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# INTERNATIONAL CIVIL AVIATION ORGANIZATION
# ASIA AND PACIFIC OFFICE

# REPORT OF THE THIRTY-FOURTH MEETING OF THE ICAO RVSM IMPLEMENTATION TASK FORCE (RVSM/TF/34)

BEIJING, CHINA

1 – 3 December 2008

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

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**History of the Meeting**



**Report of RVSM TF/34**



**Appendices**

## 1.1 Introduction

1.1.1 The thirty-fourth meeting of ICAO Reduced Vertical Separation Minimum Implementation Task Force (RVSM/TF/34) was held at the King Wing Hotel, Beijing, China from 1 to 3 December 2008. The objective of the meeting was to conduct the 12-month post implementation review of China RVSM.

## 1.2 Attendance

1.2.1 RVSM/TF/34 was attended by 27 participants from China, Hong Kong China, DPR Korea, Japan, Kyrgyzstan, Philippines, Republic of Korea, Russian Federation, Singapore, United States and IATA. A complete list of participants is at **Appendix A** to this report.

## 1.3 Officers and Secretariat

1.3.1 Mr. Kuah Kong Beng, Chief Air Traffic Control Officer, Civil Aviation Authority of Singapore (CAAS) served as the Chairperson of the Task Force.

## 1.4 Opening of RVSM/TF/34

1.4.1 Mr. Kuah Kong Beng welcomed participants. He informed the meeting that the ICAO Secretariat was unable to attend the meeting due to the sudden closure of airports in Thailand. He hoped that the situation would improve soon so that normalcy could resume. Mr. Kuah informed the meeting that RVSM/TF/34 would be the final milestone for the Task Force. The Task Force had been together for 10 years and had worked very hard over this long period of time to implement a significant ATM initiative in the Asia and Pacific Regions. RVSM operations were implemented in the Western Pacific and South China Sea in 2000, in the Bay of Bengal in 2003, in Japan (domestic airspace) and the Republic of Korea airspace in 2005 and finally in China airspace in 2007. As such, RVSM operations were implemented throughout the Asia and Pacific Regions with the exception of the Pyongyang and the Ulaanbaatar FIRs.

1.4.2 Mr. Kuah added that the successful implementation of RVSM operations was due to the diligence and understanding as well as the collaborative and cooperative spirit of the members of the Task Force. He said that the Task Force would complete its assignment to implement RVSM operations to increase efficiency. And in doing so, the Task Force had also contributed to the environment by reducing the greenhouse gas emissions.

1.4.3 Mr. Wang Liya, Deputy Director General of Air Traffic Management Bureau (ATMB), General Administration of Civil Aviation of China (CAAC) expressed his warm welcome to all participants to the meeting, on behalf of Minister Li Jiaxiang of CAAC. He was very happy to meet them again in Beijing, one year after China RVSM implementation.

1.4.4 Mr. Wang thanked the Regional Office for playing a positive role last year in helping China coordinate with other States and organizations in Asia and Pacific Regions through the Task Force. Experts from IATA, IFALPA and the United States Federal Aviation Administration (FAA) also provided technical support by developing technical materials and helped China establish the regional monitoring agency (RMA). At the same time, all neighboring States showed their understanding and provided good support in the endorsement of new letters of agreements (LOAs).

1.4.5 Mr. Wang reminded everyone that China RMA had been authorized by ICAO to start monitoring and evaluating China RVSM airspace. ATMB hoped to continue the close cooperative relationship with everyone concerned in future RMA operations and activities, in order to ensure long-term stable RVSM operations in China airspace.

## 1.5 Documentation and Working Language

1.5.1 The working language of the meeting as well as all documentation was in English.

1.5.2 Eight Working Papers and five Information Papers were presented to the meeting. A list of papers is at **Appendix B** to this Report.

## Agenda Item 1: Adoption of Agenda

1.1 The meeting reviewed the provisional agenda proposed by the Chairman for RVSM/TF/34 and adopted the following agenda.

Agenda Item 1: Adoption of Agenda

Agenda Item 2: Operational Considerations

Agenda Item 3: Issues Relating to Airworthiness and Approval of Aircraft

Agenda Item 4: Safety and Airspace Monitoring Considerations

Agenda Item 5: Implementation Management Considerations

Agenda Item 6: Review of Action Items

Agenda Item 7: Other Business

## Agenda Item 2: Operational Considerations

Review of RVSM/TF/33

2.1 The meeting reviewed the discussion at RVSM/TF/33 (April 2008, Hangzhou) as summarized below.

*Hong Kong, China*

2.2 Hong Kong, China reported to RVSM/TF/33 that during the first month of RVSM implementation by China, there had been cases where Hong Kong ATC had to descend the aircraft below FL 280 as the aircraft did not meet the RVSM approval requirement. Operations had been smooth since then.

*Russian Federation*

2.3 At RVSM/TF/33, the Russian Federation, while recognizing the difficulties in China, requested China to consider establishing more entry/exit points between the two States. IATA supported the request for more routes so that airspace capacity could be increased.

*Lateral Offset Procedure in Radar Airspace in China*

2.4 If a lateral offset procedure was required in radar airspace as an interim measure, while the underlying causes were being addressed, IATA had requested China to clarify and publish the interim procedure with an indication of the ATC clearance limit, and then ensure that it was applied in accordance with the published procedure.

*Post-Implementation RVSM Safety Assessment*

2.5 RVSM/TF/33 discussed whether an event involving an aircraft being 100 ft away from its assigned flight level resulting from an error, should be considered an large height deviation (LHD), noting that the plain language definition of an LHD formulated by the seventh meeting of the

Regional Airspace Safety Monitoring Advisory Group (RASMAG/7, June 2007) requires the aircraft to 300 ft or more away from the expected level.

*Establishment of China Regional Monitoring Agency*

2.6 RVSM/TF/33 noted that China had made progress in establishing RMA as follows:

- ATMB established an RVSM technical group in 2006;
- China RMA would be authorized from CAAC by May 2008; and
- Following endorsement by the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG), China RMA would assume the duty.

## Agenda Item 3: Issues Relating to Airworthiness and Approval of Aircraft

*No matters of concern were raised for discussion under this agenda item.*

## Agenda Item 4: Safety and Airspace Monitoring Considerations

RVSM Safety Assessments for Asia/Pacific Region

4.1 The meeting reviewed a summary of the most up-to-date safety assessments of RVSM operations in the airspaces of the Asia and Pacific Regions, as prepared by the RMAs and reviewed by RASMAG/9 (May 20008, Bangkok). Safety assessments are conducted by Asia/Pacific RMAs on a periodic basis utilizing the continuous LHD reporting, including monthly "NIL LHD reports", and the annual December traffic sample data (TSD) required by APANPIRG Conclusion 16/4. Safety assessments are submitted by RMAs to RASMAG for review.

*Technical and Operational Risk*

4.2 It was apparent to RASMAG/9 that performance in terms of technical risk was meeting a good standard throughout all areas of Asia and Pacific Regions. In no case had the technical target level of safety (TLS) been exceeded and in general the technical TLS was achieved easily.

4.3 In terms of operational risk, however, the TLS was not being achieved in some areas. A consistent theme in the analysis of these errors was that of difficulties in ATC-to-ATC coordination, which accounted for a large proportion of LHD. RASMAG continues to encourage all States to be aware that this ground-ground communication interface exhibited weaknesses in all the regional examples examined. In the wider context, the Global RMAs meeting (Montreal, May 2008) found that the most common reason for LHDs across all RMAs was the ATC-to-ATC coordination error.

*Sovereign Airspaces of China*

4.4 RASMAG/9 noted that, in the case of China, the estimates of both technical and overall risks were found to satisfy the agreed TLS value of no more than $2.5\times10^{-9}$ and $5.0\times10^{-9}$ fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 300 m (1 000 ft) and to all causes, respectively. Of note were the values for technical and operational risk which were comparatively smaller than those obtained in the pre-implementation safety

assessment, indicating that both technical and total risks had decreased after the implementation of RVSM.

*Fukuoka FIR Airspace*

4.5 RASMAG/9 noted that the Fukuoka FIR was not satisfying the regional RVSM TLS, however, the trend was stable and had not changed over the period since RASMAG/8 (December 2007, Bangkok). RASMAG/9 noted that causes of many of the LHDs resulting from ATC Unit to ATC Unit transfers were due to circumstances occurring in neighbouring FIRs while the LHD itself was exhibited in the Fukuoka FIR. JCAB RMA had made JCAB aware of these circumstances and a number of initiatives had commenced in order to manage the situation.

*Western Pacific/South China Sea Area*

4.6 Also, RASMAG/9 noted that both technical and total risks from the available TSD and LHD reports satisfied the agreed TLS value of no more than $2.5 \times 10^{-9}$ and $5.0 \times 10^{-9}$ fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 1 000 ft and to all causes, respectively.

*RVSM Non-Approved Operators Using RVSM Airspace*

4.7 The checks in conducting monitoring of operator compliance with State approval revealed that, in general, operator compliance was considered to be very high. Some instances of apparent non-compliance resulting from likely systematic causes, however, were observed and a small number of possible instances of operator non-compliance were currently under investigation by PARMO.

4.8 The meeting expressed serious ongoing concern at the number of flights that were apparently using RVSM airspace when they did not have the State approvals to do so. Questions were raised about the legal responsibility of an air navigation service provider (ANSP) who knew, through the RMA work in this area for example, that some identified airframes were filing "W", i.e. RVSM approved, when they were not authorized to do so but took no action to apply the greater vertical separation standard. In agreeing that this issue required regulatory intervention, RASMAG/9 recognized that the Australian approach to remove the 'W' was appropriate for the 'non-exclusive' RVSM airspace model applied by Australia, but noted that application of this method in other airspaces required further study.

Progress of China RMA Establishment

*Approval for Establishment of China APANPIRG RMA*

4.9 China reported to the meeting that APANPIRG/19 supported the recommendation from RASMAG that the China RMA be endorsed as an APANPIRG RMA, adopting *Conclusion 19/14 – Approval of China RMA as Asia Pacific RMA* to approve China RMA. ICAO State Letter Ref.: T 3/10.0, T3/10.1.17 – AP121/08 (ATM), dated 12 September 2008, had bee circulated in this respect.

