INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

ASIA/PACIFIC REGIONAL IMPACT STATEMENT

RVSM GLOBAL LONG TERM HEIGHT MONITORING

REQUIREMENTS EFFECTIVE FROM NOVEMBER 2010

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FOREWORD

Since the initial operational implementation of Reduced Vertical Separation Minimum (RVSM) in the North Atlantic in 1997, widespread implementation of RVSM has taken place globally. In the Asia/Pacific Region, implementation commenced as a result of the output of the Third Asia/Pacific Regional Air Navigation Meeting (RAN/3, Bangkok, Thailand, 19 April – 7 May 1993) which called for an ICAO RVSM Task Force to progress RVSM implementation in the Pacific. The Ninth meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG 9, August 1998) established the Asia/Pacific RVSM Implementation Task Force (RVSM/TF) under the terms of Decision 9/4 and simultaneously adopted Conclusion 9/3 requiring actions to establish an RVSM implementation schedule for the Asia region, in addition to the programme for the Pacific region.

Under the capable stewardship of the RVSM/TF, Asia/Pacific RVSM implementations went forward smoothly commencing with the Pacific area in 2000 and followed by the Western Pacific and South China Sea area during 2002, the Bay of Bengal area in 2003, Japan and the Republic of Korea during 2005 and throughout the airspace of China in 2007. RVSM implementations in the two remaining Asia/Pacific FIRs, Pyongyang and Ulaan Baatar, are scheduled for 2009 and 2012, respectively.

Recognising the significance of the step from a 2000 ft vertical separation minimum to a 1000 ft vertical separation minimum, intensive monitoring arrangements were put in place to ensure the continued safety of RVSM operations. Such monitoring considers RVSM safety performance in terms of two components. Technical risk relates to the technical performance of equipment, including altimetry systems. Operational risk relates to human performance error and, in simple terms, considers errors made by pilots and air traffic controllers.

To be approved for operation in RVSM airspace, States must ensure that aircraft comply with technical requirements that enable the actual height cleared by air traffic services to be accurately maintained. The RVSM monitoring programmes around the world have collected extensive height keeping data to determine the stability of Altimetry System Error (ASE) in airframes used for RVSM operations. The results show that ASE drift is worse than anticipated. Accordingly, provisions have recently been included in Annex 6 – *Operation of Aircraft* that take effect from 2010 and require the global long term monitoring of altimetry systems used for RVSM operations.

APANPIRG/20 (September 2009) has adopted this Asia/Pacific Regional Impact Statement, prepared by the Regional Airspace Safety Monitoring Advisory Group (RASMAG), under the terms of Conclusion 20/23 to provide general guidance to States. Additionally, specific guidance is provided to assist in identifying the ground-based monitoring infrastructure necessary for the regional RVSM monitoring programme, in order that States are better informed when making collaborative decisions about investments in regional infrastructure.

1. Introduction

1.1 At the broadest level, Annex 11 – *Air Traffic Services* requires States to establish a safety programme in order to achieve an acceptable level of safety in the provision of Air Traffic Services (ATS). More specific requirements exist for the implementation of safety management systems by Air Navigation Services Providers (ANSPs) that identify hazards, ensure remedial action and provide for the continuous monitoring and regular assessment of the safety level achieved.

1.2 In the specific case of the implementation and ongoing operation of reduced vertical separation minimum (RVSM), Annex 11 requires that for all airspace where a RVSM 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 reduced vertical separation minimum meets the safety objectives. Annex 11 also requires that 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. Arrangements shall be put in place, through interregional agreement, for the sharing between regions of data from RVSM monitoring programmes.

1.3 The increasing complexity of requirements and the necessary State interactions led the Fourteenth meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/14, August 2003) to establish the Regional Airspace Safety Monitoring Advisory Group (RASMAG) to provide oversight of airspace safety monitoring requirements, including the monitoring of the height keeping performance of the airframes used in RVSM operations, thereby providing a regional basis for RVSM monitoring in Asia/Pacific. In further addressing its responsibilities in this regard, APANPIRG adopted a Target Level of Safety (TLS) for en-route airspace in the Asia/Pacific region of 5×10^{-9} fatal accidents per flight hour in each dimension i.e. vertical, lateral and longitudinal. APANPIRG also continues to encourage cooperative arrangements between States to undertake airspace safety assessments and to provide airspace safety assessment and monitoring for the introduction of airspace changes and reduction in aircraft separation minima (vertical and horizontal), as well as for ongoing operations.

2. The need for RVSM Monitoring

2.1 Aircraft use a barometric altimeter to determine height and follow common pressure levels (flight levels) using a QNH of 1013 in RVSM airspace. The errors in the aircraft altimetry sensing systems are not apparent during routine operations as the altimeter displays to the aircrew and air traffic services (ATS) a level that includes these altimetry system errors (ASE). As such, the presentation to the pilot and/or ATS is often different to the actual height of the aircraft. During routine calibration the aircraft systems are maintained on the ground while at rest, so the dynamic nature of ASE is not able to be seen. Aircraft altimetry systems also utilize parts that:

- wear over time (such as the pitot-static probe and portions of internal plumbing); and/or
- are subject to damage (such as skin flexing/deformation during operations); and/or
- are affected by modification of airframes (such as the application of paint, decals and branding marks or mounting of accessories or repairs such as boiler plating in the vicinity of the static pressure ports).

2.2 All these activities are capable of producing significant error in true height. Other factors seen in normal operations of high-speed flight such as aerodynamic loading and exposure to

ranges of temperature, moisture and contaminants, are also capable of producing significant variation in the sensed pressure.

2.3 ASE can vary over the population of operational aircraft of the same type and within each specific aircraft this error can vary with time in service. **Figure 1** below details the variations observed in true altitude over a period of five years for a single airframe. Note the increased rate of deterioration in the last 10 months of the sample period.

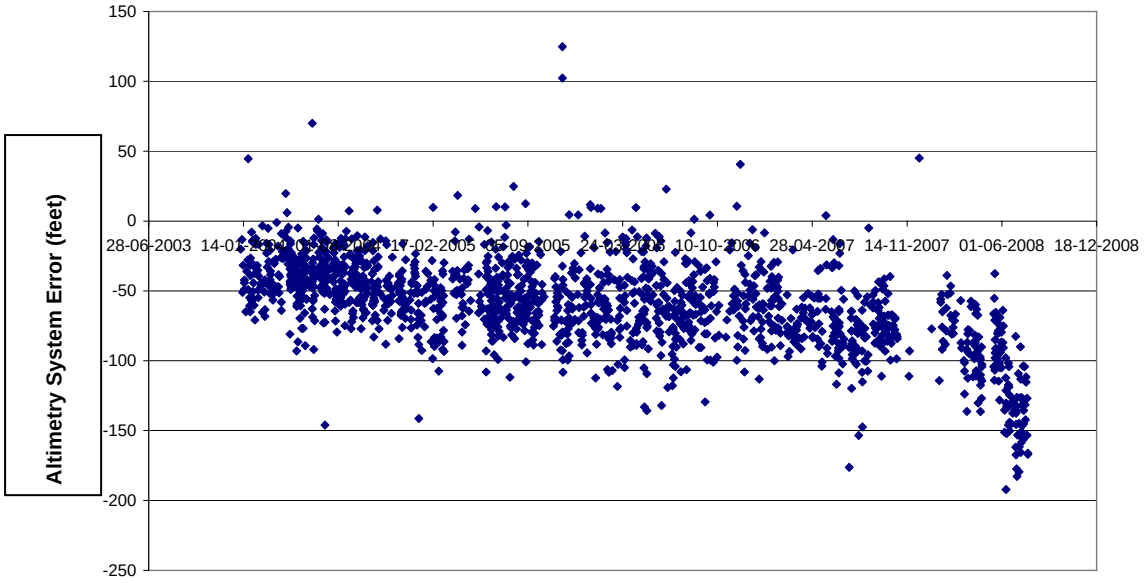

Figure 1: Example of single airframe Altimetry System Error (ASE) degradation over 5 years.

2.4 As well as the ASE variations that occur within a single airframe (as shown above), **Figure 2** below demonstrates the variation in ASE over a fleet of 15 airframes of the same type at a similar point in time.

