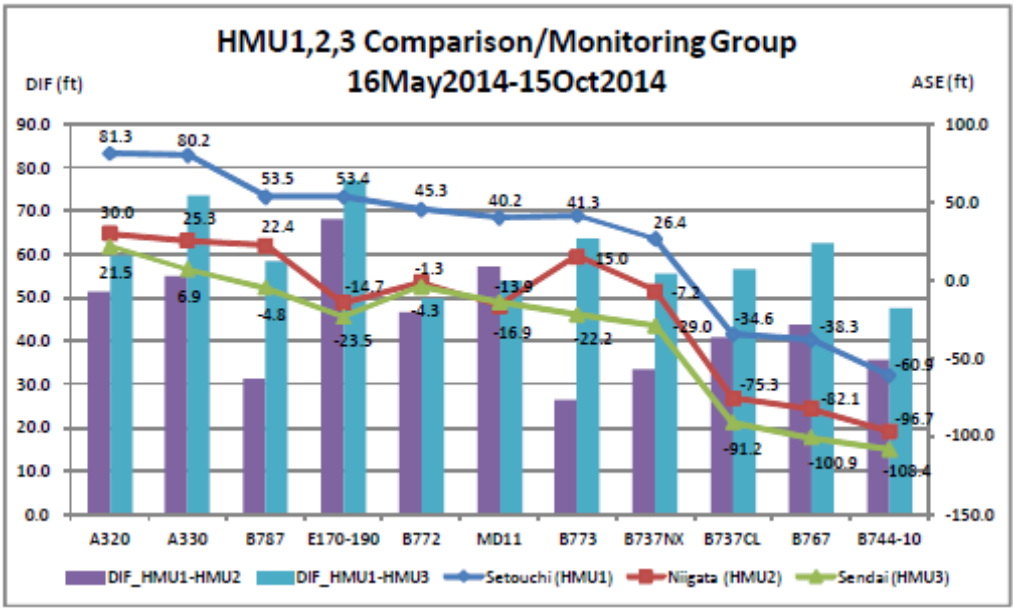


**Figure 3:** Setouchi, Niigata, Sendai HMU ASE comparison

3.19 In discussing the paper, Mr Imuta sought input from the RMAs as to how they can determine the correct results given the varying data. MAAR identified that a previous paper presented to RMACG/9 showed differences in the flight track location relative to the HMU position could have an impact on measurement results which needed to be accounted for. Mr Imuta said that a study into this aspect was still ongoing and could explain some of the results in IP/9. Ms Falk representing PARMO commented that to resolve any non-compliant/aberrant measurements, JASMA should collaborate with another RMA that uses an HMU to specifically crosscheck aircraft results. If nothing is available, JASMA could compare ground tracks to identify if the aberrant result is coming from a

track or tracks that may typically be contributing to non-compliant results. Mr Livingston commented that some of the variations between the HMUs seem so large that JASMA should consider not including this specific data for a particular flight reference. Additionally JASMA may be able to identify any source of bias and with some investigation be able to remove that bias from the calculation for ASE. However he cautioned that by removing bias it is important to ensure that a greater level of uncertainty is not introduced.

JASMA the Latest Monitoring Results of Setouchi HMU (IP/10)

3.20 Mr Imuta introduced the paper noting that it presents a summary of the latest height monitoring results obtained from Setouchi HMU for the period between 16 December 2013 and 15 October 2014. He informed the meeting that JASMA conducts careful verification of monitoring flight information over Setouchi HMU prior to updating the RMA's KSN website and the JASMA website.

3.21 The paper reports that the average of mean TVE is 31.0 ft and the average standard deviation of TVE is 60.3ft during the sample period. The last report from JASMA indicated the average of mean TVE was 16.0ft and the average standard deviation of TVE was 62.0ft.

3.22 The meeting thanked JASMA for the detailed paper and looked forward to continuing monitoring information from the JASMA HMUs in support of the Asia/Pac monitoring program.

Updated Estimate of RVSM Long Term Height Monitoring Burden for the Australian Airspace Monitoring Agency (AAMA) (IP/15)

3.23 Mr Butcher presented the paper noting that the AAMA has on an on-going basis reported on its anticipated monitoring burden following the implementation of long term height monitoring in November 2010. The data is based on a review of the current RVSM approvals data for the State airspaces that the AAMA is responsible for, taking into account completed successful monitoring activity.

3.24 The paper identified:

- the total number of RVSM approved aircraft totalled 1077 as at 1 December 2014. This represents an increase of 49 aircraft since May 2014.
- the current outstanding burden is 103 aircraft which represents an increase of 24 airframes from that reported in May 2014.
- The existing burden comprises 441 Australian registered, 57 Indonesian registered and 2 Papua New Guinea registered aircraft.
- 90% of the Australian RVSM-approved fleet is ADS-B equipped and therefore can undertake monitoring using the AAMA's AHMS
- 40 airframes from 26 operators are considered overdue in terms of the minimum monitoring requirements

3.25 The meeting thanked the AAMA for the information and discussed aspects of ensuring compliance with monitoring requirements. A number of RMAs indicated they were experiencing difficulties in having State approval authorities respond effectively to compel operators overdue for monitoring to have the monitoring completed.

**Agenda Item 4: EMA/RMA Safety Monitoring Reports for RASMAG**

Issues in Risk Estimation and Understanding about LHD Taxonomy (WP/2)

4.1 Mr Kaiyan representing China RMA informed the meeting that they had conducted a safety assessment for the responsible RVSM airspace according to the guidance in Doc 9937. He commented that in recent years, the LHD taxonomy has been expanded and the LHD code categories have increased. With more events included in the LHD data collection, the risk estimation is becoming more complicated. As a result, the paper posed a number of questions that the China RMA had been unable to resolve concerning the RVSM safety assessment and risk estimation. Mr Kaiyan stated that it would be helpful for RMAs to discuss these questions to arrive at a common understanding.

4.2 The meeting thanked China RMA for bringing these questions to its attention and thereafter spent sometime discussing them in detail. The outcomes from those discussions are detailed as follows:

4.3 Question 1: Which LHD cause categories contribute to technical risk? And which contribute to *operational risk?* The meeting reviewed the categories of LHD represented in Table A2 of the paper and provided comment as follows:

- Category G: The meeting agreed that the contingency in this case is where there is something wrong with the aircraft system, and the risk arises where the aircraft descends through flight levels. Mr Livingston confirmed this is a operational risk. Essentially the aircraft is manouvered by the aircrew as a result of a failure of the aircraft system but not the altimetry system. As the aircraft passes each level there is a Pz0 component that is accounted for. It is also important to capture the speed if available and cause of the failure. The speeds used would be higher for emergency descent but for engine failure possibly a 'drift down' speed around 200fpm or more.

  Answer: Operational risk

- Category J: Mr Livingston commented that these events should be included as ones that would be reflected in the tail region usually in the order of 300-500ft and should therefore be recorded as a technical risk. The crews are given direction to follow the resolution provided and so are acting as an extension of the aircraft system. In that regard these are similar to assigned altitude deviations and are typically assessed as a FTE issue.

  Answer: Technical risk

- Category F: Ms Falk commented that this category was created to capture AIDC failures primarily and to differentiate these from Category E which focus on human error. The practical intent is to capture where an ATC transfer fails due to a technical issue, and as a result the receiving ATC does not know the aircraft will enter the airspace or what level or time. Mr Butcher and Mr Livingston supported this view and agreed this is an operational error. It is the outcome that is generating the risk, in other words there was none or incorrect coordination not focusing on the 'technical' cause.

  Answer: Operational risk.

  In addition, the meeting discussed how this particular category is represented in the table

produced in WP/5 at RASMAG/15 which shows the category as a technical risk Mr Butcher agreed to amend the table and to provide an updated version to RASMAG/20.

**Action: Mr Butcher to amend the LHD table in WP/5 from RASMAG/15, to include Cat G under Operational Error and provide updated example to RASMAG/20. Ensure that: 1) the example shows that if an aircraft offsets before descending in accordance with published procedures relevant to an airspace, then no occurrence would be reported; and 2) the wording of Cat F is amended to remove the word 'technical' from the definition. Should reflect ATC ground system failure or such like.**

- Category M: The meeting reviewed the issue and agreed this was an operational risk.