*Progress of China RMA Establishment*

4.10 The meeting was informed that China RMA had completed the GPS monitoring system and post-flight data processing training with the assistance from the FAA Technical Center and CSSI, Inc. China RMA had started to provide aircraft height keeping performance monitoring

services to the domestic Chinese airlines, and had monitored up to six aircraft of four monitoring groups from three different domestic operators.

4.11 China informed the meeting that China RMA had continued efforts to avail itself for long-term monitoring. China RMA considered that the Long Term Height Monitoring Actions drafted by RASMAG/8 formed an important component of the regional impact statement called for under APANPIRG Conclusion 18/4. In order to progress these matters, China RMA enforced a minimum monitoring requirement. After determining the potential monitoring burden posed to the Chinese domestic operators with which China RMA provides service, a monitoring burden list and a timetable were developed on the basis of monitoring system infrastructure China RMA currently has. The meeting also noted that considering the necessity of long-term monitoring and the wide coverage of geographical area, China RMA had started the research of the feasibility and the solution of using ground-based height monitoring.

4.12 Also, China informed the meeting that an Advisory Notice had been drafted since June 2008 to further clarify and regulate relevant work in RVSM safety assessment and aircraft monitoring at China RMA and other departments in CAAC.

4.13 In order to educate airspace users as to the roles and functions of an RMA, and coordinate with the domestic operators and CAAC inspectors so that a long-term monitoring program was advancing, a seminar was held on 22 and 23 October 2008 in Kunming, China. Participants from CAAC, ATMB, regional administration bureau, regional ATMB and domestic Chinese operators were invited. In this seminar, the following topics were introduced and discussed:

a) Overview of China RMA's Duties and Responsibilities and Safety Assessment Procedures; and

b) Establishment of new work flow of aircraft RVSM approval information registration and aircraft height keeping performance monitoring in China RMA.

4.14 China informed the meeting that a nation-wide point of contacts in RVSM relevant work were established after the seminar. The aircraft RVSM approval information registration and aircraft height keeping performance monitoring program had been progressing smoothly. The Advisory Notice was going to be issued before the end of 2008.

4.15 It was noted that China RMA established a website at www.chinarma.cn . This website provides an efficient way to publish the aircraft approval data, height-monitoring data and the progress China RMA work.

4.16 CAAC issued an AIP concerning China RVSM implementation in 2007. After one year operation and China RMA establishment, part of the content had been changed. CAAC would update it and publish a new version before the end of December, 2008.

4.17 It was further noted that IATA drew the attention of RASMAG/9 to the fact that following the implementation of RVSM in China using a unique flight level allocation (FLAS), operational errors between a Chinese FIR and an adjacent FIR applying the traditional ICAO RVSM FLAS could result in the aircraft being misaligned by 100 ft. After RASMAG/9, China RMA undertook further research into this situation and collected radar data for August 2008 from the Beijing, Shanghai and Guangzhou FIR.

4.18 All the data were processed to obtain an Assigned Altitude Deviation histogram, which was used to recalculate the parameters of Pz in the collision risk model to evaluate the effects

brought by 100 ft. These studies demonstrated that, based on quantitative analysis, fitting distribution and technical risk comparison, the misalignment of 100 ft does not have extra influence on safety performance for the sovereign Chinese airspace. Accordingly, China RMA does not recommend reporting these events as LHDs. China RMA would continue to monitor the situation and implement remedial measures if they were considered necessary. The RASMAG/10 meeting in December 2008 would also be informed of these outcomes.

4.19 With regard to ground-based height monitoring facilities, IATA requested China to consider the use of ADS-B (Out) to minimize the need to re-route aircraft over the ground-based facility to monitor the height-keeping performance of the aircraft. The meeting, however, noted that more details would be required on the use of ADS-B (Out) for height monitoring and requested China to consider the usage when details are available.

Long-Term Height Monitoring of China RVSM Airspace

*Long-Term Monitoring Progress*

4.20 China informed the meeting that China RMA enforced a minimum monitoring requirement (MMR) to ensure 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). Based on the China MMR and the monthly-updated aircraft RVSM approval information, a monitoring list has been developed.

4.21 China reported to the meeting that China RMA obtained the monitoring results from the Pacific Approval Registry and Monitoring Organization (PARMO), the Monitoring Agency for Asia Region (MAAR) and Eurocontrol for the past two years. China RMA used these data, together with the China RMA's own monitoring results and the MMR, to develop a monitoring burden list (Tables 1 and 2 below) and a timetable.

Table 1 Monitoring Burden List Description:

| Column Name | Description |
|---|---|
| OPERATOR | ICAO designator of the operator |
| MGROUP | designator of Monitoring Group in MMR |
| PCOUT | Total number of aircrafts of a certain Operator- Monitoring Group |
| RCOUNT | Total number of aircrafts required to be monitored according to MMR |
| MCOUNT | effective monitoring records of a certain Operator- Monitoring Group in the database (including the monitoring results from PARMO, MAAR, EUROCONTROL and China RMA) |
| COUNT | Total number of aircrafts to be monitored (the final monitoring burden) |
| MCATEGORY | Monitoring Category in the Minimum Monitoring Requirement |

Table 2 Monitoring Burden List (2008-10-27):

| OPERATOR | MGROUP | PCOUNT | RCOUNT | MCOUNT | COUNT | MCATEGORY |
|---|---|---|---|---|---|---|
| CCA | A330 | 19 | 2 | 13 | 0 | A |
| CCA | A340 | 6 | 2 | 6 | 0 | A |
| CCA | A320 | 42 | 2 | 0 | 2 | A |
| CCA | B737(Classic) | 38 | 2 | 0 | 2 | A |
| CCA | B737 (NG) | 71 | 2 | 0 | 2 | A |
| CCA | B744-5 | 3 | 3 | 2 | 0 | A |

| OPERATOR | MGROUP | PCOUNT | RCOUNT | MCOUNT | COUNT | MCATEGORY |
|---|---|---|---|---|---|---|
| CCA | B772 | 10 | 2 | 0 | 2 | A |
| CCA | B752 | 13 | 2 | 0 | 2 | A |
| CCA | B744-10 | 9 | 8 | 2 | 0 | A |
| CCA | B767 | 9 | 2 | 2 | 0 | A |
| CDG | B737(Classic) | 12 | 2 | 0 | 2 | A |
| CDG | CRJ-700 | 2 | 2 | 0 | 2 | A |
| CDG | B737 (NG) | 21 | 2 | 0 | 2 | A |
| CDG | CARJ | 5 | 2 | 0 | 2 | A |
| CES | A340 | 6 | 2 | 5 | 0 | A |
| CES | MD90 | 9 | 2 | 0 | 2 | A |
| CES | E135-145 | 10 | 2 | 0 | 2 | A |
| CES | CARJ | 5 | 2 | 0 | 2 | A |
| CES | B767 | 3 | 2 | 0 | 2 | A |
| CES | B737 (NG) | 40 | 2 | 0 | 2 | A |
| CES | B737(Classic) | 23 | 2 | 0 | 2 | A |
| CES | A330 | 19 | 2 | 0 | 2 | A |
| CES | A320 | 99 | 2 | 0 | 2 | A |
| CES | A300 | 10 | 2 | 0 | 2 | A |
| CES | A346 | 5 | 2 | 5 | 0 | A |
| CFI | C750 | 1 | 1 | 1 | 0 | B |
| CFI | C560 | 2 | 2 | 0 | 2 | A |
| CHB | B737(Classic) | 4 | 2 | 0 | 2 | A |
| CHH | A330 | 4 | 2 | 2 | 0 | A |
| CHH | B767 | 3 | 2 | 0 | 2 | A |
| CHH | B737 (NG) | 39 | 2 | 0 | 2 | A |
| CHH | B737(Classic) | 23 | 2 | 0 | 2 | A |
| CKK | MD11 | 6 | 2 | 0 | 2 | A |
| CKK | B744 | 2 | 2 | 0 | 2 | A |
| CQH | A320 | 9 | 2 | 0 | 2 | A |
| CQN | A320 | 4 | 2 | 0 | 2 | A |
| CSC | A320 | 36 | 2 | 0 | 2 | A |
| CSC | E135-145 | 3 | 2 | 0 | 2 | A |
| CSH | B737 (NG) | 31 | 2 | 0 | 2 | A |
| CSH | H25B-800 | 1 | 1 | 0 | 1 | B |
| CSH | B767 | 7 | 2 | 0 | 2 | A |
| CSH | B752 | 10 | 2 | 0 | 2 | A |
| CSN | B772 | 10 | 2 | 9 | 0 | A |
| CSN | MD90 | 13 | 2 | 0 | 2 | A |
| CSN | MD80 | 12 | 2 | 0 | 2 | A |
| CSN | B752 | 20 | 2 | 0 | 2 | A |
| CSN | B737 (NG) | 71 | 2 | 0 | 2 | A |
| CSN | B737(Classic) | 25 | 2 | 0 | 2 | A |