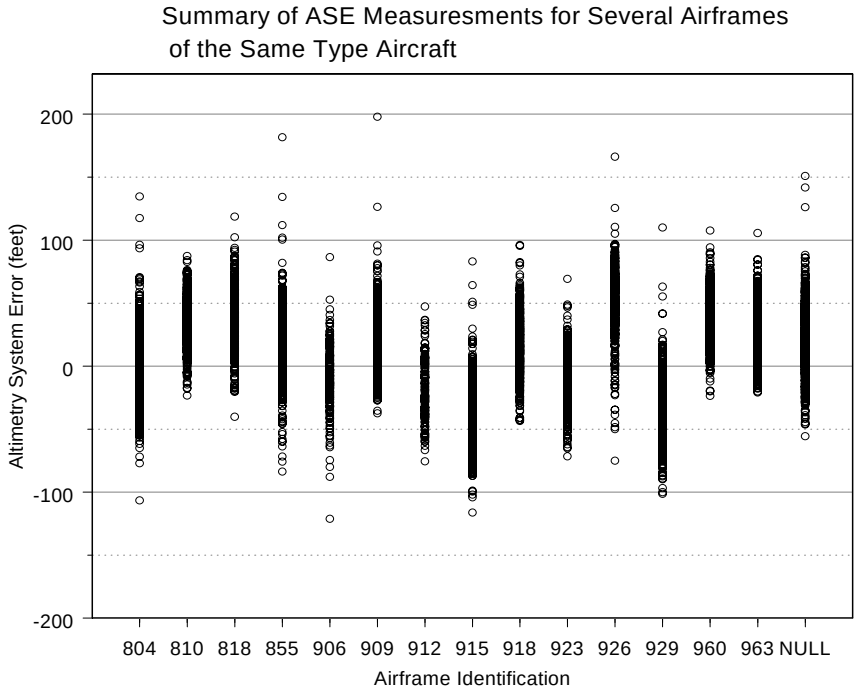

Figure 2: Variation of ASE over 15 airframes of same type at a similar point in time.

2.5 The collision risk model applied for RVSM is globally recognized by ICAO and uses an empirical basis coupled with robust mathematical methodologies to exclude height deviations of less than 300 feet for the assessment of operational errors (i.e. pilot and air traffic controller errors). However, the technical risk component of the collision risk model considers all errors in its assessment and therefore any adverse performance of individual altimetry systems must be included in the model. In an attempt to balance the need, on the one hand, for continuous assessment of the altimetry system performance of each airframe to meet mathematical principles with, on the other hand, the real-world pragmatic difficulties in actually achieving monitoring at this rate, the Annex 6 provision have been drafted accordingly. As such, in generic terms Annex 6 essentially provides for a monitoring rate of two airframes per type per operator per two years in the expectation that this will provide adequate data whilst not imposing excessively onerous requirements on operators.

2.6 Continued safe RVSM operations demand continuous high accuracy from altimetry systems, however RVSM Regional Monitoring Agencies (RMAs) globally have evidence that ASE can vary within a population of the same aircraft type at any point in time and by individual aircraft over any period of time. These concerns were identified early on in the global RVSM implementation programme and, as a consequence, monitoring requirements were incorporated in the RVSM Manual (*Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive- Doc 9574)* and Annex 11. Subsequently, because the data that became available from the monitoring clearly identified the technical problems in altimetry systems and lack of ASE stability, additional provisions were necessary in Annex 6 to ensure that global monitoring requirements were clearly defined, and amendments to Annex 11 have also been proposed by the ICAO Separation and Airspace Safety Panel (SASP) to clarify regional monitoring responsibilities. To ensure that only high accuracy altimetry systems are in operation, the new monitoring requirements required by Annex 6 – *Operation of Aircraft* need to be in place by 2010, however it clearly makes for safer operations to implement the long term height monitoring requirements without delay.

3. Asia/Pacific RVSM Monitoring Arrangements

3.1 Assessment of the safety performance of RVSM airspace is undertaken by specialist assessment bodies known as Regional Monitoring Agencies (RMAs), which are specifically established to undertake the on-going monitoring of RVSM operations in order to meet ICAO Standards. For the APAC Region, APANPIRG-endorsed RMA services are provided by:

- The Australian Airspace Monitoring Agency (AAMA), operated by Airservices Australia.
- The China RMA, operated by the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC).
- The JCAB RMA, operated by the Japan Civil Aviation Bureau.
- The Monitoring Agency for the Asia Region (MAAR), operated by Aeronautical Radio of Thailand (AEROTHAI).
- The Pacific Approvals Registry and Monitoring Organization (PARMO), operated by the United States Federal Aviation Administration.

3.2 The Flight Information Regions (FIRs) for which each RMA takes responsibility have been described in the RASMAG *"List of Competent Airspace Safety Monitoring Organizations"*–a copy of which is included as Appendix A.

4. Long Term RVSM Height Monitoring Requirements

4.1 The ICAO SASP has identified that height-keeping performance monitoring results for RVSM approved aircraft had, in some cases, demonstrated long-term adverse trends in ASE stability. The likely results of this trend, if not reversed, would be aircraft becoming non-compliant with RVSM requirements. Accordingly, to ensure that adverse trends in ASE stability were detected, it was recognised by SASP that globally applicable RVSM long-term height monitoring requirements would be necessary.

4.2 As a result of proposals made by the SASP, during 2007 the ICAO Air Navigation Commission (ANC) agreed to amendments to Annex 6 – *Operation of Aircraft* that detail global RVSM long-term monitoring requirements that become effective in November 2010. These requirements state as follows:

> *7.2.7 The State of the Operator that has issued an RVSM approval to an operator shall establish a requirement which ensures that two aeroplanes of each aircraft type grouping of the operator have their height keeping performance monitored, at least once every two years or within intervals of 1 000 flight hours per aeroplane, whichever period is longer. If an operator aircraft type grouping consists of a single aeroplane, monitoring of that aeroplane shall be accomplished within the specified period.*

4.3 Although Annex 11 has required regional RVSM monitoring programmes since 2001, as a result of the recent adoption of the Annex 6 requirements above, during May 2009 the SASP proposed a revision to Annex 11 that clarifies the regional component of RVSM monitoring. The SASP proposal is intended to retain the original long standing Annex 11 monitoring provisions whilst placing greater responsibilities on regional monitoring programmes to assist in delivering the ASE stability and aircraft group performance required by the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)*. The proposal is currently under review by the ICAO Secretariat and the ANC, and proposes amendments to Annex 11 as follows:

> *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 regional 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.~~ The scope of regional monitoring programmes shall be adequate to conduct analyses of aircraft group performance and evaluate the stability of altimetry system error.*
>
> ~~*Note. — The number of separate monitoring programmes should be restricted to the minimum necessary to effectively provide the required services for the region.*~~
>
> *3.3.5.2 Arrangements shall be put in place, through inter-regional agreement, for the sharing between regions of data from monitoring programmes.*

4.4 The RASMAG has considered the new requirements for long-term height monitoring in some detail, noting that the provisions will take effect from November 2010, in about a year's time. During 2008 RASMAG circulated 6 Long Term Height Monitoring Actions (Appendix B refers) for the attention of Asia/Pacific States and airspace users. Additionally, in relation to the Annex 6 and Annex 11 requirements, APANPIRG has agreed (Conclusion 20/20) that the RVSM **Minimum** Monitoring Requirements (MMRs) that had previously been adopted for use by RMAs in the Asia/Pacific Region should continue in use for the time being. Appendix C summarises the Asia/Pacific MMRs. In recommending this conclusion to APANPIRG, RASMAG recognised that

monitoring was a significant burden to operators and should be kept to the minimum necessary. RASMAG therefore agreed to continuously review monitoring results with the objective of migrating to the Annex 6 provisions as the basis for regional MMRs providing that regional safety requirements were not compromised.