  Answer: Operational risk

4.4 Question 2: Category D System Loop Error. Ms Falk commented that the example in the question is what would be considered a loop error. Agreed that the allocation between Category D or Category M would be contingent on the information in the occurrence. Mr Butcher commented that from the AAMA's perspective, where it was evident that there was a loop error by ATC or the pilot and a loss of separation resulted, the report would be categorised as a Category D. Ms Falk emphasized that Category M is a 'catch all' against which reports are categorized that lack a lot of detail to enable the cause to be established. Agreed that no further action was warranted.

4.5 Question 3: Risk Estimation for Category E Error with Zero Duration. The meeting reviewed this question and agreed that it was important to report these types of occurrences as even though the risk may not be realised in the receiving FIR, the fact that there had been an error was the important aspect that within a mature safety management system was important information to have. The meeting agreed that this information may also be useful to monitoring agencies to identify where systems are effectively resolving errors before the aircraft actually enters the receiving FIR. However it was recognised that not all these reports would necessarily be reported due to special operational situations.

4.6 Question 4: How do RMAs estimate operational risks due to Category E Error near the border? In discussing this question the meeting agreed that a classic example is where the sending controller fails to amend a flight level change. In the controlling FIR the change is known, but the risk is realized in the receiving FIR. In the case for example of MAAR and China RMA's interface, where the risk is in MAAR's FIRs then MAAR would include the risk in their assessment and China RMA would show the risk as 0 for that report. MAAR reminded the meeting that there are some instances where risk can be realized in both FIRs for example in the period up to and then the period from the transfer point.

4.7 Question 5: How do RMAs re-estimate the $P_z(0)$ and $P_z(1000)$? Mr Livingston commented that where there is a change to the vertical performance distribution then some review needs to be undertaken of the collision risk model parameters. In the case where new aircraft types are introduced in a airspace, the Pz0 related to ASE of the aircraft groups in the airspace would probably need to be reviewed. He noted that Pz1000 is affected by the contribution in the core and then in the tails of the distribution. The event data needs to be reviewed for any change in the 'technical' events; or where the ANSP has taken action to reduce one or more contributors of risk; or there are operational environmental changes that impact the tails. Typically this should be looked at no more than 5 years. Mr Livingston noted that the Pz0 changes rarely, but the Pz1000 can change to a greater level. Both MAAR and AAMA said they have re-evaluated the Pz values in shorter time frames than 5 years.

Category E Large Height Deviations (LHDs) (WP/8)

4.8 The PARMO presented WP/8 which contained a summary of discussions from RASMAG/19 regarding guidance developed for RMAs to aid in the determination of a category E LHD. The

RASMAG/19 meeting suggested that the MAWG meeting re-open this item for discussion. The summary of discussions from RASMAG/19 indicated that there was confusion in the interpretation of the diagram related to the time errors and transfer events.

4.9 The meeting agreed that this type of report can be considered as both a LHD and a LLE as aspects can be affected in terms of risk depending on the operational scenario. It was agreed that naming the report specifically as a LHD, could be confusing. Additionally some RMAs considered that including the wording in the table on the right side of the guidance material was un-necessary information that again could confuse an ANSP as to what was required. The meeting agreed that it was important for the ANSP to report this type of occurrence to both the RMA and EMA and let those agencies determine how the report should be categorized. The meeting reviewed an amended version of the guidance material detailed below and agreed this should be presented to RASMAG/20.

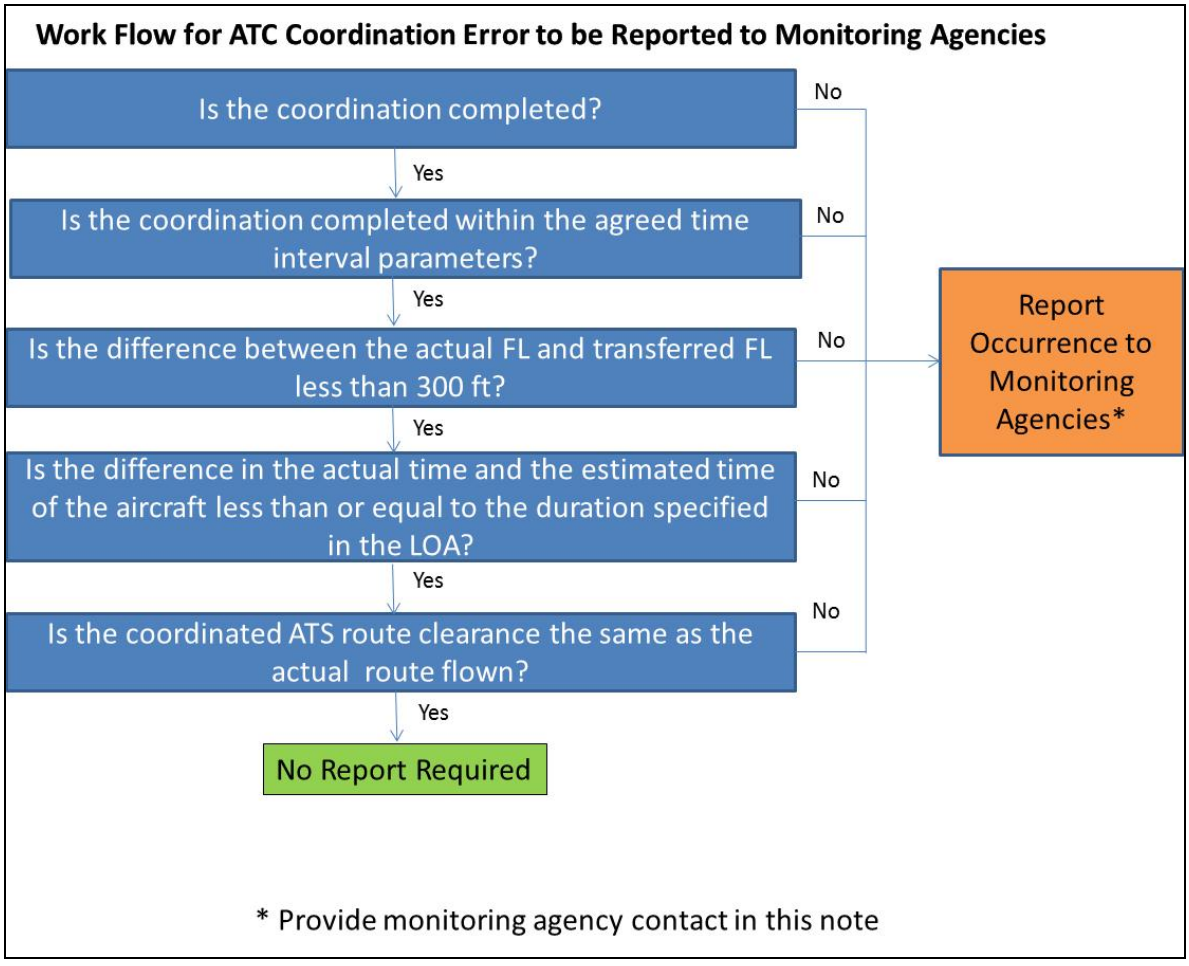


**Figure 4:** Revised guidance material

**Action: RMAs/EMAs to further review the guidance material at Figure 4 to this report and provide feedback to C. Falk by April 2015.**

**Action: PARMO and MAAR to review LHD report form and provide a paper to RASMAG/20 presenting any changes to the form and the amended guidance material from Figure 4.**

Comparisons of Average Aircraft ASE in the Asia Pacific Region (WP/4)

4.10 The PARMO presented WP/4 which follows WP/28 from RASMAG/19. WP/28 presented comparisons of average ASE results from various aircraft height monitoring systems. Upon review of WP/28, the RASMAG/19 Meeting urged other RMAs to conduct comparisons where possible. WP/4 presented a proposal for consolidating comparisons of ASE monitoring results for the Asia Pacific region.