| OPERATOR | MGROUP | PCOUNT | RCOUNT | MCOUNT | COUNT | MCATEGORY |
|---|---|---|---|---|---|---|
| CSN | A300 | 6 | 2 | 0 | 2 | A |
| CSN | B744-10 | 2 | 2 | 0 | 2 | A |
| CSN | A330 | 12 | 2 | 0 | 2 | A |
| CSN | A320 | 112 | 2 | 0 | 2 | A |
| CSZ | A320 | 20 | 2 | 2 | 0 | A |
| CSZ | B737 (NG) | 42 | 2 | 0 | 2 | A |
| CSZ | B737(Classic) | 9 | 2 | 2 | 0 | A |
| CUA | B737 (NG) | 4 | 2 | 0 | 2 | A |
| CXA | B737(Classic) | 5 | 2 | 0 | 2 | A |
| CXA | B737 (NG) | 36 | 2 | 0 | 2 | A |
| CXA | B752 | 9 | 2 | 0 | 2 | A |
| CYZ | B737(Classic) | 11 | 2 | 0 | 2 | A |
| DBH | A320 | 1 | 1 | 0 | 1 | A |
| DBH | E135-145 | 2 | 2 | 0 | 2 | A |
| DER | GLF4 | 3 | 2 | 1 | 1 | A |
| DER | GALX | 5 | 3 | 0 | 3 | B |
| DER | GLF5 | 1 | 1 | 0 | 1 | A |
| DER | H25B-800 | 7 | 5 | 0 | 5 | B |
| DER | A320 | 16 | 2 | 0 | 2 | A |
| DKH | A320 | 8 | 2 | 0 | 2 | A |
| DXH | A320 | 5 | 2 | 2 | 0 | A |
| EPA | B737(Classic) | 2 | 2 | 0 | 2 | A |
| GCR | E135-145 | 9 | 2 | 0 | 2 | A |
| GCR | E190 | 5 | 3 | 0 | 3 | B |
| GDC | B737 (NG) | 3 | 2 | 2 | 0 | A |
| GWL | B744-10 | 4 | 2 | 2 | 0 | A |
| HXA | CARJ | 3 | 2 | 0 | 2 | A |
| HZX | F900 | 1 | 1 | 0 | 1 | B |
| JAE | B744 | 6 | 2 | 2 | 0 | A |
| KPA | E190 | 1 | 1 | 0 | 1 | B |
| LKE | B737 (NG) | 6 | 2 | 2 | 0 | A |
| OKA | B737(Classic) | 4 | 2 | 0 | 2 | A |
| OKA | B737 (NG) | 4 | 2 | 0 | 2 | A |
| SHQ | B752 | 2 | 2 | 0 | 2 | A |
| SHQ | MD11 | 4 | 2 | 0 | 2 | A |
| UEA | A320 | 4 | 2 | 2 | 0 | A |
| UNA | F2TH | 1 | 1 | 0 | 1 | B |
| UNA | GALX | 2 | 2 | 0 | 2 | B |
| YZR | B737(Classic) | 6 | 2 | 0 | 2 | A |
| YZR | B744-10 | 1 | 1 | 0 | 1 | A |
| Total | | 1209 | 180 | 64 | 137 | |

4.33 China presented the meeting the Monitoring Schedule (2008-10-27) as included in **Appendix C** to this report.

4.34 The meeting noted that it was estimated from Table 2 above that there were more than 1 200 aircraft operating in the sovereign Chinese airspace that are within China RMA's responsibility, out of which 137 aircraft are to be monitored according to the schedule. Currently, China RMA has two sets of Enhanced GPS Monitoring Unit (EGMU) equipment for monitoring, and is able to monitor 4 to 8 aircraft per week. Following the initial plan should mean that China RMA is capable of completing the plan within one year. From then on, the monitoring burden will decrease. Therefore, China RMA was confident to achieve the goal of long-term monitoring.

4.35 China was of view that meeting the MMR was merely to reach a minimum requirement of monitoring. As the number of aircraft increases, the monitoring burden would grow. In addition, one set of EGMU can only monitor one flight each time which is of lower efficiency compared to ground based monitoring system. Another deficiency of the current monitoring infrastructure is that all the foreign flights flying in Chinese sovereign airspace can not be monitored at the same time. To achieve a higher level of height monitoring in RVSM airspace, China has started the research of the feasibility and the solution of using ground-based height monitoring.

*Monitoring - Problems and Concerns*

4.36 The meeting noted that CAAC drafted the MMR with reference to the MMR of MAAR, PARMO and Eurocontrol. It was not always easy to update the list of monitoring groups because the relevant data is not available from a single source or even necessarily widely published. With the development of aviation industry, it was found that some new aircraft types that are not included in the monitoring groups begin to operate in the RVSM airspace and there are not enough experience and data to decide the monitoring requirement for those new aircrafts. The meeting agreed that data particularly on new aircraft type should be shared globally among the RMAs so as to minimize duplication of the monitoring requirements.

Safety Monitoring Report from China Regional Monitoring Agency November 2007–October 2008

4.37 China presented the meeting with China RMA's periodic safety report which is distributed twice a year to CAAC and ICAO as in **Appendix D** to this report. The report contained a summary of LHD reports received by the China RMA for that time period and an update of the vertical collision risk for sovereign Chinese airspace is presented. All the analysis conducted was based on one month TSD collected in December 2007 and the latest 12-month LHD reports.

4.38 The periodic report from the China RMA demonstrated that RVSM operations in the sovereign airspace of China continued to satisfy the regional target level of safety.

Report on Activities of the RASMAG

4.39 The meeting reviewed the general activities of RASMAG/9 (May 2008, Bangkok) as below.

*Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific Region*

4.40 IATA noted that some examples of aircraft being misaligned by 100 ft had been reported to RVSM/TF/33 and were referred to RASMAG for consideration. IATA's concern arose because, as the misalignment is only 100 ft, it did not meet the 300 ft criterion of an LHD as defined under the RASMAG plain language definition of LHD and was therefore not eligible to be included in

the RVSM safety assessments. IATA considered that the extent of the deviation was irrelevant as the occurrence is a systemic problem that should be assessed under the RVSM collision risk model.

4.41 RASMAG/9 considered that as any individual occurrence of this type of event was eligible for resolution under normal State and airline safety management processes, there was no cause for concern in relation to current operations. RASMAG, however, recognized that there was absence of accurate information about the number and circumstances in which these types of events were occurring and the meeting agreed that efforts should be made to collect additional information to enable further study.

4.42 The meeting thanked China RMA for their additional efforts in investigating this issue noting, as described in paragraph 4.17 above, that the misalignment of 100 ft does not have extra influence on safety performance for the sovereign Chinese airspace and China RMA does not recommend reporting these events as LHDs.

4.43 United States informed RASMAG/9 that an examination of quality assurance data from Anchorage and Oakland from April 2006 through April 2008 showed that there were nine Category E events recorded. In eight of these cases, automated transfer of control was not yet implemented for use in these circumstances.

4.44 Noting the lack of reported Category E errors whilst automated data transfer was available compared to the number occurring when automated systems were not implemented, RASMAG/9 considered that many reported Category E events were likely to have been prevented had an automated transfer of control system been in use. RASMAG considered that if AIDC capabilities were implemented between all FIRs in the Asia/Pacific region, this would have an immediate positive benefit in terms of reduced ATC-to-ATC coordination errors and strongly encouraged States to consider accelerating AIDC implementation planning in order to achieve the direct safety benefits that would result.

## Agenda Item 5: Implementation Management Considerations

APANPIRG Activities – Outcomes of APANPIRG/19 in Relation to RVSM/TF

5.1 The meeting reviewed the summery of the outcomes of APANPIRG/19 in relation to RVSM/TF future direction.

*Review of RVSM Implementation in Asia and Pacific Regions*

5.2 Now that virtually all airspaces of the Regions have implemented RVSM and that the work of the RVSM/TF is very close to completion, APANPIRG/19 considered that the RVSM/TF could be dissolved. The dissolution would take effect after the one year review meeting of China RVSM implementation which is scheduled in December 2008, and any residual matters would be allocated to the respective ATS Coordination Groups or the ATM/AIS/SAR Sub-group for action. Accordingly, the meeting formulated Decision 19/5 – Dissolution of the RVSM/TF.

5.3 DPR Korea informed the RVSM/TF/34 meeting that RVSM operations would be implemented in the Pyongyang FIR in July 2009. As the RVSM Task Force would be dissolved after this one year review meeting, China informed the meeting that with the expertise and experience gained from China's implementation of RVSM, China would be providing the necessary technical support for RVSM implementation in the Pyongyang FIR. China suggested that General Administration of Civil Aviation of DPR Korea should make formal contact with ATMB, CAAC and

commence coordination with ICAO Bangkok Office. The meeting expressed its gratitude to China for the positive offer to assist in the RVSM implementation in the Pyongyang FIR.

*Amendments to ICAO Flight Plan*

5.4 In view of the many implications from substantial changes to ICAO flight plan format affecting a wide range of automated flight plan processing systems and the associated operating practices, APANPIRG/19 was of view that the transitioning process needed to be carefully planned taking into account compatibility with existing systems, human factors, training, cost and transition aspects. APANPIRG/19 agreed that there would be many actions necessary to ensure a streamlined regional implementation, including the development of a regional transition strategy and procedures for its implementation. In order to ensure that the matter would be appropriately addressed on a regional basis, APANPIRG/19 agreed to Decision 19/6 – Establishment of an ICAO Flight Plan & ATS Message Implementation Task Force and drafted preliminary terms of reference (TOR) accordingly.

*Draft Air Traffic Flow Management (ATFM) Communication Manual for the Asia/Pacific Regions*

5.5 APANPIRG/19 was provided the most recent draft of the now renamed *ATFM Communication Manual for the Asia Pacific Region*. The 18th meeting of APANPIRG ATM/AIS/SAR Sub-group (ATM/AIS/SAR/SG/18, June 2008) reviewed the draft ATFM Communication Manual and encouraged States to provide comments to the Regional Office by the end of August 2008.

*Proposal for the Establishment of the ATFM Task Force in North Asia*

5.6 To improve the efficiency of current ATFM procedures and strengthen cooperation among States in North Asia, a State considered the establishment of ATFM Task Force (ATFM/TF) under the auspices of the ATM/AIS/SAR/SG was necessary. APANPIRG/19 recognised that improvements of ATFM would be beneficial in this airspace but considered that the establishment of North Asia ATFM/TF would seem premature. APANPIRG/19 encouraged the State to take advantage of the normal ICAO processes and present the proposal to ATM/AIS/SAR/SG/19 during June 2009 in the usual way.

*Data Link Implementation in the Manila FIR*

5.7 APANPIRG/19 recognised that reduced separations as a result of seamless data link operations between adjacent airspaces were becoming more and more important in the situation of increasing fuel prices and environmental pressures. APANPIRG/19 urged the Philippines to consider appropriate steps for ADS/CPDLC data link services to be provided in the Manila FIR as soon as possible and developed *Conclusion 19/12 – Accelerated Data Link Implementation in the Manila Flight Information Region (FIR)* accordingly.

*Establishment of JCAB Regional Monitoring Agency (RMA)*

5.8 Japan has obtained budget approval, and commenced the technical specification design process and site surveys to commission ground-based Height Monitoring Unit (HMU) facilities.

**Agenda Item 6: Review of Action Items**

Task List for Implementation of RVSM by China and the Transition Arrangement Check List

6.1 The meeting reviewed and updated Task List as shown in **Appendix E** to this report. The meeting was pleased to confirm that all the tasks to introduce RVSM in China have been fully and successfully completed. The China RMA would take responsibility for ongoing safety monitoring in accordance with RASMAG requirements.