4.5 APANPIRG/18 recognized that the 2010 implementation of Annex 6 global long-term monitoring requirements for airframes used in RVSM operations would have significant impacts in the way regional monitoring was managed, including the need for widespread regional height monitoring infrastructure capability to be made available. Under the terms of Conclusion 18/4, APANPIRG tasked Asia/Pacific RMAs in conjunction with RASMAG to prepare this regional impact statement summarizing the estimated consequences for the Region, including consideration of the numbers of airframes required to be monitored and ground monitoring infrastructure required.

5. Monitoring of Airframes

5.1 The implementation of long-term height monitoring requirements will place significant additional responsibilities on operators, State approval authorities and RMAs alike. Within the Asia/Pacific Region, the RMAs in conjunction with RASMAG and APANPIRG have presently standardised on a set of RVSM MMRs that do not prescribe on-going monitoring requirements after the initial monitoring of operator fleet or single aircraft type operations when an RVSM operational approval is sought by the operator. However, the Annex 6 provisions specifically require on-going monitoring and, as a result, the current Asia/Pacific MMRs will need to be reviewed to incorporate, to the extent possible, the monitoring periodicity requirements on Annex 6.

5.2 For the purposes of this assessment in determining the monitoring requirement after November 2010, the Asia/Pacific RMAs have provided approximate numbers of airframes based on the criteria set in Annex 6. As a result, the total number of airframes to be monitored over the 2 year period ending November 2012 (termed the "monitoring burden") is expected to be about 1385 airframes, a subset of the approximately 7275 airframes operating in the region**.** A detailed breakdown of this analysis is provided in Appendix D. It should be noted that the number of airframes to be monitored is likely to increase over the medium term as older, non-RVSM capable aircraft are replaced with more modern types with RVSM capability.

6. Ground-Based Monitoring Infrastructure

6.1 The implementation of long-term height monitoring will require significant changes in the monitoring infrastructure to ensure the requirements of Annex 6 are met. Currently within the Asia/Pacific Region, airframe monitoring is undertaken by means of either a ground-based system or a portable unit temporarily mounted in the aircraft.

6.2 In the case of ground-based systems, monitoring is undertaken by aircraft flying in proximity to the Height Monitoring Units (HMUs) in Europe or in North America (where they are known as Aircraft Geometric Height Measurement Elements -AGHMEs) to estimate aircraft ASE. Three HMUs are managed by Eurocontrol, one by the North Atlantic Central Monitoring Agency (NAT CMA), and six AGHMEs by the Pacific Approvals Registry and Monitoring Agency (PARMO) - four in the United States and two in Canada. Ground-based monitoring by these systems is effective only for Asia/Pacific based aircraft operated internationally to those continents and for new aircraft from the major manufacturers.

6.3 In practice, ground-based monitoring can only occur when an aircraft overflies – in level flight - a ground-based monitoring unit or transits the local airspace specifically associated with the unit. This is not convenient in all cases as operators may have to vary flight patterns to overfly an HMU. Therefore ground-based monitoring units should ideally be located at points that are routinely

overflown by aircraft engaged in normal scheduled operations, rather than at locations that require aircraft to divert from normal flight paths in order to overfly the ground monitoring unit.

6.4 At present, with the exception of those in the continental United States, there are no operational ground-based monitoring facilities in the Asia/Pacific region.

6.5 The portable GPS Monitoring Unit (GMU) is a carry-on system installed in an aircraft for a single flight. Its main advantage is the ability to monitor an individual aircraft during normal operations without the need to fly over a ground-based monitoring system in a particular portion of airspace. Data files from a GMU must be post-processed to extract aircraft geometric height which must then be combined with other information in order to produce height keeping performance data. GMUs are used by the US FAA, AEROTHAI, ATMB of CAAC and one or two other approved service providers in conjunction with the FAA Technical Center. GMU monitoring is coordinated by RMAs or State approval authorities; it is widely used and effective. However, it can be costly and inconvenient to operators: there are charges for the use of the unit, and its installation and subsequent removal may involve time out of service for the aircraft.

6.6 In recent times the SASP has been progressing work to prove the acceptability of the geometric height data available in ADS-B messages as a cost effective means of monitoring ASE stability. Significant trials undertaken by the FAA in the United States have produced good results and in particular, the Australian Airspace Monitoring Agency (AAMA) operating through Airservices Australia is keen to progress this work given its wide-coverage ADS-B surveillance network and the cost effectiveness of such a system. However, using ADS-B data alone to monitor aircraft ASE will not provide a complete sample of the airspace population unless a mandated ADS-B fitment requirement exists in a particular Region or State. In Australia, for example, such a mandate will become effective in 2013 for all civil aircraft operating above Flight Level 280, but this is not yet the case in most areas of the Asia/Pacific region.

6.7 The advantage of ground-based monitoring systems (HMUs, AGHME or ADS-B) is that they provide large volumes of data and information about the aircraft population and permit repeated measurements on individual airframes, which is highly beneficial in detecting trends in ASE performance. The location of the ground-based monitoring system is very important, as it determines the number of aircraft for which ASE estimates will be produced and further consideration of this issue will need to be undertaken by RASMAG in conjunction with APANPIRG and Asia/Pacific States.

6.8 The advantage of a portable airborne system (GMU) is that it provides the ability to target specific portions of the airspace population to meet immediate needs, however GMU monitoring does not provide the continuous data streams necessary to determine aircraft group performance and ASE stability. Therefore although GMU monitoring addresses the basic MMR, it should be considered only as supplementary to ground-based monitoring.

6.9 Importantly, it should be recognised that the Asia/Pacific States have a large number of aircraft that confine their operations to single State or Regional environments and therefore would rarely be able to benefit from post-initial approval monitoring by the ground-based units in Europe and North America. This is particularly relevant in the cases of Australia, China, India and Indonesia, which have large domestic fleets that are not used for international operations. Of the approximately 1385 airframes required to be monitored regionally over the 2 year period ending November 2012, it is estimated that less than nine percent (9 %) will have access to the European, Canadian or United States ground-based monitoring installations during scheduled services.

6.10 Accordingly, a complete monitoring programme for the Asia/Pacific region should make provision for a combination of ground-based monitoring systems such as the HMU, AGHME and, if acceptable in the future, ADS-B as well as airborne systems such as the GMU. However, recognising the cost of installing, operating and maintaining such systems, regional investment should

be kept at the absolute minimum necessary to meet the operational requirements. Since the use of ADS-B systems for height monitoring is still under development and it will be some time before ABS-B is usable as a monitoring alternative, currently proven ground-based monitoring systems will need to be deployed in the Asia/Pacific region as the initial response to the long-term monitoring requirements. Deployment of these systems needs to be closely coordinated with APANPIRG, RASMAG and the Asia/Pacific RMAs to ensure effective monitoring within the Region whilst avoiding unnecessary investment in dedicated monitoring infrastructure.

7. Impacts on the Asia/Pacific Region

Objectives of height monitoring

7.1 In considering both the impact of the Annex 6 provisions and the proposed strengthening of Annex 11 regional provisions on the Asia/Pacific Region, an understanding of the objectives to be achieved by height monitoring is necessary. At the broadest level, the monitoring programme must ensure that the continued operational application of RVSM meets the established safety requirements.

7.2 In order to achieve this primary objective, three subsidiary objectives must be met for the performance monitoring of RVSM. The first is to ensure compliance with a basic RVSM Minimum Monitoring Requirement. The MMR serves as a check that operators have initially made any required airframe changes and then continue to maintain aircraft in accordance with manufacturer's recommendations for airworthiness. For this purpose, only a sample of observations from each of the operators' fleets is required and Annex 6 provisions require the monitoring at intervals of no more than two years.

7.3 The second objective is to conduct analyses of aircraft group performance, where a group consists of aircraft with nominally identical design (including nominally identical static systems and RVSM-related avionics units) as defined in Chapter 4 of the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)* and recognised in the strengthened draft Annex 11 provisions presently under consideration. In achieving this objective, a much larger data sample adequate to determine ASE performance is required. Accordingly, enough ASE monitoring data should be captured to be able to assess every monitoring group against RVSM performance requirements routinely throughout the two-year period.