4.11 The proposal is for the submission of an annual report to RASMAG containing summarized height-monitoring data from all Asia Pacific RMAs that have ASE monitoring capabilities. For the Asia Pacific region, these comparisons can become part of the RMA safety monitoring reports submitted to RASMAG. A template was provided in the attachment to the paper using the ASE data from WP/28. The goal of this annual report is to provide a very high level summary of the height-monitoring activity in the Asia Pacific region and remind the airspace community that height-keeping performance monitoring continues to be important even after the RVSM has been implemented.

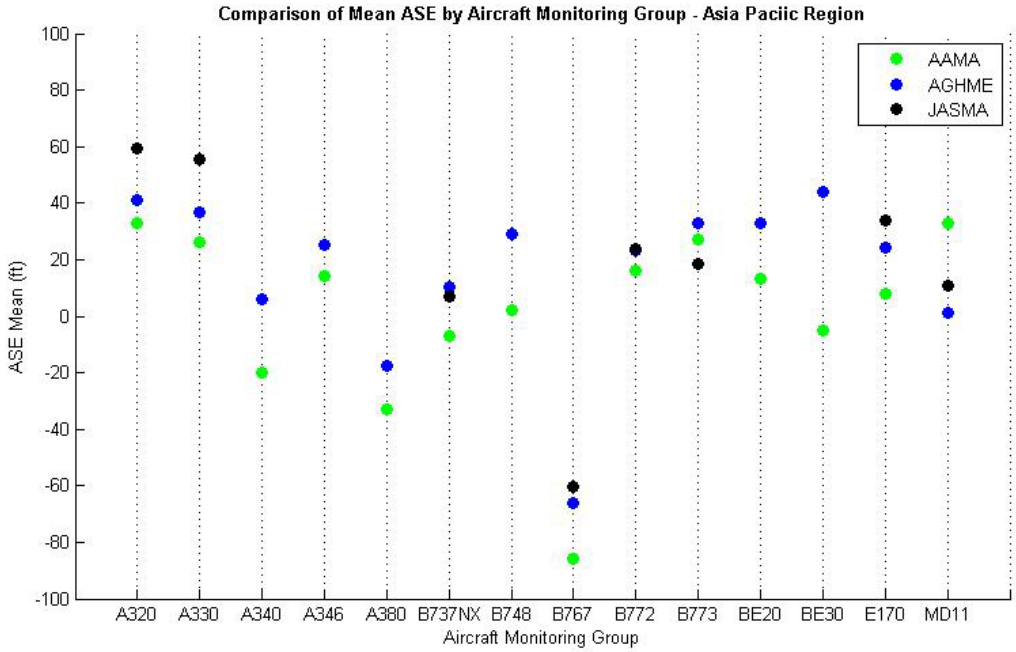


**Figure 5**: Comparison of ASE by Aircraft Monitoring Group

4.12 In reviewing the paper the meeting agreed that a high level annual report to APANPIRG through RASMAG would be of benefit in terms of demonstrating the outcomes of safety monitoring in Asia/Pac. The meeting considered that the data used in the report needed to be appropriately scoped and to that end Mr Livingston suggested a minimum number of airframes should be used for which calculations would be made. In addition a set of the aircraft types used that best demonstrate those most prevalent in the airspace. This could be decided as those that contribute the greatest number of flight hours for the identified airframes.

4.13 The meeting agreed that the RMAs should continue to undertake comparisons between the monitoring data, and that reports to RASMAG and APANPIRG should be more high level and to demonstrate the effectiveness by which the RMAs are using data from across the region to validate monitoring results. There was discussion on the potential for automating the report and MAAR agreed

to take action to develop an automated version for use by the RMAs. The meeting also agreed that the minimum sample for each aircraft type would be 25 successful monitoring flights, and that the aircraft types reported against would be A320, A330, A340, A346, A380, B737NX, B744, B748, B767, B772, B773, B787, MD11.

**Action: RMAs to provide 12 months monitoring data for the identified aircraft types to MAAR by 1 April 2015 for incorporation into a report to RASMAG/20.**

**Action: MAAR develop automated report for presentation of the aircraft monitoring data to RASMAG/20**.

AAMA Safety Report (WP5)

4.14 The AAMA highlighted that for the period ending October 2014 the overall risk for the Australian, Nauru, Papua New Guinea (PNG) and Solomon Islands airspace of 3.54 x $10^{-9}$ meet the target level of safety (TLS).

4.15 The AAMA also reports a monthly risk value in an attempt to provide real-time information on actual risk without reliance on historical high-time errors resident within the 12 month data sample. The monthly risk for October 2014 was assessed as 0.39 x $10^{-9}$ which is well below the average monthly risk based on an annual risk of 5.0 x $10^{-9}$.

4.16 The figure below shows the collision risk estimate trends for Australian, Nauru, PNG and Solomon Islands Airspace.

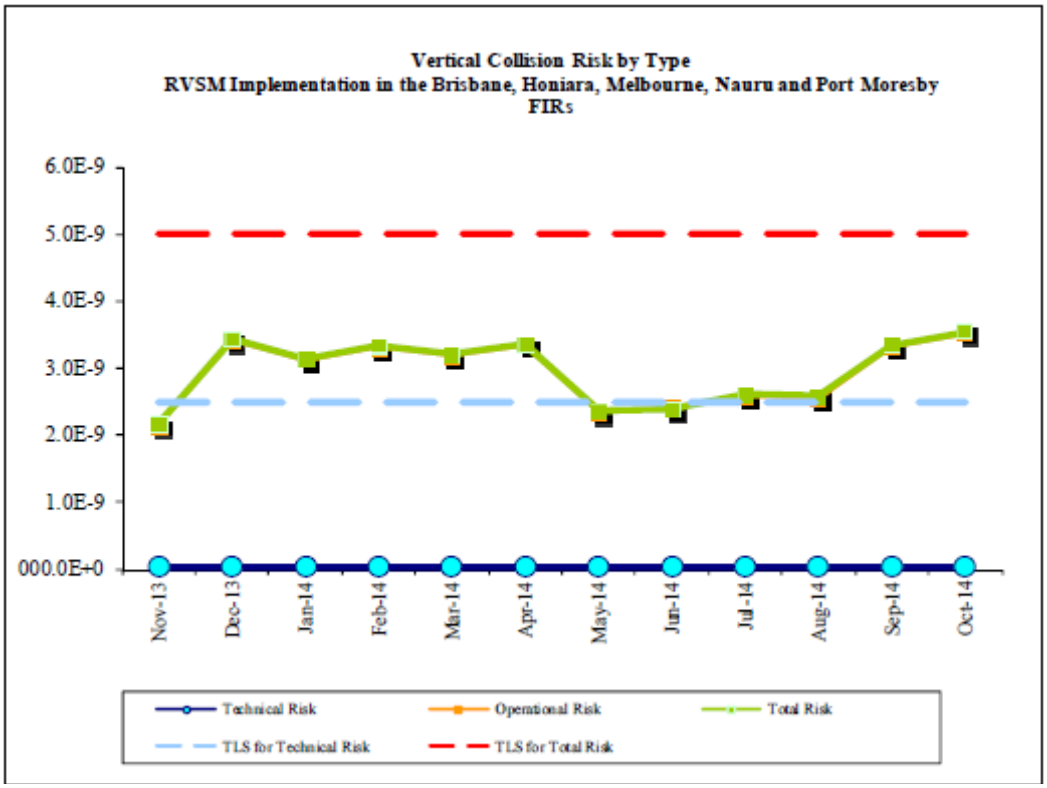


**Figure 6:** Australian, Nauru, PNG and Solomon Islands Airspace Risk Estimate Trends

4.17 The meeting noted the risk value for the Australian, Nauru, PNG and Solomon Islands airspace and thanked the AAMA for the continuing work in monitoring the airspace safety.

Non-RVSM Approved Flights in RMA Data Base (WP/6)

4.18 Mr Imuta presented the results of a once-a-month comparison between RMA's approval databases and actual flight plans operated within the RVSM airspace of Fukuoka FIR between January 2014 and October 2014. JASMA compared approximately 90,000 plans of RVSM flights and identified 42 airframes which were flying RVSM airspace of Fukuoka FIR with "W" on their flight plans but without the registration in the KSN RVSM approval database.