Terms of Reference of RVSM/TF

6.2 Further, the meeting reviewed the Terms of Reference of RVSM/TF as follows:

***Terms of Reference of the Task Force***

- *To develop strategic, benefits-driven implementation plans (based on cost benefit studies), in concert with airspace users, for RVSM operations within selected areas and airspace of the Asia/Pacific Region, ensuring inter-regional harmonization;*
- *To consider any amendments to RVSM guidance material that may be proposed by States and international organizations;*
- *To address any other matters as appropriate and relevant to the implementation of RVSM;*
- *The Task Force will include participation from States and International Organizations that are considering or involved with the implementation of RVSM; and*
- *The Task Force will report to the ATS/AIS/SAR Sub-Group.*

6.3 The meeting agreed that the Task Force had met all the Terms of Reference adopted by APANPIRG, recognizing with gratitude that the Terms of Reference had been fully accomplished by the cooperative interaction of affected States and airspace users over the 34 meetings (plus some of the special coordination meetings) in the 10-year history of the RVSM/TF. The meeting also agreed that the RVSM Implementation Task Force could be dissolved at the end of this one year review meeting, in accordance with APANPIRG's Conclusion 19/5.

**Agenda Item 7: Other Business**

The Fifth Meeting of the Western Pacific/South China Sea RVSM Scrutiny Group

7.1 The meeting reviewed the outcomes of the fifth meeting of the Western Pacific/South China Sea (WPAC/SCS) RVSM Scrutiny Working Group (WPAC/SCS RSG/5, October 2008) as follows. WPAC/SCS RSG/5 conducted a 90-day post implementation review of the extensive flight level changes that had been implemented in early July 2008.

7.2 Many States reported improvements in terms of safety, capacity, efficiency and ATC and pilot workload, with positive benefits from the reduced numbers of RVSM transitions served by some States. Hong Kong, China reported that significant adverse weather had been experienced in the

weeks after implementation and this had added to the complexity. Overall, the implementation had proceeded smoothly and operations are satisfactory.

7.3 Thailand informed the meeting that the implementation of the revised flight level arrangements has brought many benefits to flights that operate within the Bangkok and neighboring FIRs. The additional levels for both east and west bound traffic and the elimination of flight level transition requirements had significantly improved the traffic flow and greatly enhanced ATC flexibility. Planning was in progress to further enhance procedures in Bangkok ACC to take further advantage of the improvements available as a result of the new FLOS/FLAS.

Forecasts of Asia/Pacific Traffic

7.4 The meeting noted that ICAO Pacific Area Traffic Forecasting Group was formed in 1991 with the primary objective of developing forecasts of civil aviation activity in the transpacific market to support air navigation systems planning activity for ICAO and its Contracting States. The scope of the Group was subsequently broadened to include Intra-Asia/Pacific which is reflected in the current designation as Asia/Pacific Area Traffic Forecasting Group (APA TFG). The Group maintains close relationships with and provides essential data for regional meetings as well as groups charged with air navigation planning and implementation in Asia/Pacific and North America. This report contains forecasts produced by the Group at its fourteenth meeting (September 2008, Bangkok).

7.5 The meeting was informed that average Intra-Asia/Pacific yield was expected to decline only marginally over the forecast horizon, at a rate similar to that for transpacific yield. Intra-Asia passenger aircraft movements were forecast to increase from 950 thousand in 2007 to some 1.4 million in 2015, at an average annual growth rate of 4.8 per cent. For the period 2007 to 2025, aircraft movements were forecast to increase at an average annual growth rate of 4.4 per cent and reach some 2.1 million by 2025.

7.6 IATA informed the meeting that there would be an impact on air traffic movements for the next few years due to the current global economic crisis. Some airlines with operations in the Asia and Pacific; however, had indicated that they were still planning for expansion in view that air traffic movements would be expected to pick up after 2010.

## 8. Closing of the Meeting

8.1 On behalf of the ICAO RVSM Implementation Task Force for the Asia and Pacific Regions, Mr. Kuah thanked all delegates. He stated that as usual the teamwork and cooperative spirit of the Task Force had ensured that the final meeting went smoothly. Mr. Kuah said that the final chapter of the Task Force had come to an end and he felt some sadness that the Task Force would be dissolved. On the positive side however, he was glad that the Task Force had achieved a significant milestone in the air traffic management initiatives for the Asia and Pacific Regions and that the widespread RVSM implementations would deliver efficiency and environment benefits for many years to come. Mr. Kuah wished all delegates a safe journey home. The meeting was very grateful to Mr. Kuah for his excellent job to keep the meeting focus on specific issues, and for the success of the meeting.

8.2 Mr. Kyotaro Harano, Regional Officer ATM, ICAO Asia and Pacific Office was unable to attend the meeting due to the complex situation in Thailand. However, in a written statement presented via the Chairman, he passed his sincere appreciation and congratulations to the Task Force, both personally and on behalf of Mr. Mokhtar A. Awan, Regional Director, ICAO Asia and Pacific Office. Mr. Harano also passed his appreciation to China for hosting the closing ceremony.

8.3 Mr. Harano recalled that the Task Force was established by APANPIRG/9 (August 1998, Bangkok) to look into the introduction of RVSM – which was a totally new concept at that time – over the Pacific. Hence, the first meeting was held in Tokyo in November 1998. Since then, the Task Force had wide representation from States planning to implement RVSM, operators and international organizations depending on the focus of the Task Force. After the Pacific implementation in February 2000, the Task Force successfully implemented RVSM in the Western Pacific/South China Sea area in February and October 2002, in the Bay of Bengal area in November 2003, in the Incheon FIR and the domestic airspace of Japan in September 2005 and finally in China in November 2007. Mr. Harano thanked all the participants of the Task Force over the last 10 years and recognized the Task Force for its excellent achievements.

8.4 Mr. Harano's statement recalled that during September 2008 APANPIRG/19 had recognized that as the majority of airspaces in Asia and Pacific Regions had now implemented RVSM the work of the Asia/Pacific RVSM Implementation Task Force was approaching completion. Accordingly, APANPIRG/19 formulated *Decision 19/5 – Dissolution of the RVSM/TF*. In dissolving the Task Force, APANPIRG placed on the record its highest commendation and appreciation to all parties associated with the Task Force for the continuous implementation of RVSM and the very positive and quantifiable beneficial effects on safety, efficiency and the environment that have resulted directly from the work of the Task Force.

…….……

## List of Participants

| | Name | | Title/Organization | TEL/FAX/E-MAIL |
|---|---|---|---|---|
| 1. | **CHINA** | | | |
| | 1. | Mr. Wang Liya | Deputy Director General<br>Air Traffic Management Bureau of CAAC<br>ATMB Building<br>12 Dongsanhuan Road Middle<br>Chaoyang District, Beijing 100022<br>People's Republic of China | Tel: 86-10-87786663<br>Fax: 86-10-87786810<br>E-mail: wangliya@atmb.net.cn |
| | 2. | Mr. Wen Libin | Deputy Chief Engineer General<br>Air Traffic Management Bureau of CAAC<br>ATMB Building<br>12 Dongsanhuan Road Middle<br>Chaoyang District, Beijing 100022<br>People's Republic of China | Tel: 86-10-87786676<br>Fax: 86-10-87786810<br>E-mail: wenlibin@atmb.net.cn |
| | 3. | Mr. Miao Xuan | Director of Air Traffic Control Division<br>Air Traffic Management Bureau of CAAC<br>ATMB Building<br>12 Dongsanhuan Road Middle<br>Chaoyang District, Beijing 100022<br>People's Republic of China | Tel: 86-10-87786811<br>Fax: 86-10-87786810<br>E-mail: miaoxuan@263.net.cn |
| | 4. | Mr. Zhao Dongsheng | Deputy Director of Flight Standard Department<br>General Administration of Civil Aviation<br>Administration of China<br>155 Dongsi Street West<br>Beijing 100710<br>People's Republic of China | Tel: 86-10-64091408<br>Fax: 86-10-64092458<br>E-mail: ds_zhao@caac.gov.cn |

| | Name | | Title/Organization | TEL/FAX/E-MAIL |
|---|---|---|---|---|
| | 5. | Mr. Zhang Yuanchao | Assistant, Air Traffic Management Division<br>Air Traffic Management Bureau of CAAC<br>ATMB Building<br>12 Dongsanhuan Road Middle<br>Chaoyang District, Beijing 100022<br>People's Republic of China | Tel: 86-10-87786819<br>Fax: 86-10-87786810<br>E-mail: jackzyc@yahoo.com.cn |
| | 6. | Mr. Tang Jinxiang | Assistant, Aviation Data Communication Corporation<br>Air Traffic Management Bureau of CAAC<br>ATMB Building<br>12 Dongsanhuan Road Middle<br>Chaoyang District, Beijing 100022<br>People's Republic of China | Tel: 86-10-82325050-938<br>Fax: 86-10-82325552<br>E-mail: tangjx@adu.com.cn |
| | 7. | Mr. Zhao Jun | Assistant, Aviation Data Communication Corporation<br>Air Traffic Management Bureau of CAAC<br>ATMB Building<br>12 Dongsanhuan Road Middle<br>Chaoyang District, Beijing 100022<br>People's Republic of China | Tel: 86-10-82325050-937<br>Fax: 86-10-82354025<br>E-mail: lieny1983@126.com |
| | 8. | Mr. Jin Kaiyan | Assistant Aviation Data Communication Corporation<br>Air Traffic Management Bureau of CAAC<br>ATMB Building<br>12 Dongsanhuan Road Middle<br>Chaoyang District, Beijing 100022<br>People's Republic of China | Tel: 86-10-82326053-940<br>Fax: 86-10-87786055<br>E-mail: jky03062112@yahoo.com.cn |