7.4 The final objective requires that in order to fulfil the system performance monitoring required by Chapter 6 of the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)*, and as recognised in the strengthened draft Annex 11 provisions presently under consideration, the monitoring process should also aim to provide evidence of ASE stability. Sufficient ASE performance data must be available to show that, for the bulk of airframes circulating in the RVSM environment, ASE performance does not vary substantially from the beginning to the end of the two-year monitoring period. Such data is obtained from repeated samples on individual airframes throughout the two-year period.

Portable and ground-based monitoring

7.5 In terms of meeting the basic MMR, monitoring completed using a portable GMU is acceptable. However, to assess aircraft group performance and long-term ASE stability, large volumes of data are necessary, including results of monitoring of the same airframes over a period of time. Such large volumes of data are only obtainable from ground-based monitoring installations that are regularly overflown by the relevant airframes. Accordingly, a regional monitoring infrastructure that provides the ability to meet the basic MMR requirements as well as the group performance and ASE

stability monitoring requirements is necessary. This involves a mixture of portable GMU and ground-based monitoring capability used in a continuous and well coordinated manner.

Current Asia/Pacific monitoring capabilities

7.6 At present, there are no ground-based monitoring installations operating in the Asia/Pacific region. Such facilities are available in some other areas of the world visited regularly by aircraft based in the Asia/Pacific region, and some monitoring results are available to be shared between RMAs on a global basis.

7.7 Limited portable GMU monitoring capability is available via Asia/Pacific RMAs - as described in paragraph 6.5 above.

Appropriate ground-based monitoring locations

7.8 Clearly, in a region of the size of the Asia/Pacific it is not at all feasible to provide 100% monitoring capabilities in all areas. However, a review of the major international traffic flows (see Appendix E) suggests that appropriate locations for installation of ground-based monitoring systems could include Australia/New Zealand, Southeast Asia, Northeast Asia, China and India/Pakistan. The availability of ground-based monitoring capabilities in these five areas would adequately serve the majority of international traffic flows, whilst also catering for the disposition and monitoring of the larger domestic fleet operations in Australia, China and India. Adoption of such a ground-based infrastructure could mean that existing regional portable GMU capability is adequate. However, the absence of suitable ground-based infrastructure means that investment in GMU capabilities will be necessary.

7.9 In relation to a ground-based unit in northeast Asia, Japan is already advanced with planning to install three ground-based height monitoring units (HMUs) in the Japanese airspace (i.e. Fukuoka FIR). The first HMU is targeted to commence operations in the second quarter of 2011, the second and the third HMUs will come on stream in the second quarter of 2012.

Coordination arrangements

7.10 In an effort to minimise duplications of effort whilst still ensuring compliance with monitoring provisions, effective coordination between RMAs globally, and between RMAs and the States they are serving, is essential. Each Asia/Pacific RMA should examine monitoring results accumulated by all other authorized global RMAs, regardless of region, in order to utilize monitoring results from other regions to avoid duplication and reduce the actual monitoring burden faced by each RMA and operator.

7.11 APANPIRG has already recognised the importance of coordination between RMAs and States, with APANPIRG/19 (September 2008) promulgating the following Conclusion:

> ***Conclusion 19/15 – Enhanced communications between States and RVSM RMAs***
>
> *That, noting the Annex 6 provisions for the global long term monitoring of airframes used in RVSM operations and the critical role of Asia/Pacific RVSM Regional Monitoring Agencies (RMAs) in monitoring the safety of RVSM operations, the Regional Office draw the attention of States to the Long Term Height Monitoring Actions promulgated by RASMAG. In particular, States are encouraged to immediately strengthen relationships with their respective RMAs to ensure that information in relation to RVSM approval status is continuously available to RMAs.*

7.12 Despite Conclusion 19/15, Asia/Pacific RMAs continue to experience difficulties in receiving timely and accurate information (including routine large height deviation [LHD] reporting) from States. In order to enable RMAs to assist States to fulfil their monitoring obligations, it is necessary that States:

a) continuously update RMA databases of operators and aircraft holding State RVSM approvals;

b) enable the expeditious forwarding of all LHD and related reports to RMAs, and

c) ensure availability of current details for State RVSM Point of Contact (POC) officials.

7.13 To highlight the importance of data provision, APANPIRG/20 adopted Conclusion 20/22 calling for States to provide an update of RVSM approvals data in conjunction with the annual December traffic sample data submission required by Conclusion 16/4. In the event that adequate compliance with coordination arrangements is not achieved, RASMAG recommends that APANPIRG place non compliant States on the APANPIRG List of Deficiencies in the ATM/AIS/SAR Fields.

8. Conclusions

8.1 The Annex 6 requirements for RVSM long-term height monitoring that take effect from November 2010 will have a significant impact on the way in which such monitoring will be undertaken in the Asia/Pacific region. The RASMAG, in conjunction with the Asia/Pacific RMAs, has determined a probable monitoring burden of approximately 1385 airframes region-wide in the 2 years ending November 2012 and the existing Asia/Pacific RVSM Minimum Monitoring Requirements will need to be reviewed against the amended ICAO documentation.

8.2 Three primary objectives need to be achieved in terms of RVSM height monitoring:

a) Compliance with a basic Minimum Monitoring Requirement (MMR - e.g. two aircraft per type, per operator, per two years),

b) Conduct of analyses of aircraft group performance, and

c) Evaluation of the stability of altimetry system error.

8.3 Achievement of the first objective is via sampling of relatively few airframes at relatively long intervals. Achievement of the other two objectives requires large volumes of data obtained via repeated sampling of airframes over extended periods of time using ground-based monitoring equipment.

8.4 Additional monitoring infrastructure will need to be deployed in the Asia/Pacific Region. A range of proven monitoring systems is currently available, including ground-based fixed installation HMUs and AGHMEs and portable airborne GMUs. A mix of ground-based and portable GMU capability will be required. Although the use of ADS-B for height monitoring purposes is currently under development with trials to date showing encouraging results, it is expected to be some time before ADS-B provides a practical monitoring capability.

8.5 Monitoring conducted using portable GMU equipment achieves a single monitoring result on each occasion that is suitable for compliance with basic MMRs, however the large volumes

of data necessary for evaluation of the group performance of aircraft and stability of altimetry systems can only be obtained by frequent monitoring using ground-based monitoring installations.

8.6 Ground-based monitoring can only occur when an aircraft overflies – in level flight - a ground-based monitoring unit or transits the local airspace specifically associated with the unit. Therefore ground-based monitoring units should ideally be located at points that are routinely overflown by aircraft engaged in normal scheduled operations, rather than at locations that require aircraft to divert from normal flight paths in order to overfly the ground monitoring unit.

8.7 States retain responsibility for compliance with Annex provisions, including those relating to RVSM height monitoring. An extensive system of APANPIRG approved RMAs has been established in the Asia/Pacific region to assist States in this regard, provided States make the necessary data continuously available to RMAs and comply with relevant RMA requirements. Arrangements have been implemented between global RMAs to enable sharing of monitoring data.

8.8 However, within the Asia/Pacific Region, present coordination activities by States with their respective RMAs are not adequate. States will be required to comply with related APANPIRG Conclusions, including Conclusions 19/15 and 20/22, and immediately strengthen relationships with their respective RMAs to ensure that information in relation to RVSM approval status is continuously available to RMAs. Should voluntary compliance not be effective, RASMAG recommends that APANPIRG place non-compliant States on the APANPIRG List of Deficiencies in the ATM/AIS/SAR Fields.

8.9 A review of the major international traffic flows suggests that appropriate locations for installation of ground-based monitoring systems could include Australia/New Zealand, Southeast Asia, Northeast Asia, China and India/Pakistan. The availability of ground-based monitoring capabilities in these five areas would adequately serve the majority of international traffic flows, whilst also catering for the disposition and monitoring of the larger domestic fleet operations in Australia, China and India. Adoption of such a ground-based infrastructure could mean that existing regional portable GMU capability is adequate. However, the absence of suitable ground-based infrastructure means that investment in GMU capabilities will be necessary.

8.10 Japan has already indicated its intention to deploy three HMUs situated within the airspace of Japan, with the first HMU targeted to become operational in 2011.

8.11 APANPIRG, in close coordination with RASMAG and Asia/Pacific RMAs will need to be involved in recommending the types and appropriate locations of monitoring systems to most effectively monitor the Asia/Pacific aircraft population with the least infrastructure investment.