4.19 The meeting thanked JASMA for the information noting that the data showed some improvement in the situation in the Fukuoka FIR mainly due to the KSN data base information being updated recently.

Use of 30NM Separation Standard Within Fukuoka FIR (WP/7)

4.20 Mr Sakae presented WP/7 on behalf of JASMA and informed the meeting that previous information presented at the IPACG/40 meeting as was a post-implementation safety report for official use of ADS30NM lateral/longitudinal distance based separation standard between RNP4 capable aircraft within Fukuoka FIR. He stated that although the conclusion in the original report remains valid, WP/7 presents some amendments in the calculated results because of the erroneous use of some parameters in the original safety assessment.

4.21 The meeting thanked Mr Sakae for the updated safety assessment noting that the calculated risk for the implementation of 30 NM separation in the NOPAC routes was $0.0452 \times 10^{-9}$ and is based on a 10 minute reporting interval.

4.22 In discussing the results of the safety assessment, Ms Falk mentioned that the SASP has been reviewing a number of the parameters in the lateral risk model. The SASP had agreed that the RNP performance was used to model the original RNP4/30 NM minimum, but they now use distributions that more closely model the observed navigation performance and therefore a high Py0 is the result. Specifically, the modelling now undertaken by SASP accounts more specifically for the communication requirements assumed in the airspace and for the monitoring of the rate of blunders.

Need for Coordination Between FIRs (WP/11)

4.23 BOBASMA provide information relating to four Category E LHD reports that they receive from MAAR where one of the involved FIRs is the responsibility of India. BOBASMA expressed concern in the paper that in all cases of Cat-E LHD occurrences reported by Kuala Lumpur/Yangon there was no advice at the time of the occurrence to the involved Indian FIR. All these reports were directly received from MAAR a significant time after the occurrence of the deviation. As the ATC tapes are preserved only for a period of 30 days investigation of these LHDs was not possible. BOBASMA noted that recent meetings had resulted in a point of contact being exchanged between the relevant FIRs and hopefully the issue of late notification will be resolved.

4.24 The meeting thanked BOBASMA for informing the MAWG of the issue noting that it was pleasing to see the issue had been constructively resolved. MAAR commented that this issue has been going on for sometime and they have been impressing on the parties involved to take action to resolve it.

Update of Improvement of LHD Reporting (IP/3)

4.25 China RMA informed the meeting that concerns were raised during the RASMAG/19 meeting regarding the lack of LHDs from China that may indicate a lack of a mature reporting culture. A comparison of the estimated flight hours for airspace analyzed by China RMA, divided by the reported LHDs suggested an unreasonable ratio, and some category E LHDs concerning ATC errors reported by neighbouring countries are not reported by Chinese FIRs. RASMAG urged China to improve its mechanism of LHD reporting and develop a plan to establish an open reporting culture as part of a 'just culture' element of its safety management system by conducting a review, and requested China to report to APANPIRG/25 about progress made.

4.26 The meeting was informed that subsequent to the RASMAG meeting, ATMB and China RMA members visited all seven regional ATMBs in China and held LHD data collection workshops in each area. China RMA took this opportunity to explore the controllers' understanding about LHD reporting, and discussed with them about the problems and questions they had. China RMA also prepared a training material of LHD data collection aimed at to standardizing the LHD reporting process.

4.27 The meeting congratulated China RMA on the positive action China had taken to implement a more developed reporting culture supported by a just culture environment. The meeting hoped that the initiatives implemented would have a positive outcome and add to the ability of the China RMA to effectively monitor safety within the China FIRs.

Summary of LHD Reports 2014 (IP/4)

4.28 IP4 presents a summary of LHD reports received by MAAR during the calendar year 2014. Category E LHD still dominates all other categories. The main hot spots in the Bay of Bengal (BOB) airspace are similar to those identified for 2013, which are; the boundaries between Kolkata FIR - Yangon FIR and Chennai FIR - Yangon FIR; and the area around GADER, a Kabul FIR boundary point next to Karachi FIR, but also very close to Tehran FIR, as shown in Figure 7.

4.29 MAAR also informed the meeting that States in Bay of Bengal, Arabian Sea and Indian Ocean Region are working towards implementing AIDC between ACCs, improving VHF coverage, using ADS-B to expand surveillance coverage, and exchanging surveillance data. LHDs near GADER are caused by Tehran ACC assigning flight levels in violation to the restrictions for flights entering Kabul FIR via the Low ATS route structure. MAAR has coordinated with the MIDRMA on this matter. As for Western Pacific/South China Sea (WPAC/SCS), and Mongolia, the number and duration of LHD reports seems to have reduced from 2013.

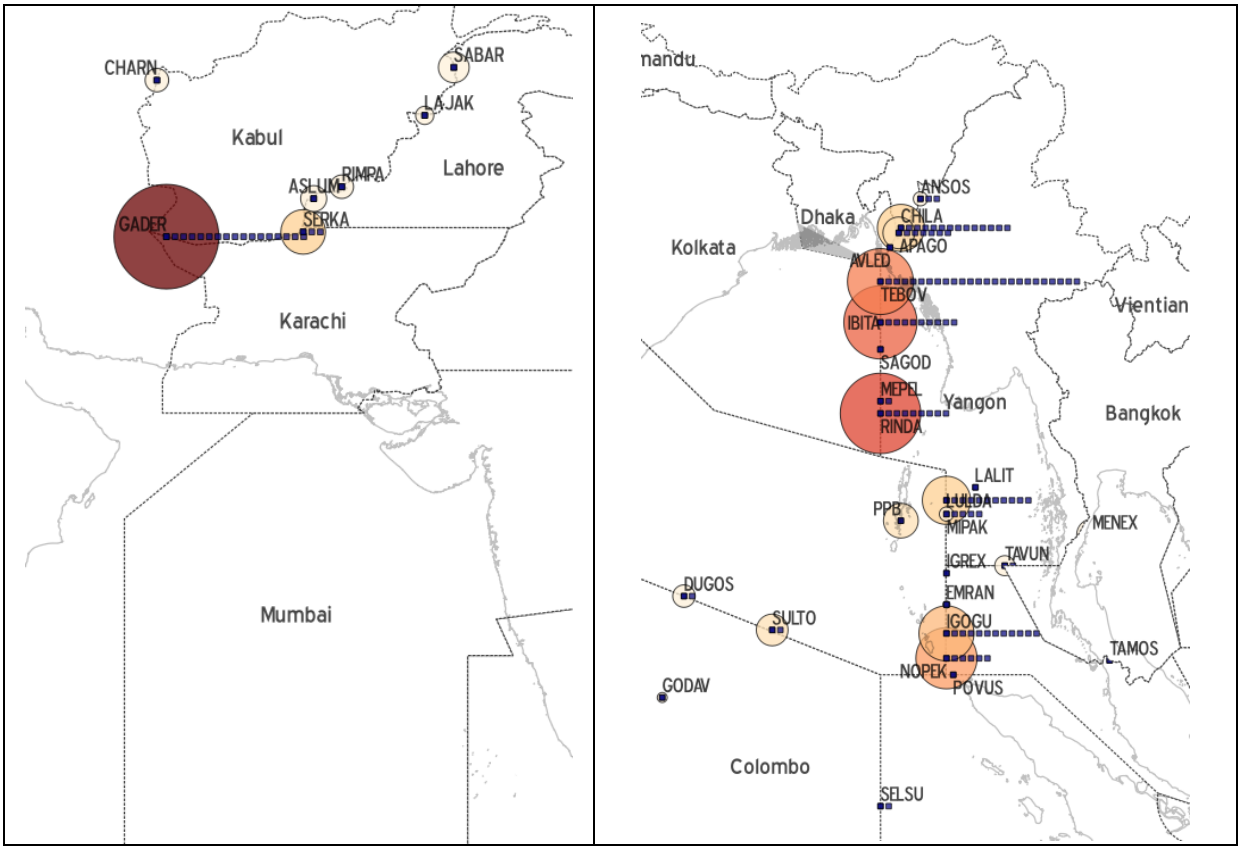


**Figure 7:** Hotspots identified by MAAR

Summary of LHDs and Risk Analysis of the Chinese RVSM Airspace (IP/5)

4.30 China RMA presented detailed information of the Large Height Deviation (LHD) reports received by the China RMA, and a safety review of the Chinese RVSM airspace for the period of January 2013 to September 2014.