| | Name | | Title/Organization | TEL/FAX/E-MAIL |
|---|---|---|---|---|
| 2. | **DPR KOREA** | | | |
| | 9. | Mr. Pak Yong Chol | Director, Air Traffic Management Bureau<br>General Administration of Civil Aviation<br>Sunan District<br>Pyongyang<br>Democratic People's Republic of Korea | Tel: 850-2-18111~999 Ext-8108<br>Fax: 850-2-3814410 Ext-4625<br>E-mail: gaca@silibank.com |
| | 10. | Mr. An Gyong Hwa | Director, AIS, Air Traffic Management Bureau<br>General Administration of Civil Aviation<br>Sunan District<br>Pyongyang<br>Democratic People's Republic of Korea | Tel: 850-2-18111~999 Ext-8108<br>Fax: 850-2-3814410 Ext-4625<br>E-mail: gaca@silibank.com |
| 3. | **HONG KONG, CHINA** | | | |
| | 11. | Mr. Benjamin Yik-siu Fong | Chief Air Traffic Control Officer<br>Civil Aviation Department<br>4/F, Air Traffic Control Complex<br>1 Control Tower Road<br>Hong Kong International Airport<br>Lantau<br>Hong Kong, China | Tel: (852) 2910 6434<br>Fax: (852) 2910 0186<br>E-mail: bysfong@cad.gov.hk |
| 4. | **JAPAN** | | | |
| | 12. | Mr. Natsuki Ibe | Chief, Operations Section<br>ATC Division<br>ATS Department<br>Civil Aviation Bureau<br>Ministry of Land, Infrastructure, Transport and Tourism<br>2-1-3 Kasumigaseki, Chiyoda-ku<br>Tokyo 100 8918, Japan | Tel: 81-3-5253 8749<br>Fax: 81-3-5253 1663<br>E-mail: ibe-n2z7@mlit.go.jp |

| | Name | Title/Organization | TEL/FAX/E-MAIL |
|---|---|---|---|
| 5. | **KYRGYZSTAN** | | |
| | 13. Mr. Bakyt Djunushaliev | Deputy Director of Civil Aviation Authority<br>Civil Aviation Authority<br>Ministry of Transport and Communications<br>184, Ahumbaev st., Bishkek, 720044<br>Kyrgyz Republic | Tel: +996 312 541580<br>Fax: +996 312 542140, 542141<br>E-mail: dga@infotel.kg |
| 6. | **PHILIPPINES** | | |
| | 14. Mr. Romeo D. Alamillo | Asst Director, Flight Standards Inspectorate Service<br>Civil Aviation Authority of the Philippines<br>Old MIA, Pasay City<br>Metro Manila 1300<br>Philippines | Tel: +639178338824<br>Fax:<br>E-mail: rdalamillo@yahoo.com |
| 7. | **REPUBLIC OF KOREA** | | |
| | 15. Mr. Chang, Jae Soo | Assistant Director, ATM Division<br>Civil Aviation Safety Authority (CASA)<br>Ministry of Construction and Transportation<br>274 Gwahae-dong, Gangseo-gu<br>Seoul 157-711<br>Republic of Korea | Tel: 82-2-2669 6433<br>Fax: 82-2-6342 7289<br>E-mail: atcchang@mltm.go.kr |
| | 16. Mr. Choi, In Beom | Air Traffic Controller<br>ATC Division, Air Traffic Center<br>Civil Aviation Safety Authority (CASA)<br>Ministry of Construction and Transportation<br>P.O. Box 26 Woonseo-dong, Joong-gu<br>Incheon 400-650<br>Republic of Korea | Tel: 82-32-880 0260<br>Fax: 82-32-889 2381<br>E-mail: deomin2000@yahoo.com.kr |

| | Name | | Title/Organization | TEL/FAX/E-MAIL |
|---|---|---|---|---|
| 8. | **RUSSIAN FEDERATION** | | | |
| | 17. | Mr. Sitnikov Igor | Deputy Chief of ATM Division<br>State ATM Corporation<br>37/7 Leningradsky prosp. 125993<br>Moscow<br>Russian Federation | Tel: +7 495 601 08 01<br>Fax: +7 495 601 08 03<br>E-mail: sitnikov@gkovd.ru |
| | 18. | Ms. Motornaya Marina | Senior Expert, International Relations Department<br>State ATM Corporation<br>Moscow 125993<br>Leningradsky prospect, 37, bld.7<br>Russian Federation | Tel: +7 495 601 08 04<br>Fax: +7 495 601 07 95<br>E-mail: mm@gkovd.ru |
| 9. | **SINGAPORE** | | | |
| | 19. | Mr. Kuah Kong Beng | Chief Air Traffic Control Officer<br>Civil Aviation Authority of Singapore<br>Singapore Changi Airport<br>P.O. Box 1<br>Singapore 918141 | Tel: 65-6541 2405<br>Fax: 65-6545 6516<br>E-mail: kuah_kong_beng@caas.gov.sg |
| 10. | **UNITED STATES** | | | |
| | 20. | Mr. Pat Power | Senior FAA Representative, North Asia<br>Federal Aviation Administration<br>US Embassy<br>Beijing, China | Tel: +86-2132233321223<br>E-mail: pat.power@faa.gov |
| | 21. | Mr. Robyn B. Cicero | Country Desk Officer – North Asia<br>Federal Aviation Administration<br>Washington, D.C.<br>U.S.A. | Tel: +1 202 385 8899<br>E-mail: robyn.cicero@faa.gov |

| | Name | | Title/Organization | TEL/FAX/E-MAIL |
|---|---|---|---|---|
| 11. | **IATA** | | | |
| | 22. | Mr. Cheng Shixin | Manager, Safety Operations & Infrastructure<br>International Air Transport Association<br>12A/f, Bldg12, Xibaihe Beili<br>Chaoyang District, Beijing,100028<br>P.R.China | Tel: 86-10-8425 2591<br>E-mail: chengsx@iata.org |
| | 23. | Capt. Aric Oh | Deputy Chief Pilot (Technical)<br>Singapore Airlines Limited<br>Flight Operations Technical<br>(SIN-STC 02-A)<br>SIA Training Centre, 04C<br>720 Upper Changi Road East<br>Singapore 486852 | Tel : 65-6540 3694<br>Fax : 65-6543 4053<br>E-mail: aric_oh@singaporeair.com.sg |
| | 24. | Mr. Kakuya Abe | Assistant Manager, Flight Standards<br>All Nippon Airways Co., Ltd. (ANA)<br>3-3-2, Haneda Airport<br>Ota-ku, Tokyo 144-8515<br>Japan | Tel: 81-3-5757 4123<br>Fax: 81-3-5757 5404<br>E-mail: kak.abe@ana.co.jp |
| | 25. | Mr. Katsura Motoda | Staff Director, Route Planning, Flight Operations<br>Japan Airlines International Co., Ltd.<br>Terminal 1, 3-3-2, Haneda Airport<br>3-chome, Ota-ku<br>Tokyo 144-0041<br>Japan | Tel: 81-3-5756 3134<br>Fax: 81-3-5756 3527<br>E-mail: katsura.motoda@jal.com |
| | 26. | Mr. Yusuke Chaki | Manager, Operations Standards Section<br>Nippon Cargo Airlines (NCA)<br>NCA Global Operations Center<br>Narita International Airport<br>Terminal 2, Narita-shi, Chiba 282-0004<br>Japan | Tel: 81-476-32-9739<br>Fax: 81-476-32-9788<br>E-mail: yusuke.chaki@nca.aero |

| | Name | Title/Organization | TEL/FAX/E-MAIL |
|---|---|---|---|
| 12. | **EX-CHAIRPERSON** | | |
| | 27. Mr. Gregg Hood<br>*ATC WG Chairperson* | Group General Manager, Personnel Licensing<br>Education and Training<br>Civil Aviation Safety Authority<br>Australia | Tel: 61-2-62171118<br>Fax: 61-2-62171210<br>E-mail: greg.hood@casa.gov.au |

## LIST OF WORKING PAPERS (WPs) AND INFORMATION PAPERS (IPs)

### WORKING PAPERS

| NUMBER | AGENDA | WORKING PAPERS | PRESENTED BY |
|---|---|---|---|
| WP/1 | 1 | Provisional Agenda | Secretariat |
| WP/2 | 2, 4 | Review of the 33rd Meeting of ICAO RVSM Implementation Task Force (RVSM/TF/33) | Secretariat |
| WP/3 | 4 | Asia/Pacific RVSM Safety Assessments | Secretariat |
| WP/4 | 6 | Task List for Implementation of Reduced Vertical Separation Minimum (RVSM) by China and the Transition Arrangement Check List | Chairman |
| WP/5 | 6 | Terms of Reference of RVSM/TF | Secretariat |
| WP/6 | 4 | Progress of China RMA Construction | China RMA |
| WP/7 | 4 | Long Term Height Monitoring of China RVSM Airspace | China RMA |
| WP/8 | 4 | Safety Monitoring Report from China Regional Monitoring Agency November 2007 – October 2008 | China RMA |

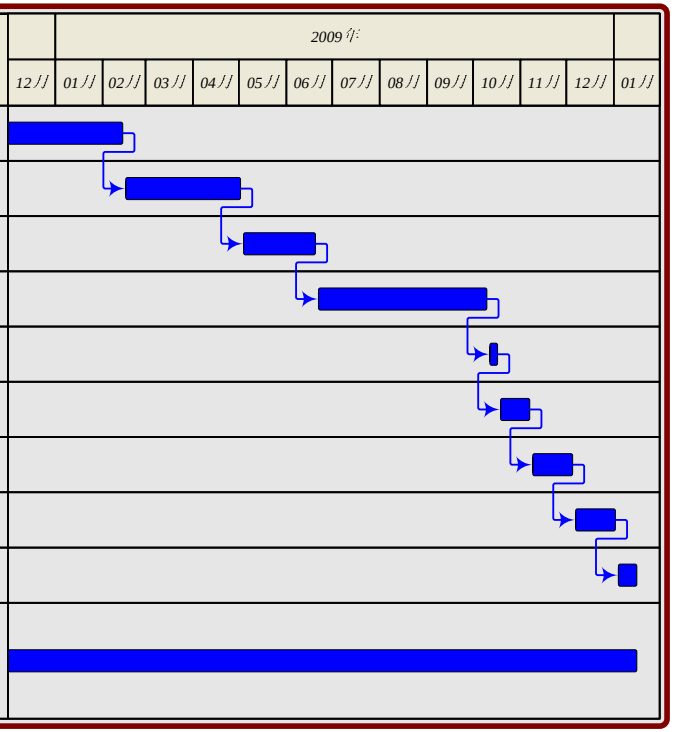
### INFORMATION PAPERS

| NUMBER | AGENDA | INFORMATION PAPERS | PRESENTED BY |
|---|---|---|---|
| IP/1 | - | List of Working Papers (WPs) and Information Papers (IPs) | Secretariat |
| IP/2 | 4 | Report on Activities of the RASMAG | Secretariat |
| IP/3 | 5 | APANPIRG Activities – Outcomes of APANPIRG/19 | Secretariat |
| IP/4 | 7 | The Fifth Meeting of the Western Pacific/South China Sea RVSM Scrutiny Group | Secretariat |
| IP/5 | 7 | Forecasts of Asia/Pacific Traffic | Secretariat |