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References

- The RVSM Manual – *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574);*
- The draft ICAO Regional Monitoring Agency (RMA) Manual - *Manual of Operating Procedures and Practices for Regional Monitoring Agencies in relation to the use of a 300 m (1 000 ft) Vertical Separation Minimum above FL 290;*
- Annex 11 – *Air Traffic Services;*
- Annex 6 – *Operation of Aircraft;*
- PANS-ATM, Doc 4444 - *Procedures for Air Navigation Services – Air Traffic Management;*
- APANPIRG Conclusions 17/4, 18/2, 18/3, 18/4, 19/15, 20/22 and 20/23;
- Regional Office State Letter AP018/8 of 31 January 2008; and
- Reports of the Regional Airspace Safety Monitoring Advisory Group of APANPIRG (RASMAG/9 – May 2008, RASMAG/10 – December 2008, RASMAG/11 – June 2009)

APPENDIX A

APANPIRG Asia/Pacific Airspace Safety Monitoring

RASMAG LIST OF COMPETENT AIRSPACE SAFETY MONITORING ORGANIZATIONS

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

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

(Last updated 14 October 2010)

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

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

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

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

APPENDIX B

RASMAG Long Term RVSM Height Monitoring Actions – Asia/Pacific Region

APANPIRG/18 (September, 2007) was of the opinion that work should be undertaken as soon as possible in order to assess the consequences for the Asia/Pacific Region of the implementation of ICAO global long term RVSM height monitoring requirements from 2010 and, under the terms of Conclusion 18/4, requested Asia/Pacific Regional Monitoring Agencies (RMAs) in conjunction with the APANPIRG Regional Airspace Safety Monitoring Advisory Group (RASMAG) to prepare a regional impact statement summarizing the estimated consequences for the Region, including consideration of the numbers of airframes required to be monitored.

In order to progress these matters in a timely fashion, RASMAG/8 (December, 2007) formulated six Long Term Height Monitoring (LTHM) Actions for promulgation, as outlined below. More details in respect to each LHTM Action can be found in the RASMAG/8 report, available from the website of the ICAO Asia/Pacific Office at http://www.bangkok.icao.int/ under the "Meetings" menu.

LTHM Action 1: Based on the final draft of the RMA Manual which was expected to be available from June 2008, Asia/Pacific RMAs in conjunction with RASMAG prepare and widely promulgate an information circular detailing, as a minimum, the roles and responsibilities of an RMA, the height monitoring process and equipment required, and the reasons and quantum of the global long term height monitoring requirements.

LTHM Action 2: To maintain effective delivery of existing RMA services and facilitate planning specifically designed to prepare for application of global long-term RVSM height monitoring requirements from 2010, each Asia/Pacific RMA should, as a matter of priority, bring to the attention of State regulators the difficulties being experienced by RMAs in receiving timely and accurate information (including routine large height deviation [LHD] reporting) from States. Asia/Pacific RMAs should seek assistance from States in implementing robust processes to:

a) continuously update RMA databases of operators and aircraft holding State RVSM approvals;

b) enable the expeditious forwarding of all LHD and related reports to RMAs, and

c) ensure availability of current details for State RVSM Point of Contact (POC) officials.

LTHM Action 3: Whilst recognizing that responsibility for compliance with Annex 6 height monitoring provisions remains the responsibility of States, as soon as practicable each Asia/Pacific RMA, in conjunction with State regulatory authorities and airspace user organizations, should develop a methodology for reviewing the RMA database of RVSM approvals in order to develop and promulgate a list of the minimum height monitoring which must be accomplished by each operator to which the RMA provides services. In preparing this list, account should be taken of special circumstances pertaining to infrequent airspace users recognizing that some operators may be required to complete minimum monitoring requirements which are a function of the proposed 1,000-flying-hour limit rather than the two-year limit.

LTHM Action 4: After determining the potential monitoring burden posed by the operators to which it provides service, each Asia/Pacific RMA should examine monitoring results accumulated by all other authorized global RMAs, regardless of region, in order to utilize monitoring results from other regions to avoid duplication and reduce the actual monitoring burden the RMA faces.

LTHM Action 5: Each Asia/Pacific Region RMA should, in light of its anticipated height monitoring burden, propose recommendations through RASMAG to APANPIRG useful in determining the regional ground-based and GPS-based Monitoring System (GMS) height monitoring infrastructure necessary to enable its affiliated operators to meet the global long-term RVSM monitoring requirements applicable from November 2010.

LTHM Action 6: Asia/Pacific RMAs collaboratively investigate the technical feasibility of using the aircraft geometric height produced by ADS-B and Multilateration surveillance systems to support monitoring of aircraft height keeping performance.

APPENDIX C

SUMMARY OF ASIA/PACIFIC RVSM MINIMUM MONITORING REQUIREMENTS (MMRs):

1. UPDATE OF MONITORING REQUIREMENTS TABLE AND WEBSITE. As significant data is obtained, monitoring requirements for specific aircraft types may change. When the table is updated, a letter will be distributed to States and operators. The updated table will be posted on the websites of the APAC Regional Monitoring Agencies (RMAs) on behalf of the International Civil Aviation Organization (ICAO) Asia-Pacific Regional Planning Group (APANPIRG).

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 programme. The attached table of monitoring requirements establishes requirements for initial monitoring associated with the RVSM approval process. In their application to the appropriate State authority for RVSM approval, operators must include a plan that demonstrates the process that will be used to meet 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 shall be coordinated with the State authority.

4. APPLICABILITY OF MONITORING FROM OTHER REGIONS. Monitoring data obtained in conjunction with RVSM monitoring programmes from other regions can be used to meet Asia/Pacific monitoring requirements. Asia/Pacific RMAs 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 that show how they intend to meet the requirements specified in the attached table. Monitoring will be carried out in accordance with this table.

6. AIRCRAFT GROUPS NOT LISTED IN THE TABLE. Contact the RMA responsible for the State of registration for clarification if an aircraft group is not listed in the Minimum Monitoring Requirements table or for clarification of other monitoring related issues. An aircraft group not listed in the table below will probably be subject to Category 2 monitoring requirements.

7. TABLE OF MONITORING GROUPS. A table of monitoring groups is provided as an appendix to this Minimum Monitoring Requirements document. The table shows the aircraft types and series that are grouped together for operator monitoring purposes.

8. 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 that aircraft RVSM systems were in the approved RVSM configuration for the flight.

9. 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 tables.

10. FOLLOW-ON MONITORING. Monitoring is an on-going program that will continue indefinitely after the RVSM approval process. A follow-on sampling program for additional operator aircraft will be coordinated by the Asia-Pacific Regional Airspace Safety Monitoring Advisory Group (RASMAG).