4.31 The report provided an assessment of the operational risk composition and trend of LHDs within the Chinese airspace.


**Figure 8:** Operational risk composition and trend

4.32 The meeting was also informed that the operational and weighted total risk of 2.46 x $10^{-9}$ **meets** the specified TLS value for these components of 5.0 x $10^{-9}$.

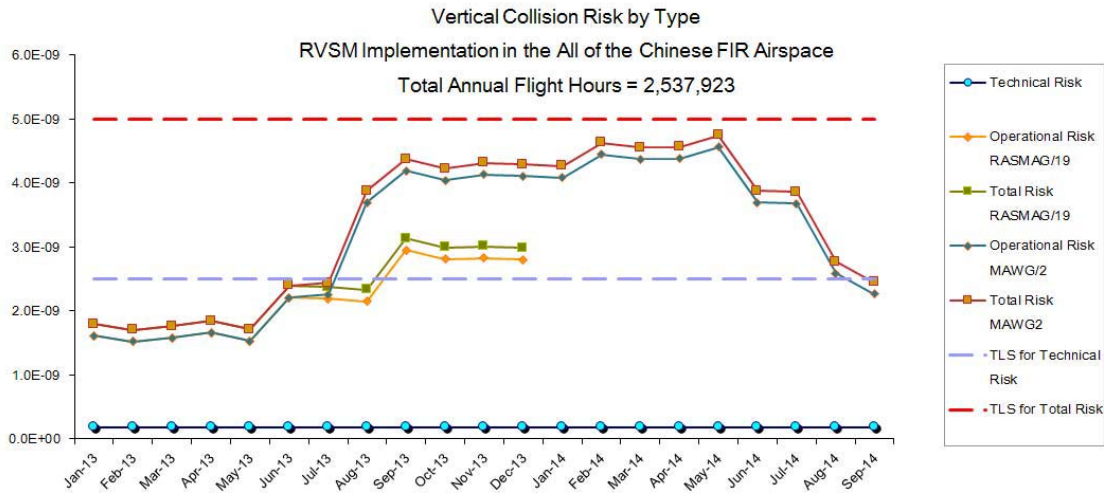


**Figure 9:** Trends of Risk Estimates for RVSM Airspace

4.33 The meeting thanked China RMA for the excellent work undertaken noting it was pleasing to see the level of risk in the airspace declining in recent months.

Summary of Error Reports Received by JASMA (IP/11)

4.34 JASMA presented a summary of the Large Height Deviations (LHDs), Large Lateral Deviations (LLDs) and Large Longitudinal Errors (LLEs) reports received by JASMA for Fukuoka FIR between November 2013 and October 2014. The summary identified 41 LHD reports and no LLDs or LLEs between November 2013 and October 2014.

4.35 JASMA informed the meeting that remedial action to reduce the transfer errors between Fukuoka and Taipei FIR including the reintroduction of AIDC has been successfully undertaken. In response to an enquiry from AAMA regarding the high number of TCAS related reports in enroute airspace, JASMA stated that nearly 45% of these reports are nuisance alerts.

4.36 The meeting thanked JASMA for the report and encouraged further reporting at RASMAG/20.

Summary of LHD Reports Sent to MAAR (IP/16)

4.37 BOBASMA informed the meeting that the Airport Authority of India and BOBASMA had been working to increase the reporting by controllers of LHD, LLD and LLEs observed in the airspace. The efforts of BOBASMA led to a significant increase in the number of LHD reports from Chennai and Kolkata FIRs. However under-reporting of LHD occurrences in Mumbai and Delhi FIRs is an ongoing concern. Given the fact that both these FIRs account for more traffic than that in Chennai and Kolkata FIRs and also use only manual voice coordination for coordinating flight data with adjacent units, it is expected that the reporting ratio will at least remain the same if not more than that in Chennai or Kolkata FIRs. BOBASMA advised that it will continue to endeavor to increase the

awareness of controllers in these two FIRs.

4.38 The meeting thanked BOBASMA for the report noting that it had forwarded to MAAR 77 LHD reports from the different Indian ACCs/OCCs for the period January to October 2014.

Summary of Error Reports Received by PARMO 2014 (IP/17)

4.39 The PARMO presented a summary of event reports received to date for calendar year 2014. There were 17 total event reports received; 13 large height deviation (LHD) reports, 3 large lateral deviation (LLD) reports, and one large longitudinal error (LLE). The event data contained in IP/17 did not include the additional events available to the PARMO from the FAA safety databases. The events contained in the safety data bases will be reviewed, and added to the existing data as appropriate prior to the next RASMAG meeting.

4.40 IP/17 also provided summary information from aircraft operations that had not provided ATC with an updated forward position estimate. All of the 408 events involved operations using HF radio for communication and are not eligible for the reduced longitudinal separation minima. Therefore, these reports were included to inform the meeting of this activity, and will not be incorporated into the PARMO collision risk estimates for performance-based reduced longitudinal separation. As a result of this monitoring activity, noticeable improvement has been observed with a few operators. New procedures were initiated which include HF radio read-backs. The FAA is now collecting data resulting from this new process.

**Agenda Item 5: Data Link Performance Monitoring**

Performance Based Communication and Surveillance and EMA Roles (WP13)

5.1 The PARMO provided an update to the status of the implementation of performance-based communication and surveillance (PBCS) and efforts to coordinate amendments to ICAO documents and annexes. WP/13 also explored potential functions that the EMAs could provide in facilitating PBCS.

5.2 The ICAO Operational Data Link Panel (OPLINKP) has agreed to proposed amendments for relevant sections of Annex 6, Annex 11, Annex 15, Doc 4444 (PANS-ATM) and Doc 8400 (PANS-ABC), to include provisions for PBCS. In addition, OPLINKP has provided ICAO with mature DRAFTs of the Doc [Global Operational Data Link (GOLD)], Doc [Satellite Voice Operations Manual (SVOM)] and Doc 9869 (PBCS Manual) for processing to become official ICAO documents by the 1st half of 2015.

5.3 The potential roles to be fulfilled by the EMA, which would include coordinating with PBCS monitoring programs, include the following:

- Maintaining database of RCP and RSP approvals for each aircraft type/system within an operator's fleet (together with RNP/RNAV approvals);

- Performing scrutiny checks on filed RCP/RSP designators against RCP/RSP approvals;

5.4 To support the above, functions would include establishing means to exchange appropriate information with local and regional PBCS monitoring programs established by ANSPs, including:

- Providing the operators' fleet composition comprising different aircraft types/systems; and

- Obtaining the filed RCP/RSP designators by operators and appropriate performance analysis results, such as for an operator/aircraft type/system or for a specified airspace (i.e. region or specific CTA).

5.5 In discussing the raised by PARMO, Mr Butcher pointed to the need to complete the revised EMA manual for global application as this manual would provide supporting documentation for the new PBCS Manual. Additionally, there was discussion with regards to including the collection of RCP and RSP approval information into the F2 forms received by the RMAs. The meeting agreed with this proposal.

**Action: Ms Falk and Mr Butcher to review the revised F2 formats proposed previously by Mr Farmer and draft revised forms.**

Observed Data Link Performance in Anchorage and Oakland Airspace (IP18)

5.6 The PARMO presented IP/18 which provided the observed data link performance for the Anchorage and Oakland Flight Information Regions (FIRs). The performance of data link communication systems is relevant to the work of the RASMAG and MAWG. Many of the reduced horizontal separations employed or planned in various parts of the Asia Pacific region, such as the 30-NM and 50-NM longitudinal separation, require communication and surveillance systems that utilize data link to support the reduced separation minima.