— END —

# Monitoring Schedule (2008-10-27)

| ID | OPR No. of aircrafts, No. to be monitored | Starting time | End Time | Duration |
|---|---|---|---|---|
| 1 | CSN，CQN，CYZ 298，22 | 12/1/2008 | 2/13/2009 | 11w |
| 2 | CES，CKK 237，22 | 2/16/2009 | 5/1/2009 | 11w |
| 3 | CCA 220，10 | 5/4/2009 | 6/19/2009 | 7w |
| 4 | GDC，CHH，YZR，DER，GCR，LKE，CHB 135，28 | 6/22/2009 | 10/9/2009 | 16w |
| 5 | CSZ 71，2 | 10/12/2009 | 10/16/2009 | 1w |
| 6 | CXA 50，6 | 10/19/2009 | 11/6/2009 | 3w |
| 7 | CSH 49，7 | 11/9/2009 | 12/4/2009 | 4w |
| 8 | CDG 40，8 | 12/7/2009 | 1/1/2010 | 4w |
| 9 | CSC 39，4 | 1/4/2010 | 1/15/2010 | 2w |
| 10 | CQH，9_2；OKA，8_4；DKH，8_2；JAE，6_0；SHQ，6_4；DXH，5_0；CUA，4_2；UEA，4_0；GWL，4_0；DBH，3_3；HXA，CFI，3_2；UNA，3_3；EPA，2_2；KPA，1_1； HZX，1_1）59，32 | 12/1/2008 | 1/15/2010 | 59w |



**SAFETY MONITORING REPORT FROM CHINA REGIONAL MONITORING AGENCY NOVEMBER 2007 – OCTOBER 2008**

**Presented by**

**China RVSM Regional Monitoring Agency**
**December 2008**

**SUMMARY**

This report presents the airspace safety oversight from China RVSM Regional Monitoring Agency for the time period 1 November 2007 to 30 October 2008. The purpose of this report is to compare actual performance to safety goals related to continued use of reduced vertical separation minimum (RVSM) in sovereign Chinese airspace. This report contains a summary of large height deviation reports received by China RMA for the most recent reporting period of 1 November 2007 to 31 October 2008. This report also contains an update of the vertical collision risk. The vertical collision risk estimate for Chinese RVSM airspace is below the target level of safety (TLS) value of 5.0 x $10^{-9}$ fatal accidents per flight hour, a value well within that range agreed internationally as "safe".

## 1. Introduction

1.1 China RVSM Regional Monitoring Agency (China RMA) serves as the regional monitoring agency (RMA) for the domestic Chinese airspace.

1.2 This report covers the current reporting period 1 November 2007 to 31 October 2008 in the China RMA's ongoing process of providing periodic updates of information relevant to the continued safe use of the RVSM in Chinese sovereign airspace. China RMA produces two reports each calendar year following the standardize reporting period and format guidelines set forth by the International Civil Aviation Organization's (ICAO's) Asia and Pacific Region Regional Airspace Safety Monitoring Advisory Group (RASMAG).

1.3 Within this report, the reader will find the summary of airspace safety oversight for the sovereign Chinese airspace, including the Large Height Deviation (LHD) reports analysis and an update of the vertical collision risk estimate for Chinese RVSM airspace

## 2. Data Submission

2.1. China RMA requests an annual one-month traffic movement sample and monthly large height deviation reports from the ATS providers in Chinese RVSM airspace. The second and third column of Table 1 lists the Flight Information Regions (FIRs) and relevant Area Control Centers in China.

### 2.2. Traffic Sample Data (TSD)

2.2.1. Traffic sample data for December 2007 for the entire domestic Chinese RVSM airspace were used in the assessment of risk for the RVSM airspace. Table 1 contains a summary of the traffic sample data received by China RMA for each FIR. Traffic sample data was received from all of the FIR's.

| FIR Name | FIR Code | Data Collected in ACCs | Collecting Method | Status | Remarks |
|---|---|---|---|---|---|
| Beijing | ZBPE | Beijing | Automatic system | Received | Data completed |
| | | Taiyuan | - | - | Included in Beijing ACC |
| | | Hohhot | - | - | Included in Beijing ACC |
| Shanghai | ZSHA | Shanghai | Automatic system | Received | Data completed |
| | | Qingdao | Automatic system | Received | Data completed |
| | | Jinan | Automatic system | Received | Data completed |
| | | Xiamen | Automatic system | Received | Data completed |
| | | Nanchang | - | - | Included in Shanghai ACC |
| | | Hefei | - | - | Included in Shanghai ACC |
| Guangzhou | ZGZU | Guangzhou | Automatic system | Received | Data completed |
| | | Guilin | Automatic system | Received | Data completed |
| | | Zhanjiang | Automatic system | Received | Data completed |
| | | Nanning | Automatic system | Received | Data completed |
| | | Changsha | - | - | Included in Guangzhou ACC |
| Wuhan | ZHWH | Wuhan | Automatic system | Received | Data completed |
| | | Zhengzhou | Automatic system | Received | Data completed |
| Shenyang | ZYSH | Shenyang | Automatic system | Received | Data completed |
| | | Dalian | Manual | Received | Data completed |
| | | Harbin | Manual | Received | Data completed |
| | | Hailar | Manual | Received | Data completed |
| Lanzhou | ZLHW | Lanzhou | Manual | Received | Data completed |
| | | Xian | Automatic system | Received | Data completed |
| Urumqi | ZWUQ | Urumqi | Manual | Received | Data completed |
| Kunming | ZPKM | Kunming | - | - | Included in Chengdu ACC |
| | | Chengdu | Automatic system | Received | Data completed |
| | | Lhasa | Manual | Received | Data completed |
| | | Guiyang | - | - | Included in Chengdu ACC |
| Sanya(Island) | ZJSA | Sanya | Automatic system | Received | Data completed |

**Table 1:** Summary of Traffic Data of December 2007 in the Sovereign Chinese Airspace

## 2.3. **Large Height Deviation (LHD) Data**

2.3.1. From April 2008, the responsibility of Wuhan ACC was transferred to Guangzhou FIR. Therefore, the LHD reports in Wuhan ACC were reported from Guangzhou FIR.

2.3.2. From October 2008, China RMA provided two versions of LHD report template to the appropriate ATS providers (ATC users and airline users).

2.3.3. The plain language definition of an LHD event agreed at the Seventh Meeting of the RASMAG are demonstrated in the China RMA website where the LHD report template can be downloaded (http://www.chinarma.cn/Chinese/lhdReportTemplate.html).

## 3. Large Height Deviations Report Summary

3.1. Table 2 provides the summary of LHD reports submitted by each FIR of China from November 2007 to October 2008.

| FIR Name | Beijing | Shanghai | Guangzhou | Wuhan | Shenyang | Lanzhou | Urumqi | Kunming | Sanya(Island) |
|---|---|---|---|---|---|---|---|---|---|
| 2007-11 | | X | X | X | | X | X | X | X |
| 2007-12 | X | X | X | X | | X | X | X | |
| 2008-01 | X | X | X | | X | X | X | X | |
| 2008-02 | X | X | X | | X | X | X | X | |
| 2008-03 | X | X | X | X | X | X | X | X | X |
| 2008-04 | X | X | X | X | X | | X | X | X |
| 2008-05 | X | X | X | X | X | X | X | X | X |
| 2008-06 | X | X | X | X | X | X | X | X | X |
| 2008-07 | X | X | X | X | X | X | X | X | X |
| 2008-08 | X | X | X | X | X | X | X | X | X |
| 2008-09 | X | X | X | X | X | X | X | X | X |
| 2008-10 | X | X | X | X | X | X | X | X | X |

**Table 2:** Summary of LHD Reports collected by China RMA

X = Large Height Deviation Report was received for the specified month (including reports indicating "NIL" events)

3.2. Tables 3 summarize the number of LHD occurrences during the time period November 2007 to October 2008 in the domestic Chinese airspace.

| Month-Year | No. of LHD Occurrences | LHD Duration (Minutes) | No. of flight levels transitioned without clearance |
|---|---|---|---|
| November 2007 | 1 | 0 | 1 |
| December 2007 | 1 | 0.1 | 0 |
| January 2008 | 3 | 0 | 8 |
| February 2008 | 1 | 2 | 0 |
| March 2008 | 4 | 0.05 | 6 |
| April 2008 | 1 | 0.217 | 0 |
| May 2008 | 1 | 8 | 0 |
| June 2008 | 1 | 0 | 2 |
| July 2008 | 3 | 0.2 | 3 |
| August 2008 | 7 | 3.917 | 7 |
| September 2008 | 3 | 1 | 3 |
| October 2008 | 3 | 0.53 | 4 |
| **Total** | **29** | **16.014** | **34** |

**Table 3:** Summary of LHD Occurrences in sovereign Chinese airspace

3.3. The large height deviation reports are separated by categories based on the details provided for each deviation. Table 4 summarizes the number of LHD occurrences by cause of the deviation

| LHD Category Code | LHD Category Description | No. of LHD Occurrences | LHD Duration (Min) | No. of flight levels transitioned without clearance |
|---|---|---|---|---|
| A | Flight crew failing to climb/descend the aircraft as cleared; | 2 | 2.5 | 4 |
| B | Flight crew climbing/descending without ATC clearance; | 2 | 0 | 5 |
| C | Incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearances etc); | 2 | 0.167 | 1 |
| D | ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message); | 5 | 0.2 | 9 |
| E | Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues (e.g. late or non-existent coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters); | 2 | 3 | 0 |

| LHD Category Code | LHD Category Description | No. of LHD Occurrences | LHD Duration (Min) | No. of flight levels transitioned without clearance |
|---|---|---|---|---|
| G | Aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure); | 1 | 0 | 4 |
| H | Airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors); | 5 | 8.15 | 2 |
| I | Turbulence or other weather related causes; | 8 | 1.78 | 7 |
| J | TCAS resolution advisory; flight crew correctly following the resolution advisory; | 1 | 0 | 2 |
| M | Other<br>Deviation due to display error of ATC automatic system<br>Deviation due to station interference | 1 | 0.217 | 0 |
| **Total** | | **29** | **16.014** | **34** |

**Table 4:** Summary of LHD Causes in sovereign Chinese airspace

## 4. Estimate of Vertical Collision Risk for Chinese RVSM Airspace

4.1. The vertical collision risk was estimated in order to determine whether the target level of safety (TLS) continued to be met in Chinese RVSM airspace, thus supporting the ongoing safe application of RVSM.