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE, HOWEVER, IT IS NOT REQUIRED TO BE COMPLETED PRIOR TO OPERATIONAL APPROVAL			
MONITORING CATEGORY		**AIRCRAFT TYPE**	**MINIMUM OPERATOR MONITORING FOR EACH AIRCRAFT GROUP**
1	Group approved and monitoring data indicates performance in accordance with RVSM standards. **Group Definition:** aircraft have been manufactured to a nominally identical design and build and for RVSM airworthiness approval fall into a group established in an RVSM certification document (e.g., Service Bulletin, Supplemental Type Certificate, Type Certificate Data Sheet).	[A30B, A306], [A312 (GE), A313 (GE)], [A312 (PW), A313 (PW)], A318, [A319, A320, A321], [A332, A333], [A342, A343], A344, A345, A346 B712, [B721, B722], [B733, B734, B735], B737(Cargo), [B736, B737/BBJ, B738/BBJ, B739], [B741, B742, B743], B74S, B744 (5" Probe), B744 (10" Probe), B752, B753, [B762, B763], B764, B772, B773 CL60(600/601), CL60(604), C560, [CRJ1, CRJ2], CRJ7, DC10, [E135, E145], [E170, E190], F100, GLF4, GLF5, LJ60 L101, MD10, MD11, MD80 (All series), MD90	Two airframes from each fleet* of an operator to be monitored as soon as possible but **not later than 6 months after the issue of RVSM operational approval** ** Note. For the purposes of monitoring, aircraft within brackets [ ] may be considered as belonging to the same monitoring group. For example, an operator with six A332 and four A333 aircraft may monitor one A332 and one A333 **or** two A332 aircraft **o**r two A333 aircraft.*
2	Group approved but insufficient monitoring data collected to move aircraft to Monitoring Category 1. Group definition applies.	Other group aircraft other than those listed in Category 1 including: A124, A388, ASTR, B703, B731, B732, BE20, BE40, C500, C25A, C25B, C525, C550**, C56X, C650, C750, CRJ9, [DC86, DC87], DC93, DC95, F2TH, [FA50 FA50EX], F70, [F900, F900EX], FA20, FA10, GLF2(II), GLF(IIB), GLF3, GALX, GLEX, H25B(700), H25B(800), H25C, IL62, IL76, IL86, IL96, J328, L29(2), L29(731), LJ31, [LJ35, LJ36], LJ45, LJ55, SBR1, T134, T154, T204, P180, PRM1,YK42	60% of airframes from each fleet of an operator (round up if fractional), as soon as possible but **not later than 6 months after the issue of RVSM operational approval.** (*Note: If 60 percent of the fleet yields a fractional number, round up to the next whole aircraft (e.g., for a fleet of 2 aircraft, 0.6 x 2 = 1.2; therefore, 2 aircraft must be monitored). ** Refer to aircraft group table for detail on C550 monitoring
3	Non-Group **Non-group Definition:** aircraft that do not fall under the group definition and for RVSM airworthiness approval are presented as an individual airframe.	Non-group approved aircraft	100% of aircraft shall be monitored as soon as possible but **not later than** **6 months after the issue of RVSM operational approval.**

APPENDIX D

Estimated RVSM Monitoring Burden for Asia/Pacific Region as a result of Long Term Height Monitoring Requirements of Annex 6 - Period from Nov 2010 to Nov 2012

(Data estimated by Asia/Pacific RVSM Regional Monitoring Agencies)

AAMA – Australian Airspace Monitoring Agency (Airservices Australia)

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Australia	ANO	1	[E170, E190]	2	2
	AUZ	1	[B762, B763]	22	2
	JST	1	[A319, A320, A321]	41	2
		1	[A332, A333]	6	2
	NJS	1	B712	11	2
	OZJ	2	B732	3	2
	OZW	1	F100	8	2
	QFA	1	[A332, A333]	16	2
		2	A388	7	2
		1	[B733, B734, B735]	22	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	38	2
		1	[B741, B742, B743]	4	2
		1	B744	30	2
		1	[B762, B763]	7	2
	RON	1	[B733, B734, B735]	2	2
	TGW	1	[A319, A320, A321]	6	2
	UTY	1	F100	8	2
	VAU	1	B773	2	2
	VOZ	1	[B736, B737/BBJ, B738/BBJ, B739]	50	2
		1	B773	1	1
		1	[E170, E190]	19	2
	IGA	1	[A319, A320, A321]	1	1
	IGA	3	B350	1	1
	IGA	2	BE40	4	3
	IGA	2	C25A	1	1
	IGA	3	C510	1	1
	IGA	2	C525	5	5
	IGA	2	C550	9	8
	IGA	1	C560	2	2
	IGA	2	C650	5	5

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Australia	IGA	3	C680	1	1
	IGA	2	C750	2	2
	IGA	1	CL60	5	5
	IGA	1	[E170, E190]	1	1
	IGA	1	F100	2	2
	IGA	2	F2TH	1	1
	IGA	2	[F900, F900EX]	2	2
	IGA	3	GL5T	1	1
	IGA	2	GLEX	2	2
	IGA	1	GLF4	3	3
	IGA	1	GLF5	1	1
	IGA	2	H25B	7	7
	IGA	2	H25C	1	1
	IGA	2	[LR35, LR36]	4	4
	IGA	2	LJ45	6	2
	IGA	1	LJ60	1	1
	IGA	2	PRM1	2	2
Total Australia				**376**	**106**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Indonesia	AFE	1	MD80	2	2
		2	B732	1	1
		1	[E135, E145]	1	1
	AWQ	1	[B733, B734, B735]	8	2
		1	[A319, A320, A321]	2	2
	BTV	1	[B733, B734, B735]	15	2
		1	[A319, A320, A321]	4	2
	CGR	1	[B733, B734, B735]	2	2
	IGA	3	F28	2	2
	IGA	1	[E135, E145]	1	1
	GIA	1	[A332, A333]	6	2
		1	[B733, B734, B735]	41	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	4	2
		1	B744	3	2
	LNI	1	[B733, B734, B735]	12	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	12	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Indonesia		1	MD80	7	2
		1	MD90	5	2
	MDL	1	[A319, A320, A321]	8	2
	MDL	1	[B733, B734, B735]	2	2
	MNA	1	[B733, B734, B735]	14	2
	PAS	3	F28	4	2
	SJY	2	B732	16	2
		1	[B733, B734, B735]	3	2
	TGN	2	C650	1	1
		2	B732	1	1
	TMG	2	B732	1	1
		1	[B721, B722]	1	1
	TRV	1	[B733, B734, B735]	1	1
		1	C560	1	1
		2	H25B	1	1
	TWA	3	F28	1	1
		2	PRM1	1	1
	XFA	2	B732	2	2
Total Indonesia				**186**	**56**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Papua New Guinea	ANG	1	[B762, B763]	1	1
		1	B752	1	1
Total Papua New Guinea				**2**	**2**

AAMA Grand Total *(Australia + Indonesia + Papua New Guinea)*	**Total # Airframes under Monitoring Group**	**Resultant Monitoring Burden**
	564	**164**

China RMA – Air Traffic Management Bureau (ATMB)
of Civil Aviation Administration of China (CAAC)

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total Aircraft Type Count	Resultant Monitoring Burden (# airframes)
China	CAO	1	B744-10	3	2
		1	B744-5	4	2
		1	B747CL	2	2
	CBJ	1	A320	23	2
		1	B737	1	1
		1	GALX	5	2
		1	GLF4	6	2
		1	GLF5	4	2
		2	HA4T	1	1
		1	H25B-800	5	2
	CCA	1	A318	1	1
		1	A320	73	2
		1	A330	23	2
		1	B737CL	32	2
		1	B737NX	95	2
		1	B744-5	1	1
		1	GLF4	1	1
		1	B772	10	2
		1	B767	5	2
		1	B752	12	2
		1	B744-10	9	2
		1	A340	6	2
	CDG	1	B737CL	12	2
		1	CRJ7	2	2
		1	B737NX	22	2
		1	CARJ	5	2
	CES	1	A306	10	2
		1	A320	126	2
		1	E135-145	10	2
		1	CARJ	5	2
		1	B737CL	18	2
		1	A346	5	2
		1	A340	5	2
		1	B767	3	2
		1	B737NX	60	2
		1	A330	20	2
	CFI	1	C560	2	2
		1	C56X	3	2
		1	C750	1	1
	CHB	1	A320	3	2
		1	B737CL	4	2
	CHH	1	A330	5	2
		1	A346	3	2
		1	B737CL	16	2
		1	B737NX	66	2
		1	B767	3	2
	CKK	1	B744-10	2	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total Aircraft Type Count	Resultant Monitoring Burden (# airframes)
China		1	B772	3	2
		1	MD11	6	2
	CQH	1	A320	17	2
	CQN	1	A320	7	2
	CSC	1	A320	45	2
		1	A330	2	2
		1	E135-145	3	2
	CSH	1	B737NX	37	2
		1	H25B-800	1	1
		1	B767	7	2
		1	B752	10	2
	CSN	1	A320	154	2
		1	B737CL	25	2
		1	B737NX	81	2
		1	B744-10	2	2
		1	B752	18	2
		1	A330	17	2
		1	MD90	13	2
		1	E135-145	6	2
		1	B772	4	2
		1	B772	10	2
		1	A306	5	2
	CSS	1	B752	1	1
	CSZ	1	B737CL	9	2
		1	B737NX	43	2
		1	A320	38	2
	CUA	1	B737NX	8	2
	CXA	1	B737NX	54	2
		1	B752	8	2
	CYZ	1	B737CL	16	2
	DER	1	H25B-800	2	2
	DKH	1	A320	16	2
	EPA	1	B737CL	5	2
	GCR	1	E135-145	20	2
		1	E170-190	25	2
	GDC	1	B737NX	3	2
	GSC	1	B744-10	1	1
	GWL	1	B744-10	4	2
	HBH	1	A320	1	1
		1	E135-145	2	2
	HXA	1	CARJ	4	2
	HZX	1	F900	1	1
		2	FA7X	1	1
	JAE	1	B744-10	6	2
	KNA	1	B737NX	5	2
	KPA	1	E170-190	5	2
	LKE	1	B737NX	7	2
	OKA	1	B737CL	2	2
		1	B737NX	3	2
	SHQ	1	B752	2	2
		1	MD11	4	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total Aircraft Type Count	Resultant Monitoring Burden (# airframes)
	UEA	1	A320	6	2
	UNA	1	A318	1	1
		1	LJ60	1	1
		2	F2TH	1	1
		1	GALX	3	2
	YZR	1	B737CL	8	2
		1	B744-10	3	2
Total China				**1525**	**195**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total Aircraft Type Count	Resultant Monitoring Burden (# airframes)
DPRK	KOR	2	IL62	4	3
		2	IL76	1	1
		2	T134	1	1
		1	T154	1	1
		2	T204	1	1
Total DPRK				**8**	**7**