5.7 The attachment to IP/18 contains a data link performance summary for the Anchorage and Oakland FIRs. The data link performance summary includes aggregate data link performance and several examples of analysis by satellite system, ground service station, operator, and operator aircraft combination.

5.8 The meeting thanked Ms Falk for the detailed presentation and reviewed the data in some detail noting that in all cases the 95% safety metric had been met. Mr Livingston commented that this type of monitoring that looks at RCP and RSP performance is important as the communication service providers do not measure this type of performance. Importantly these performance metrics are critical to the maintenance of safety when implementing types of separation minima.

5.9 The meeting discussed the software GOLD performance analysis tool (GPAT) that the PARMO uses to produce the reports and Ms Falk advised she would make a new version available to those RMAs/EMAs who were interested.

**Action: Ms Falk to make updated version of GPAT available to monitoring agencies.**

**Agenda Item 6: Monitoring activity of non-approved aircraft in RVSM airspace**

Identification of Non-RVSM Approved Airframes Operating With RVSM Approval Status (WP3)

6.1 This paper contains a summary of activities undertaken by MAAR to identify rogue airframes. The provision of flight plans provided by Hong Kong and Thailand has helped increase the frequency of the RMA's traffic scrutiny exercise to a bi-monthly basis.

6.2 To make the reporting of rogue aircraft more systematic, MAAR has designed a report format

that would inform States and RMAs of any aircraft under their responsibility that needs RVSM approval status confirmation. MAAR advised that they had developed rogue report templates sent to State CAAs and RMAs, respectively. Aircraft with no proof of approvals and expired approvals are listed as rogue. Repetitive rogue airframes are also highlighted. Additional information regarding expired and expiring approvals are also provided to State CAA for their necessary updates.

6.3 From the traffic scrutiny for the period of July-August 2014, 125 airframes from 23States were identified as rogue. These include 67 airframes with no proof of RVSM approvals and 58 airframes with expired approvals. Rogue airframes from India and the Philippines, which were predominant in previous rogue reports, have diminished or became non-existent as a result of operators becoming more active in getting their aircraft approvals updated by their State CAAs. Expired approvals are mostly due to the lack of updates from State CAAs in updating MAAR with the new expiry date after monitoring has been completed by operators. MAAR stated it will continue to coordinate with State CAAs to retrieve updates more effectively.

6.4 The meeting thanked MAAR for the excellent work undertaken to identify non-approved aircraft. In particular the meeting was impressed with the templates developed by MAAR and Mr Butcher suggested that these should be developed into a standard form or letter for the use of RMAs. The meeting agreed on this proposal and suggested adjusting the template to include also those aircraft who have not met the Annex 6 monitoring requirements.

**Action: MAAR supported by Mr Butcher to draft standardised forms and letters along the lines of those used by MAAR for consideration at RASMAG/20.**

Identification of Non-RVSM Approved Airframes (WP10)

6.5 The AAMA provided the outcome of the October 2014 check to identify non-RVSM aircraft. The meeting was informed that the assessment identified 53 individual airframes in the data set, with airframes from Thailand showing the highest number (11). In undertaking the comparison process, the AAMA was reliant on the quality of the data contained in the approvals databases provided by other RMAs. While the AAMA comparison identified a large number of airframes for some States of registry, it is recognised that delays in processing approval information between the State authorities and RMAs could be a factor.

6.6 The meeting noted the criteria used by the AAMA to highlight long-term rogues is:

- a Rogue observed during the last 6 months; and
- a Rogue first observed at least 12 months or more ago.

6.7 Discussions between the RMAs in regard to some of the data in the AAMA report managed to resolve some identified rogues and led to agreements by some RMAs to provide specific data in relation to some of the fleets identified to resolve their current status.

Identification of Non-Approved Airframes (IP/6)

6.8 The China RMA provided the results of once-a-month comparison between RMAs' approval databases and flight plans operated within the RVSM airspace of Chinese FIRs and Pyongyang FIR using the flight plan data up to September 2014.

6.9 The airframes suspected to be 'non-approved' for China and DPR Korea have been forwarded to the respective POC to confirm. A list of non-approved Chinese aircraft has been forwarded to the ATMB for follow up actions. The China RMA also forwards data to other RMAs directly to confirm

the approval status for suspected airframes.

Follow-Up for Traffic Scrutiny Reported at RASMAG/19 (IP12)

6.10 The PARMO presented a listing of the 41 aircraft under NAARMO and PARMO responsibility that were reported as operating within RVSM airspace without an approval during RASMAG/19. Full operational and airworthiness approvals could not be located for 8 of the 41 aircraft. In addition, 2 of the 41 aircraft were found in the PARMO approvals file with an expired approval date and 1 aircraft was found to have a current approval that is due to expire at the end of this year.

6.11 The meeting thanked PARMO for the report and discussed some aspects of the information in detail. Further action was expected to resolve some of the identified records.

**Agenda Item 7: Updates on MMR groups**

Minimum Monitoring Requirements (MMR) Update (IP/13)

7.1 Mr Perez presented the results of the on-going 2014 review by EUROCONTROL and FAA of the RVSM Minimum Monitoring Requirements (MMR) Chart. The MMR Chart presented in the paper captures the most recent revisions identified in 2014 through analysis of monitoring data and through requests of various members of the Regional Monitoring Agency Coordination Group at their annual meeting this year (RMACG/9). The paper also identifies candidate Monitoring Groups for future attention.

7.2 The meeting was advised of items included in the Civilian MMR revision as follows:

a) Moved Group C25B into Category 1
b) Added into Category 2 newer aircraft Types, even if not yet seen in monitoring data as Monitoring Groups. Also included definitions in Table 2: A350, AJ27, BCS1, HDJT, SU95
c) Designated several Types for further study, e.g., 2 years of monitoring results, signs of stability: A350, AJ27, BCS1, HDJT, SU95; B787, GLF6, B748, EA50.
d) Changed name of G250-G280 Group to merely G280
e) Retained F900 in its same place, i.e., Category 1
f) Placed E120 in Table 1, Category 2. The civilian Table 2 has had an E120 definition without there being an entry in Table 1. NAARMO/PARMO have no monitoring data on this old type, and EurRMA has very little. Perhaps a future edition will remove E120, but coordination with the manufacturer may be done first.
g) Deferred splitting P180 into 2 Groups (as in WP164). This split is still being treated as "provisional," and is not yet in the chart, pending further investigation.
h) Included the 18 Groups from Category 3 in Table 2 definitions.

7.3 The "Military" MMR has been revised as follows:

a) More Monitoring Groups (39) than are assigned into Categories (10), such that 29 of the 39 Groups in Table 2 can be considered awaiting further study, pending 2 years of monitoring results and signs of stability.
b) Renamed C560-M to C20, GLF5-M to C37
c) Retained the 10 Groups in Categories as originally proposed, including C130 in its same place, i.e., Category 2. AAMA has proposed that the C130 Group be moved to Category 1, but FAA and Eurocontrol deferred this decision since they lacked enough data from their systems to make a determination.

d) Included the 3 Groups from Category 3 in Table 2 definitions.

7.4 The meeting thanked Mr Perez for bringing the new MMR to the meeting and agreed that the RMAs should commence using the chart with immediate effect. Mr Butcher queried why the C130J had been left in Category 2 when he had advice from the European RMA that it had been agreed to move the group to Category 1. Mr Perez agreed to look into this issue and advise Mr Butcher as soon as possible. In addition, Mr Butcher noted that the KC30 tanker aircraft based on the A330 airframe is not shown in the military chart. Mr Perez agreed to provide this information to the FAA and European RMA for consideration.

**Action: Mr Butcher to provide C130 monitoring results data to FAA/European RMA.**

**Agenda Item 8: Any Other Business**

PARMO RNP Database Status (WP/9)

8.1 The PARMO presented WP/9 which contained the current status of the PARMO RNP database. Operators registered within the United States with verified RNP 4 approvals were provided in Table 1 of WP/9.