4.2. This section updates the results of safety oversight for the RVSM implementation in Sovereign Chinese airspace, which was fully implemented on 22 November 2007. Accordingly, the internationally accepted collision risk methodology is applied in assessing the safety of implementing the RVSM in the Sovereign Chinese airspace. Each monthly risk estimate was 'weighted' by the factors proportionate to the total number of flight hours in Chinese RVSM airspace flow according to the air traffic control status.

4.3. The TSD of December 2007, the continuous LHD reports in the Sovereign Chinese airspace between November 2007 and October 2008 are used to produce the risk estimates presented in this report.

### 4.4. Estimate of the CRM parameters

4.4.1. Table 5 summarizes the value and source material for estimating values for each of the empirical parameters of the internationally accepted Collision Risk Model (CRM), which is used to conduct the risk assessment and the safety oversight for the RVSM implementation in sovereign Chinese airspace.

| Parameter Symbol | Parameter Definition | Parameter Value | Source for Value |
|---|---|---|---|
| $S_x$ | Longitudinal separation standard for a region, or Length of longitudinal window used to calculate occupancy | 80Nm | Standard value used in overall airspace |
| $S_h$ | Planned Horizontal Separation | 80Nm | Standard value used in overall airspace |
| $P_z(0)$ | Probability of vertical overlap (with planned vertical separation equal to zero) | 0.4026 | Estimated based radar data form from Upper Control Area of Beijing, Guangzhou, Shanghai, August 2008 |
| $P_z(S_z)$ | Prob. that 2 aircraft nominally separated by the vertical separation minimum $S_z$ are in vertical overlap. | $5.604\times10^{-9}$ | |
| $P_y(0)$ | Probability of Lateral Overlap | 0.025 | Estimated by FAA Technical Center based on the proportion of GPS operations observed in the TSD data collected in China |
| $P_h(\theta)$ | Probability of Horizontal Overlap | $6.88\times10^{-7}$ | Value used in the Western Pacific/South China Sea safety assessment |
| $\left\lvert\overline{h(\dot{\theta})}\right\rvert$ | Average relative horizontal speed during overlap for aircraft pairs on routes with crossing angle θ (let θ=45°) | 367.4 knots | Value used in Western Pacific/South China Sea safety assessment (corresponds to an average aircraft speed of 480 knots) |
| $\lvert\overline{\dot{y}}\rvert$ | Average absolute relative cross track speed for an aircraft pair nominally on the same track | 2.8 knots | Estimated by FAA Technical Center based on the proportion of GPS operations observed in the TSD data collected in China |
| $\lvert\overline{\dot{z}}\rvert$ | Average absolute relative vertical speed of an aircraft pair that has lost all vertical separation | 1.5 knots | Value used in NAT RVSM safety assessment |
| $\lambda_x$ | Average aircraft length | 0.02345Nm | Estimated based on the collected TSD |
| $\lambda_y$ | Average aircraft wingspan | 0.02073Nm | |
| $\lambda_z$ | Average aircraft height | 0.0070 Nm | |
| $\lambda_h$ | Diameter of the disk representing the shape of an aircraft in the horizontal plane | 0.02345Nm | |

**Table 5**: Estimate of the empirical Parameters in the CRM

4.4.2. Table 6 summarizes the values for estimating parameters in the CRM, which we estimated on the basis of TSD collected. They are demonstrated separately by air traffic control status.

| Parameter Symbol | ATC status | Parameter Value | Parameter Definition |
|---|---|---|---|
| T | Radar | 1912337.4 | Annual flight hours |
| | Procedural | 263522 | |
| $E_z$(same) | Radar | 0.0430 | Same-direction vertical occupancies |
| | Procedural | 0.0120 | |
| $E_z$(opposite) | Radar | 0.2062 | Opposite-direction vertical occupancies |
| | Procedural | 0.0963 | |
| Crossing pairs | Radar | 1257480 | Annual estimate of crossing pairs in crossing route |
| | Procedural | 27120 | |
| $\overline{\lvert\Delta V\rvert}$ | Radar | 53.889 knots | Average relative along-track speed between aircraft on same direction routes |
| | Procedural | 91.966 knots | |
| $\overline{\lvert V\rvert}$ | Radar | 447.78 knots | Average absolute aircraft ground speed |
| | Procedural | 455.93 knots | |

**Table 6:** Estimate of the Parameters based on the collected TSD in separately ATC status

## 4.5. Estimate of Vertical Collision Risk for Chinese RVSM Airspace

4.5.1. This section summarizes the results of the safety assessment for the sovereign Chinese RVSM airspace. Figure 1 presents the Technical Risk computed by the TSD collected in December 2007.


**Figure 1:** Technical Risk Bar Chart computed by the TSD collected in December, 2007

4.5.2. Table 7 provides the results of the airspace safety oversight, as of October 2008, in terms of the technical, operational, and total risks for the RVSM implementation in the sovereign Chinese RVSM airspace.

| Source of Risk | Lower Bound Risk Estimation | TLS | Remarks |
|---|---|---|---|
| Technical Risk | $1.707 \times 10^{-10}$ | $2.5 \times 10^{-9}$ | Below Technical TLS |
| Operational Risk | $2.007 \times 10^{-9}$ | - | - |
| **Total Risk** | **$2.17 \times 10^{-9}$** | **$5.0 \times 10^{-9}$** | **Below Overall TLS** |

**Table 7**: Risk Estimates for the RVSM Implementation in Sovereign Chinese RVSM Airspace

4.5.3. Figure 2 provides the vertical collision risk estimates by type (e.g. technical, operational, and total) for each month during the current reporting period based on recent Large Height Deviation reports.

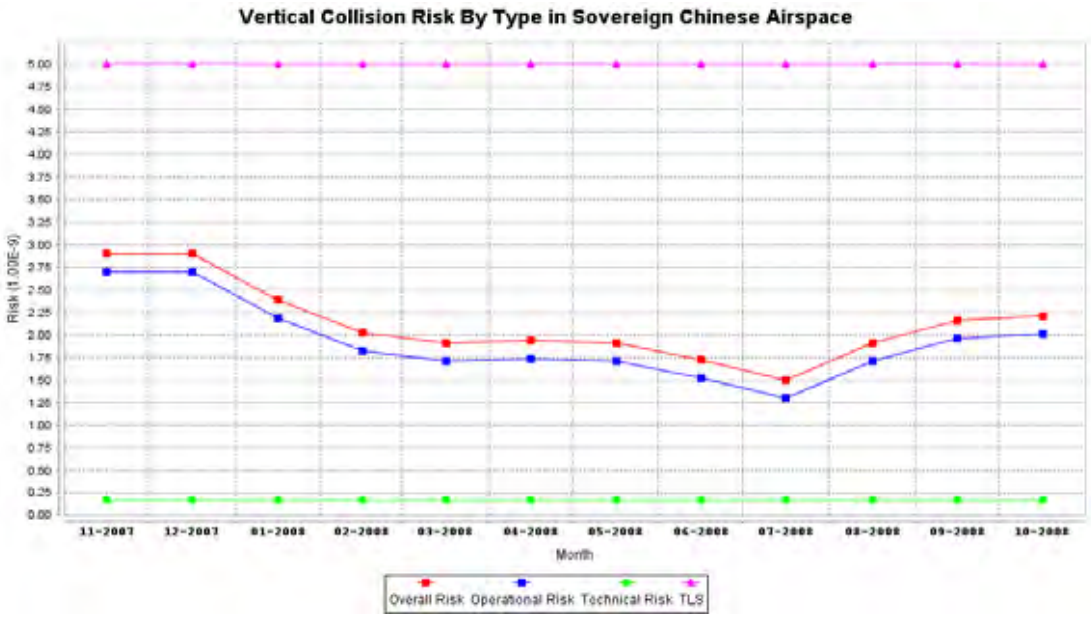



**Figure 2:** Trends of Risk Estimates for the RVSM Implementation in Sovereign Chinese Airspace

4.5.4. Therefore, the estimates of both technical and total risks from the available TSD and LHD reports satisfy the agreed TLS value of no more than $2.5 \times 10^{-9}$ and $5.0 \times 10^{-9}$ fatal accidents per flight hour. However, a "climbing" trend of total risk in the recent several months can be found from figure 2. That is because relatively more LHD events occurred in the latest 3 months, especially those caused by ATC error. ATMB had paid high attention to this phenomenon and sent a specialist group to investigate the details of the events. Since most of these events were proved to be caused by ATC operational error, ATMB of CAAC has requested all of the regional ATMBs to enhance the training and safety oversight to controllers. China RMA will keep tracing the progress and try to give some pieces of advice for ATMB to take remedial action when necessary.