China RMA Grand Total *(China + DPRK)*	Total Aircraft Type Count	Resultant Monitoring Burden
	1533	**202**

JCAB RMA – Japan Civil Aviation Bureau

Responsible State	Operator	MMR Category (1, 2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Japan	ADO	1	B737CL	6	2
		1	B767	3	2
	AJX	1	B767	31	2
	ANA	1	A320	29	2
		1	B744-5	1	1
		1	B744-10	12	2
		1	B767	60	2
		1	B772	23	2
		1	B773	26	2
	ANK	1	A320	24	2
		1	B737CL	19	2
		1	B737NX	28	2
	FDA	1	E170-190	3	2
	IBX	1	CARJ	4	2
		1	CRJ7	2	2
	JAL	1	A306	22	2
		1	B737NX	30	2
		1	B744-5	12	2
		1	B744-10	31	2
		1	B767	49	2
		1	B772	26	2
		1	B773	20	2
		1	MD80	9	2
		1	MD90	16	2
	JAZ	1	B744-5	12	2
		1	B744-10	17	2

Responsible State	Operator	MMR Category (1, 2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Japan	JEX	1	B737CL	19	2
		1	B737NX	30	2
		1	MD80	9	2
	JTA	1	B737CL	23	2
	NCA	1	B744-10	8	2
	NXA	1	B737CL	19	2
	SFJ	1	A320	4	2
	SKY	1	B737NX	13	2
	SNJ	1	B737CL	9	2
	IGA	1	C560	1	1
	IGA	1	C525	1	1
	IGA	1	C525	1	1
	IGA	1	C525	1	1
		1	C560	1	1
	X	1	CARJ	9	2
		1	E170-190	7	2
	X	1	C560	2	2
	X	1	C560	1	1
	IGA	1	C680	1	1
		2	C25A	2	2
	IGA	2	C25A	1	1
	IGA	2	C25A	2	2
		2	C510	1	1
	IGA	2	LJ31	1	1
	IGA	2	C25A	1	1
	IGA	2	C25A	1	1
	IGA	3	B350	1	1

Responsible State	Operator	MMR Category (1, 2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
	YAY	1	GLEX	2	2
		1	GLF4	2	2
	YAY	1	GLF5	2	2
	MIL	1	B744-5	2	2
		1	B767(KC-767)	4	2
Total Japan				**696**	**102**

JCAB RMA Grand Total	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
	696	**102**

MAAR – Monitoring Agency for the Asia Region (AEROTHAI)

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Bangladesh	BBC	1	A310	3	2
		1	B737NX	2	2
		1	DC10	5	2
		3	F28	3	3
	GMG	1	MD80	2	2
Total Bangladesh				**15**	**11**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Cambodia	PMT	2	B732	1	1
		1	MD80	1	1
Total Cambodia				**2**	**2**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Hong Kong, China	AHK	1	A306	8	2
	CPA	1	A330	31	2
		1	A340	15	2
		1	B747CL	5	2
		1	B744-5	14	2
		1	B744-10	28	2
		1	B772	5	2
		1	B773	30	2
	CRK	1	B737NX	3	2
		1	B737CL	3	2
	HKE	1	B737NX	6	2
	HDA	1	A320	14	2
		1	A330	17	2
	PJS	1	CL604	1	1
		1	GLF5	1	1
	TAG	2	BD700	2	2
		1	CL605	1	1
	MTJ	2	GLF2	5	3
		1	GLF4	3	2
		1	GLF5	6	2

Total Hong Kong, China	198	38

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
India	AIC	1	A310-GE	10	2
		1	A320	70	2
		1	A330	2	2
		2	B732	6	4
		1	B744-10	6	2
		1	B772	12	2
		1	B773	9	2
	AXB	1	B737NX	22	2
	BDA	2	B732	4	3
		1	B752	4	2
	GOW	1	A320	8	2
	IGO	1	A320	28	2
	JAI	1	A330	12	2
		1	B737NX	54	2
		1	B773	10	2
	KFR	1	A320	23	2
		1	A330	5	2
	SEJ	1	B737NX	22	2
	IGA	-	-	77	77
Total India				**384**	**116**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Macao, China	AMU	1	A320	14	2
		1	A306	2	2
	VVM	1	B767	3	2
	IGA	-	-	7	7
Total Macao, China				**26**	**13**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
Malaysia	AXM	1	A320	48	2
	MAS	1	A330	14	2
		1	B737CL	37	2
		1	B737NX	3	2

		1	B744-10	12	2
		1	B772	17	2
	XAX	1	A330	5	2
		1	A340	2	2
	IGA	-	-	3	3
Total Malaysia				**141**	**19**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Myanmar	JAB	1	F100	2	2
		1	A310	2	2
	MMA	1	F100	1	1
		1	A320	2	2
Total Myanmar				**7**	**7**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Nepal	RNA	1	B752	2	2
Total Nepal				**2**	**2**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Pakistan	ABQ	1	A320	5	2
	PIA	1	A310	12	2
		1	B737CL	6	2
		1	B747CL	5	2
		1	B772	6	2
		1	B773	3	2
	SAI	2	B732	12	8
	IGA	-	-	6	6
Total Pakistan				**55**	**26**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Philippines	CEB	1	A320	21	2
	EZD	1	A320	3	2
	GAP	2	B732	6	4
	PAL	1	A320	22	2
		1	A330	8	2
		1	A340	3	2
		1	B773	2	2
		1	B744-10	5	2
	IGA	-	-	5	5
Total Philippines				**75**	**23**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Singapore	JEC	1	B747CL	2	2
	JSA	1	A320	10	2
	SIA	1	A330	19	2
		1	A345	5	2
		1	B744-10	9	2
		1	B772	45	2
		1	B773	29	2
		2	A380	12	8
	SLK	1	A320	19	2
	SQC	1	B744-10	11	2
	TGW	1	A320	10	2
Total Singapore				**171**	**28**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Sri Lanka	ALK	1	A320	5	2
		1	A330	4	2
		1	A340	5	2
Total Sri Lanka				**14**	**6**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
Taiwan	CAL	1	A330	17	2
		1	A340	6	2
		1	B737NX	6	2
		1	B744-10	33	2
	EVA	1	A330	11	2
		1	B744-10	15	2
		1	B773	14	2
		1	MD11	8	2
		1	MD90	1	1
	MDA	1	E170-190	8	2
	TNA	1	A320	7	2
	UIA	1	MD90	10	2
Total Taiwan				**136**	**23**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Thailand	AIQ	1	A320	14	2
		1	B737CL	5	2
	BKP	1	A320	9	2
	NOK	1	B737CL	6	2
	OEA	1	B747CL	6	2
		1	MD80	5	2
	THA	1	A300	15	2
		1	A306	2	2
		1	A330	20	2
		1	A345	4	2
		1	A346	6	2
		1	B737CL	9	2
		1	B744-5	3	2
		1	B744-10	15	2
		1	B772	14	2
		1	B773	9	2
	IGA	-	-	5	5
Total Thailand				**147**	**37**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Vietnam	HVN	1	A320	31	2
		1	A330	9	2
		1	B772	10	2
		2	F70	2	2
	PIC	1	A320	1	1
		1	B737CL	5	2
Total Vietnam				**58**	**11**