8.2 Archive data from the Ocean21 system for August 2014 were used to provide aircraft operator filed flight plans. Records containing RNP 4 flight plan information for operators observed to have filed RNP 4 in their flight plans in the Anchorage and Oakland oceanic FIRs. The results were provided by EMA are listed alphabetically by EMA. The paper highlighted operators registered to States which do not have a designated EMA. Details on the observed aircraft operator are provided in the appendix of WP/9. The PARMO also noted that there are also Asia Pacific FIRs without designated EMAs.

8.3 The meeting discussed aspects of the paper and Mr Butcher cautioned that some EMAs who are only responsible for their own State FIRs may not want to take on the extra responsibilities of an EMA for other States as a matter of course. The meeting agreed that to facilitate the collection of RNP approvals information, it could be easily achieved by collecting the data on the F2 forms already used by the RMAs.

8.4 China RMA asked if there is a check done by PARMO to correlate the RNP against and route specifications for navigation performance. Ms Falk advised that currently they do not do that correlation. China RMA indicated they have RNP requirements for some routes so it would be interesting to make that correlation. They also said they do not have an EMA for Chinese airspace and given the need to collect this data, he thinks there should be an agreement from RASMAG to enable the RMAs to collect this information from the CAAs. China RMA agreed that they would put a proposal to RASMAG/20 to formalise data sharing of RNP approval data by the RMAs.

**Action: China RMA to provide proposal at RASMAG/20 to formalise RMAs collecting RNP approval data where an EMA is not established for a State.**

Global Guidance Material for EMAs (IP/14)

8.5 The AAMA and PARMO presented IP/15 containing the current proposed global guidance for monitoring the application of performance-based horizontal separation minima. This work is being progressed through the ICAO Separation and Airspace Safety Panel (SASP) and originally began with the ICAO Asia Pacific EMA Manual.

8.6 The new title for the document will be *Manual on Monitoring the Application of Performance-Based Horizontal Separation Minima*. Due to the linkage with the planned PBCS documents and PfAs to Annex 6, Annex 11 and Doc 4444 described in WP/13, the draft of this document must be ready for ICAO by the end of January 2015.

8.7 The meeting thanked Ms Falk for the presentation, noting the extensive work that has been undertaken by herself and Mr Butcher to progress the document through the SASP. Mr Butcher requested that the meeting participants review the document in detail and provide comments to Ms Falk by the end of December. The meeting also agreed to update the safety assessment example in the document from SEASMA.

**Action: All EMAs to review the draft global** *Manual on Monitoring the Application of Performance-Based Horizontal Separation Minima* **document and provide comment to Ms Falk by 31 December 2014.**

**Action: SEASMA to provide updated example of the safety assessment used in the document to Ms Falk by 31 December 2014.**

**Next meeting**

8.8 The meeting noted that the RMACG/10 meeting was now planned to be held 18-22 May 2015 at Bangkok, Thailand.

8.9 The meeting discussed possible venues for the next meeting of the MAWG. It was agreed to make a decision on this at the next RASMAG meeting. However for planning purposes, EMAs and RMAs should plan on a late November/early December time frame.

**Closing of the Meeting**

8.10 In closing, the Chairman thanked the meeting participants for their contributions to the work of the MAWG. Additionally the meeting expressed its sincere thanks to PARMO and the FAA for graciously hosting the meeting.

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## ATTACHMENT 1 - LIST OF ACTIONS

| Action number | By Whom | By When | Action Required | Deliverable | Status |
|---|---|---|---|---|---|
| 1/1 | All EMAs | RASMAG/19 | Review and work towards standardisation on Hsu model as presented by PARMO and the AAMA and identify compliance or implementation issues. RASMAG/19. | Info to RASMAG | Closed |
| 1/2 | PARMO | RASMAG19 | research the issue related to the geometric height reference for DO260B aircraft | Report | Closed |
| 1/3 | AAMA | RASMAG/19 | undertake research into identifying the reference for aircraft altitude | Report | Closed |
| 1/4 | All RMAs | RASMAG/20 | PARMO coordinate with other RMAs a paper for presentation to RASMAG/19 that provides comparative ASE data sourced from the various monitoring systems in Asia/Pac | Paper | Open |
| 1/5 | JASMA | RASMAG/20 | In conjunction with meteorological services in Japan research the reasons for highest values of ASE trend during summer and lowest in winter | Report | Open |
| 1/6 | All RMAs/EMAs | RASMAG/20 | Provide analyses to the next RASMAG on SLOP use and any subsequent decrease in airspace risk as a result. This analysis should be included in the safety assessment reports to RASMAG. Account for new SLOP procedures. | Report | Open |
| 1/7 | MAAR | RASMAG/19 | Develop the illustrations at paragraph 5.7 of MAWG/1 report into a poster type format and present to RASMAG for distribution to States and ANSPs. | Formatted poster draft | Closed |
| 1/8 | All RMAs/EMAs | RASMAG/19 | Provide additional information in report that identifies hotspot areas for LHD/LLE/LLD reports including the category of errors reported in the hotspot. | Report | Closed |
| 1/9 | Chairman | RASMAG/20 | Draft paper for RASMAG/19 to highlight the discussion and outcomes regarding non-approved ('rogue') operations and process agreed by RMAs to State authorities and ANSPs | Paper | Open |
| 1/10 | PARMO | RASMAG/19 | Review category E LHD definition to account for time error and provided proposed new wording | New definition | Closed |
| 1/11 | AAMA/MAAR | RASMAG/19 | Incorporate individual risk plots in RVSM risk assessments and demonstrate their effectiveness | Report/Paper | Closed |

| Action number | By Whom | By When | Action Required | Deliverable | Status |
|---|---|---|---|---|---|
| 1/12 | All RMAs | RASMAG/20 | ASE data from non-approved airframes | Report | Open |
| 1/13 | RMAs/EMAs | RASMAG/19 | Identify from analysis of operational and technical error reports, 2 or 3 significant safety issues as part of their RASMAG safety assessment reports | Report inclusion | Closed |
| 1/14 | RASMAG | RASMAG/20 | RASMAG to collate and review safety issues identified by the RMAs and EMAs and report these to APANPIRG as Asia/Pacific top airspace safety issues | Report | Open |
| 1/15 | All RMAs | RASMAG/19 | RMAs to consider these issues further and to provide to RASMAG/19 data on aircraft/operators that have not met the Annex 6 monitoring requirements in regards to compliance with monitoring time frames. This information can then be developed into a draft conclusion for APANPIRG, encouraging States and operators to comply with the Annex provisions | Data report | Closed |
| 1/16 | AAMA | RASMAG/19 | Draft a standard letter for RMAs to use to notify State regulators and operators of non-compliance with Annex 6 monitoring provisions | Standard letter | Closed |
| 2/1 | Chair | RASMAG/20 | Mr Butcher to advise Mr Lewis at European RMA of the decision not to participate in a centrally published list of operators that incorrectly use ‘W’ on a continuing basis. (SD para ref 2.3) | Email advice | Open |
| 2/2 | All RMAs | MAWG/3 | RMAs to coordinate with State authorities under their jurisdiction to seek standardisation in the use of HAE as a reference for geo-altitude in ADS-B data. (SD para ref 3.5) | Coordination | Open |
| 2/3 | AAMA | RASMAG/20 | AAMA to make B787 monitoring data available to other RMAs. (SD para ref 3.5) | Data report | Open |