| SN | Activity Completed | Start | Target Date | Present Status | Group Responsible |
|---|---|---|---|---|---|
| 1 | **Identify Operational Need** | | | | |
| 2 | ~~Agree operational need for Chinese Airspace~~ | ~~12-Mar-07~~ | ~~16-Mar-07~~ | **Completed** | ~~China~~ |
| 3 | **Safety Assessment** | | | | |
| 4 | ~~Review available summary data (non-compliant aircraft, aberrant aircraft, etc)~~ | ~~12-Mar-07~~ | ~~21-Sep-07~~ | **Completed** | ~~SAM/WG, RMA, RVSM Task Force~~ |
| 5 | ~~Examine history of height keeping errors relating to ATC clearances and assess possible RVSM impact~~ | ~~12-Mar-07~~ | ~~21-Sep-07~~ | **Completed** | ~~China, SAM/WG, RMA, RVSM Task Force~~ |
| 6 | ~~Confirm RVSM risk model assumptions/parameters are consistent with airspace where RVSM is to be applied~~ | ~~12-Mar-07~~ | ~~21-Sep-07~~ | **Completed** | ~~China, SAM/WG, RMA, RVSM Task Force~~ |
| 7 | ~~Conduct analyses to predict occupancy after RVSM implementation~~ | ~~12-Mar-07~~ | ~~21-Sep-07~~ | **Completed** | ~~China, SAM/WG, MAAR, RVSM Task Force~~ |
| 8 | ~~Collect weather and turbulence data for analysis~~ | ~~12-Mar-07~~ | ~~1-Jul-07~~ | **Completed** | ~~China, SAM/WG, OPS/AIR/WG, RVSM Task Force~~ |
| 9 | Report monthly large height deviations (including operational errors) to the State | Jan-06 | ~~18-Sep-07~~ | **Ongoing** | China, Users |
| 11 | **Feasibility Analysis** | | | | |
| 12 | ~~Examine the operational factors and workload associated with RVSM implementation~~ | ~~12-Mar-07~~ | ~~16-Mar-07~~ | **Completed** | ~~China, ATC/WG, RVSM Task Force~~ |
| 13 | **Determination of Requirements (airborne & ground systems)** | | | | |
| 14 | ~~Assess the impact of RVSM implementation on controller automation systems and plan for upgrades/modifications~~ | ~~12-Mar-07~~ | ~~18-Sep-07~~ | **Completed** | ~~China~~ |
| 15 | **Aircraft & Operator Approval Requirements** | | | | |
| 16 | ~~Promulgate the operational approval process~~ | ~~12-Mar-07~~ | ~~3-Aug-07~~ | **Completed** | ~~China, OPS/AIR/WG, RVSM Task Force~~ |
| 17 | ~~Notify China when significant changes occur to RVSM documentation~~ | ~~12-Mar-07~~ | ~~3-Dec-08~~ | ~~**Ongoing**~~ **Completed** | ~~OPS/AIR/WG, RVSM Task Force, Regional Office~~ |
| 18 | **Perform Rulemaking (if required)** | | | | |
| 19 | Recommend State airspace regulatory documentation | | | **Ongoing** | Regional Office |
| 20 | **Perform Necessary Industry & International Co-ordination** | | | | |
| 21 | ~~Establish target implementation date~~ | ~~12-Mar-07~~ | ~~16-Mar-07~~ | **Completed** | ~~RVSM Task Force, China~~ |
| 22 | ~~Report to ATM/AIS/SAR/SG/17~~ | ~~2-Jul-07~~ | ~~2-Jul-07~~ | **Completed** | ~~RVSM Task Force Chairman~~ |
| 23 | Report to ATM/AIS/SAR/SG/18 | | 7-Jun-08 | | RVSM Task Force Chairman |
| 24 | ~~Process Doc 7030 amendment~~ | ~~12-Mar-07~~ | ~~29-Mar-08~~ | **Completed** | ~~China, ICAO Regional Office (to include China FIRs)~~ |
| 25 | ~~Publish advance AIC~~ | ~~12-Mar-07~~ | ~~7-Jun-07~~ | **Completed** | ~~China~~ |
| 26 | ~~Publish AIP Supplement containing RVSM policy/procedures~~ | ~~12-Mar-07~~ | ~~25-Aug-07~~ | **Completed** | ~~China~~ |
| 27 | Publish AIP Supplement containing transition areas/procedures | | 11-Oct-07 | | China and States concerned |
| 28 | ~~Review inter-facility coordination procedures~~ | ~~3-Aug-07~~ | ~~18-Sep-07~~ | **Completed** | ~~China~~ |
| 29 | ~~Finalize changes to Letters of Agreement~~ | ~~3-Aug-07~~ | ~~30-Oct-07~~ | ~~**Ongoing**~~ **Completed** | ~~China~~ |
| 30 | ~~Disseminate information on RVSM policy and procedures through RVSM Website~~ | ~~30-Apr-07~~ | ~~7-Nov-07~~ | **Completed** | ~~OPS/AIR/WG, RVSM Task Force~~ |
| 31 | **Approval of Aircraft & Operators** | | | | |
| 32 | ~~Establish approved operations readiness targets~~ | ~~12-Mar-07~~ | ~~16-Mar-07~~ | **Completed** | ~~ATC/WG, RVSM Task Force~~ |

| SN | Activity Completed | Start | Target Date | Present Status | Group Responsible |
|---|---|---|---|---|---|
| 33 | Assess operator readiness | 12-Mar-07 | 18-Sep-07 | **Completed** | China, OPS/AIR/WG |
| **34** | **Develop Pilot & ATC Procedures** | | | | |
| 35 | Review weather and contingency procedures for applicability under RVSM | 12-Mar-07 | 18-Sep-07 | **Completed** | China, RVSM Task Force |
| 36 | Publish appropriate Pilot/ATC policy & procedures on RVSM website | 30-Apr-07 | 18-Sep-07 | **Completed** | China, RVSM Task Force |
| 37 | Identify transition areas and procedures | 12-Mar-07 | 18-Sep-07 | **Completed** | China, ATC/WG |
| 38 | Conduct simulation modelling to assess impact of RVSM operations | 6-Nov-06 | 6-Nov-06 | **Completed** | China |
| 39 | Report on simulation activity | 12-Mar-07 | 16-Mar-07 | **Completed** | China, RVSM Task Force |
| 40 | Coordinate use of ACAS II (TCAS V.7) for RVSM operations | 12-Mar-07 | 10-Oct-07 | **Completed** | China, OPS/AIR/WG, RVSM Task Force |
| 41 | Develop procedures for handling non-compliant aircraft (inc ferry & mntce) in ATS documentation | 12-Mar-07 | 1-Jul-07 | **Completed** | China, OPS/AIR/WG, ATC/WG, RVSM Task Force |
| 42 | Develop mutually acceptable ATC procedures for non-approved State acft to transit RVSM airspace | 12-Mar-07 | 17-Sep-07 | **Completed** | States concerned, ATC/WG, RVSM Task Force |
| 43 | Implement procedures for suspension of RVSM | 12-Mar-07 | 17-Sep-07 | **Completed** | States concerned, ATC/WG, RVSM Task Force |
| 44 | Liaise with State defense authorities regarding military operations | started | 17-Sep-07 | **Completed** | China |
| **45** | **Pilot & ATC Training** | | | | |
| 46 | Provide Pilot/ATC training documentation based on past experience | 12-Mar-07 | 18-Sep-07 | **Completed** | IATA, IFALPA, IFATCA, RVSM Task Force |
| 47 | Conduct local RVSM training for air traffic controllers | 7-May-07 | 18-Sep-07 | **Completed** | China |
| **48** | **Perform System Verificiation** | | | | |
| 49 | Height keeping performance monitoring needed to undertake initial safety analysis | started | 31-Aug-07 | **Completed** | China, RMA, SAM/WG, RVSM Task Force |
| 50 | Provide representative traffic movement data to RMA | started | 31-Aug-07 | **Completed** | China |
| 51 | Undertake initial safety analysis | started | 31-Aug-07 | **Completed** | China, RMA, SAM/WG, RVSM Task Force |
| 52 | Prepare/maintain regional status report detailing RVSM implementation plans | 3-Sep-07 | 7-Sep-08 | ~~**Ongoing**~~ **Completed** | RVSM Task Force |
| **53** | **Final Implementation Decision** | | | | RVSM Task Force |
| 54 | Review aircraft altitude-keeping performance and operational errors | 12-Mar-07 | 1-Sep-07 | **Completed** | China, SAM/WG, OPS/AIR/WG |
| 55 | Complete ATS State documentation | 3-Aug-07 | Aug-07 | **Completed** | China |
| 56 | Publish Trigger NOTAM | | 11-Nov-07 | **Completed** | China |
| 57 | Complete readiness assessment | | 18-Sep-07 | **Completed** | China, RMA, SAM/WG, RVSM Task Force |
| 58 | Complete safety analysis | | 18-Sep-07 | **Completed** | China, RMA, SAM/WG, RVSM Task Force |
| **59** | **Declare Initial Operational Capability** | | | | China, SAM/WG, RVSM Task Force |
| **60** | **Monitor System Performance** | | | | |
| 61 | Perform Follow-On Monitoring | 21-Sep-07 | 1-Jul-08 | **Ongoing** | China, RMA, OPS/AIR/WG, SAM/WG |
| 62 | Adopt Minimum Monitoring Requirements (MMR) | 12-Mar-07 | Aug-07 | **Completed** | China |
| **63** | **Declare Full Operational Capability** | | | | |
| 64 | Task Force/30 (Bangkok) | 12-Mar-07 | 16-Mar-07 | **Completed** | RVSM Task Force |

| SN | Activity Completed | Start | Target Date | Present Status | Group Responsible | |
|---|---|---|---|---|---|---|
| ~~65~~ | ~~Special Coordiantion Meeting (SCM)~~ | ~~16-May-07~~ | ~~18-May-07~~ | **Completed** | ~~China, Mongolia, Russia, Chairpersons, IATA, ICAO Regional Office, Kazakhstan~~ | |
| ~~66~~ | ~~Special Coordiantion Meeting (SCM) or Follow-up Mission by the Regional Office~~ | ~~7-Jul-07~~ | ~~7-Jul-07~~ | | | |
| ~~67~~ | ~~Task Force/31 (Bangkok)~~ | ~~31-Jul-07~~ | ~~3-Aug-07~~ | **Completed** | ~~RVSM Task Force~~ | |
| ~~68~~ | ~~Task Force/32 (Beijing) - Go/No-Go Meeting - 4 days~~ | ~~18-Sep-07~~ | ~~21-Sep-07~~ | **Completed** | ~~RVSM Task Force~~ | |
| ~~69~~ | ~~Task Force/33 (Beijing) - 90 day review China implementation - 3 days~~ | ~~Apr-08~~ | ~~Apr-08~~ | **Completed** | ~~RVSM Task Force~~ | |
| ~~70~~ | ~~Task Force/34 (TBD) - one year review China implementation - 3 days~~ | ~~Dec-08~~ | ~~Dec-08~~ | **Completed** | ~~RVSM Task Force~~ | |