MAAR Grand Total *(Bangladesh + Cambodia + Hong Kong + India + Macao + Malaysia + Myanmar + Nepal + Pakistan + Philippines + Singapore + Sri Lanka + Taiwan + Thailand + Vietnam)*	**Total # Airframes under Monitoring Group**	**Resultant Monitoring Burden**
	1,431	**362**

PARMO- Pacific Approvals Registry and Monitoring Organization (USA FAA)

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Fiji	FJI	1	[B736, B737, B738, B739]	3	2
		1	B744	2	2
		1	[B762, B763]	1	1
Total Fiji				**6**	**5**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
New Zealand	ANZ	1	[A319, A320, A321]	12	2
		1	[B733, B734, B735]	16	2
		1	B744	7	2
		1	[B762, B763]	5	2
		1	B772	8	2
	PBN	1	[B736, B737, B738, B739]	10	2
	IGA	1	GLF4	1	1
	IGA	3	WW24	1	1
	IGA	1	[B733, B734, B735]	1	1
Total New Zealand				**61**	**15**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Vanuatu	AVN	1	[B733, B734, B735]	1	1
		1	[B736, B737, B738, B739]	1	1
Total Vanuatu				**2**	**2**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Republic of Korea	AAR	1	[A319, A320, A321]	24	2
		1	[A332, A333]	7	2
		1	B744	12	2
		1	[B762, B763]	8	2
		1	B772	10	2
	KAL	1	[A30B, A306]	8	2
		1	[A332, A333]	19	2
		2	A388	1	1
		1	[B736, B737, B738, B739]	31	2
		1	B744	44	2
		1	B772	18	2
		1	B773	5	2
	IGA	2	GLEX	1	1
Total Republic of Korea				**188**	**26**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Canada	ACA	1	[A332, A333]	8	2
		1	[B762, B763]	30	2
		1	B772	6	2
		1	B773	12	2
		1	[E170, E190]	60	2
	IGA	2	[LJ35, LJ36]	1	1
	IGA	1	CL60	3	3
	IGA	2	GLEX	1	1
	IGA	3	C680	1	1
	IGA	2	[FA50, FA50EX]	2	2
	IGA	2	[F900, F900EX]	1	1
	WJA	1	[B736, B737, B738, B739]	81	2
Total Canada *(Asia/Pacific operations only)*				**206**	**21**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Mexico	AMX	1	B772	4	2
	IGA	1	GLF4	1	1
	IGA	1	GLF5	1	1
	IGA	2	[F900, F900EX]	1	1
Total Mexico *(Asia/Pacific operations only)*				**7**	**5**

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
United States	AAH	2	B732	1	1
	AAL	1	B752	124	2
		1	[B762, B763]	73	2
		1	B772	47	2
	ASA	1	[B736, B737, B738, B739]	82	2
	ATN	2	[DC86, DC87]	15	9
	AWE	1	[A319, A320, A321]	206	2
		1	[A332, A333]	11	2
		1	B752	36	2
	BJS	2	LJ45	1	1
	BSK	1	[B736, B737, B738, B739]	5	2
	CKS	1	[B741, B742, B743]	15	2
		1	B744	2	2
	COA	1	[B736, B737, B738, B739]	192	2
		1	B752	41	2
		1	B753	17	2
		1	[B762, B763]	10	2
		1	B764	16	2
		1	B772	20	2
	DAL	1	B752	147	2
		1	[B762, B763]	74	2
		1	B764	21	2
		1	B772	16	2
	EIA	1	[B741, B742, B743]	11	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
United States	EJM	2	[F900, F900EX]	2	1
		2	GALX	2	2
		1	GLF4	7	2
	FDX	1	B752	20	2
		1	DC10	73	2
		1	MD11	58	2
	GTI	1	[B741, B742, B743]	11	2
		1	B744	8	2
	HAL	1	[B762, B763]	18	2
	KAI	1	GLF4	4	2
		1	GLF5	1	1
	LXJ	3	CL30	10	10
		1	CL60	10	2
	MGE	1	[B721, B722]	1	2
	NAC	2	B732	1	1
	NAO	1	[B762, B763]	6	2
	NWA	1	[A332, A333]	20	2
		1	[B741, B742, B743]	10	2
		1	B744	10	2
		1	B752	32	2
		1	B753	11	2
	OAE	1	B752	3	2
	OPT	2	BE40	8	5
	OPT	2	C750	3	2
	PAC	1	B744	7	2
	RYN	1	B752	1	1
	SGB	2	B732	4	3
	SKW	1	CRJ7	64	2
	SOO	1	[B741, B742, B743]	11	2
	SWA	1	[B736, B737, B738, B739]	341	2
	TAG	1	GLF4	5	2
	TCF	1	[E170, E190]	58	2
	UAL	1	[A319, A320, A321]	152	2
		1	B744	26	2
		1	B752	97	2
		1	[B762, B763]	35	2
		1	B772	52	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
United States	UPS	1	B744	10	2
		1	B752	75	2
		1	[B762, B763]	32	2
		1	MD11	37	2
	VNR	2	P180	1	1
	WOA	1	DC10	10	2
		1	MD11	14	2
	IGA	1	[A319, A320, A321]	1	1
	IGA	1	[B736, B737, B738, B739]	3	3
	IGA	1	[B762, B763]	4	4
	IGA	1	[E135, E145]	6	6
	IGA	2	[F900, F900EX]	21	21
	IGA	2	[FA50, FA50EX]	11	11
	IGA	2	[LJ35, LJ36]	17	17
	IGA	2	ASTR	8	8
	IGA	3	B350	2	2
	IGA	1	B74S	1	1
	IGA	2	BE40	1	1
	IGA	2	C25A	2	2
	IGA	2	C25B	3	3
	IGA	3	C441	1	1
	IGA	3	C501	3	3
	IGA	3	C510	2	2
	IGA	2	C525	7	7
	IGA	2	C550	10	10
	IGA	1	C560	10	10
	IGA	2	C56X	3	3
	IGA	3	C680	2	2
	IGA	2	C750	23	23
	IGA	3	CL30	4	4
	IGA	1	CL60	23	23
	IGA	3	EA50	1	1
	IGA	2	F2TH	9	9
	IGA	2	FA10	4	4
	IGA	2	FA20	1	1
	IGA	3	FA7X	2	2
	IGA	3	G150	1	1

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
United States	IGA	2	GALX	10	10
	IGA	2	GLEX	24	24
	IGA	2	GLF2	3	3
	IGA	2	GLF3	12	12
	IGA	1	GLF4	59	59
	IGA	1	GLF5	43	43
	IGA	2	H25B	7	7
	IGA	2	J328	1	1
	IGA	1	L101	1	1
	IGA	2	LJ31	3	3
	IGA	2	LJ45	1	1
	IGA	2	LJ55	1	1
	IGA	1	LJ60	3	3
	IGA	1	MD80	2	2
	IGA	2	PRM1	3	3
	IGA	2	SBR1	1	1
	IGA	3	TBM7	1	1
	IGA	3	WW24	5	5
Total United States *(Asia/Pacific operations only)*				**2910**	**514**

PARMO Grand Total ***(Fiji + New Zealand + Vanuatu + Republic of Korea + Asia/Pacific operations conducted by North America operators (Canada + Mexico + United States)***	**Total # Airframes under Monitoring Group**	**Resultant Monitoring Burden**
	3380	**588**

Overall Asia/Pacific – Estimated Total Monitoring Burden

Asia/Pacific Region - Grand Total ***(AAMA + China RMA + JCAB RMA+ MAAR + PARMO)***	**Total # Airframes under Monitoring Group**	**Resultant Monitoring Burden**
	7274	**1385**