| Action number | By Whom | By When | Action Required | Deliverable | Status |
|---|---|---|---|---|---|
| 2/4 | Chair | RASMAG/20 | Mr Butcher to amend the LHD table in WP/5 from RASMAG/15, to include Cat G under Operational Error and provide updated example to RASMAG/20. Ensure that: 1) the example shows that if an aircraft offsets before descending in accordance with published procedures relevant to an airspace, then no occurrence would be reported; and 2) the wording of Cat F is amended to remove the word 'technical' from the definition. Should reflect ATC ground system failure or such like. (SD para ref 4.3) | Report with amendment proposal | Open |
| 2/5 | All RMAs/EMAs | April 2015 | RMAs/EMAs to further review the guidance material at Figure 4 to this report and provide feedback to C. Falk by April 2015. (SD para ref 4.9) | Review and comment | Open |
| 2/6 | PARMO/MAAR | RASMAG/20 | PARMO and MAAR to review LHD report form and provide a paper to RASMAG/20 presenting any changes to the form and the amended guidance material from Figure 4. (SD para ref 4.9) | Report with revised poster | Open |
| 2/7 | All RMAs | 1 April 2015 | RMAs to provide 12 months monitoring data for the identified aircraft types to MAAR by 1 April 2015 for incorporation into a report to RASMAG/20. (SD para ref 4.13) | Report with Data | Open |
| 2/8 | MAAR | RASMAG/20 | MAAR develop automated report for presentation of the aircraft monitoring data to RASMAG/20. (SD para ref 4.13) | Automated report proposal | Open |
| 2/9 | PARMO/AAMA | 31 Jan 2015 | Ms Falk and Mr Butcher to review the revised F2 formats proposed previously by Mr Farmer and draft revised forms. (SD para ref 5.5) | Review for inclusion in SASP EMA documentation | Open |
| 2/10 | PARMO | RASMAG/20 | Ms Falk to make updated version of GPAT available to monitoring agencies. (SD para ref 5.9) | Software coordination | Open |
| 2/11 | MAAR/AAMA | RASMAG/20 | MAAR supported by Mr Butcher to draft standardised forms and letters along the lines of those used by MAAR for consideration at RASMAG/20. (SD para ref 6.4) | Standardised letters | Open |
| 2/12 | AAMA | 1 Feb 2015 | Mr Butcher to provide C130 monitoring results data to FAA/European RMA. (SD para ref 7.4) | Data report | Open |

| Action number | By Whom | By When | Action Required | Deliverable | Status |
|---|---|---|---|---|---|
| 2/13 | China RMA | RASMAG/20 | China RMA to provide proposal at RASMAG/20 to formalise RMAs collecting RNP approval data where an EMA is not established for a State. (SD para ref 8.4) | Proposal | Open |
| 2/14 | All EMAs | 31 Dec 2014 | All EMAs to review the draft global Manual on Monitoring the Application of Performance-Based Horizontal Separation Minima document and provide comment to Ms Falk by 31 December 2014. (SD para ref 8.7) | Review and comment | Open |
| 2/15 | SEASMA | 31 Dec 2014 | SEASMA to provide updated example of the safety assessment used in the document to Ms Falk by 31 December 2014. (SD para ref 8.7) | Updated safety assessment | Open |

## ATTACHMENT 2 – LIST OF PARTICIPANTS

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|---|---|---|
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ATTACHMENT 3- LIST OF PAPERS

| Number | Agenda Item | Title | Prepared by |
|---|---|---|---|
| **Agenda Item 1 – Adoption of Agenda** | | | |
| WP/1 | 1 | AGENDA, TIMETABLE AND WORKING ARRANGEMENTS | Chairperson |
| **Agenda Item 2 – Review outcomes of related meetings** | | | |
| WP/12 | 2 | OTHER RELATED MEETINGS See also attachment | Chairperson |
| **Agenda Item 3 – ADS-B Height Monitoring** | | | |
| IP/1 | 3 | HEIGHT REFERENCE IN ADS-B OUT DATA FOR AIRCRAFT HEIGHT-KEEPING PERFORMANCE MONITORING See also attachment: MAWG-2 IP1 ADSB height reference Attachment WP ASP17-17-HAE in Geometric Altitude Subfield | PARMO |
| IP/2 | 3 | PROGRESS UPDATE FOR THE CHINA RMA'S EVALUATION OF ALTIMETRY SYSTEM ERROR USING ADS-B See also attachment: MAWG-2 IP2 Progress Update for The China RMA's ADS-B Monitoring Attachment | China RMA |
| IP/7 | 3 | PER-AIRFRAME ASE COMPARISON BETWEEN JASMA'S HMUS AND MAAR'S AHMS | JASMA/MAAR |
| IP/8 | 3 | DISTRIBUTION OF ALTIMETRY SYSTEM ERROR RESULTS FROM THE US ADS-B DATA | PARMO |
| IP/9 | 3 | JASMA COMPARISON RESULTS OF 3HMUs | JASMA |
| IP/10 | 3 | JASMA THE LATEST MONITORING RESULTS OF SETOUCHI HMU | JASMA |
| IP/15 | 3 | UPDATED ESTIMATE OF RVSM LONG TERM HEIGHT MONITORING BURDEN FOR THE AUSTRALIAN AIRSPACE MONITORING AGENCY (AAMA). See also attachment | AAMA |
| **Agenda Item 4 – EMA/RMA Safety Monitoring Reports for RASMAG** | | | |
| WP/2 | 4 | Issues in Risk Estimation and Understanding about LHD Taxonomy | China RMA |
| WP/4 | 4 | COMPARISONS OF AVERAGE AIRCRAFT ASE IN THE ASIA PACIFIC REGION See also attachment: Comparison of ASE PERFORMANCE | PARMO |
| WP/5 | 4 | AAMA RVSM SAFETY ASSESSMENT REPORT AUSTRALIAN, PAPUA NEW GUINEA, NAURU and SOLOMON ISLANDS. See | AAMA |

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|---|---|---|---|
| | | also attachment. | |
| WP/6 | 4 | NON-RVSM APPROVED FLIGHTS IN RMA DATABASE | JASMA |
| WP/7 | 4 | SAFETY REPORT FOR OFFICIAL USE OF ADS 30 NM SEPARATION STANDARD WITHIN FUKUOKA FIR | JCAB/JASMA/ENRI |
| WP/8 | 4 | CATEGORY E LARGE HEIGHT DEVIATIONS (LHD) | PARMO |
| WP/11 | 4 | NEED FOR COORDINATION BETWEEN FLIGHT INFORMATION REGIONS | BOBASMA |
| IP/3 | 4 | UPDATE OF IMPROVEMENT OF LARGE HEIGHT DEVIATION REPORTING See also attachment: MAWG-2 IP4 Update of LHD Reporting Improvement Attachment WP32 APANPIRG25 | China RMA |
| IP/4 | 4 | SUMMARY OF LARGE HEIGHT DEVIATION (LHD) REPORTS 2014 | MAAR |
| IP/5 | 4 | Summary of Large Height Deviations (LHDs) and Risk Analysis of the Chinese RVSM Airspace | China RMA |
| IP/11 | 4 | SUMMARY OF ERROR REPORTS RECEIVED BY JASMA | JASMA |
| IP/16 | 4 | SUMMARY OF LHD REPORTS SENT TO MAAR 2014 | BOBASMA |
| IP/17 | 4 | SUMMARY OF LHD REPORTS FROM PARMO/NAARMO | PARMO |
| **Agenda Item 5 – Data Link Performance Monitoring** | | | |
| WP/13 | 5 | PERFORMANCE BASED COMMUNICATION AND SURVEILLANCE AND EMA ROLES | PARMO |
| IP/18 | 5 | DATALINK UPDATE | PARMO |
| **Agenda Item 6 – Monitoring activity of non-approved aircraft in RVSM airspace** | | | |
| WP/3 | 6 | IDENTIFICATION OF NON-RVSM APPROVED AIRFRAMS OPERATING WITH RVSM APPROVAL STATUS. See also attachments: MAWG-2 WP3 MAAR Rogue Attachments A & B | MAAR |
| WP/10 | 6 | IDENTIFICATION OF NON-APPROVED AIRFRAMES OPERATING WITH RVSM APPROVAL STATUS | AAMA |
| IP/6 | 6 | Identification of Non-Approved Airframes Operating with RVSM Approval Status | China RMA |
| IP/12 | 6 | FOLLOW-UP FOR TRAFFIC SCRUTINY REPORTED AT RASMAG/19 | PARMO |

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|---|---|---|---|
| **Agenda Item 7 – Updates on MMR groups** | | | |
| IP/13 | 7 | MMR UPDATE | PARMO |
| **Agenda Item 8 – Any other business** | | | |
| WP/9 | 8 | PARMO RNP DATABASE STATUS | PARMO |
| IP/14 | 8 | GLOBAL GUIDANCE MATERIAL FOR EMAs See also attachment | AAMA/PARMO |