

**INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE**



**REPORT OF THE THIRTY-THIRD MEETING OF
THE ICAO RVSM IMPLEMENTATION TASK FORCE (RVSM/TF/33)
– 90-DAY REVIEW OF CHINA IMPLEMENTATION**

HANGZHOU, CHINA

9 – 11 April 2008

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

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RVSM/TF/33
Table of Contents

	Page
History of the Meeting	
Introduction.....	i
Attendance	i
Officers and Secretariat.....	i
Opening of the Meeting	i
Documentation and Working Language	ii
Report of RVSM TF/33	
Agenda Item 1: Adoption of Agenda.....	1
Agenda Item 2: Operational Considerations	1
Agenda Item 3: Issues Relating to Airworthiness and Approval of Aircraft	6
Agenda Item 4: Safety and Airspace Monitoring Considerations.....	6
Agenda Item 5: Implementation Management Considerations.....	9
Agenda Item 6: Review of Action Items.....	10
Agenda Item 7: Future Work – Meeting Schedule	10
Agenda Item 8: Other Business.....	10
Appendices	
Appendix A: List of Participants	A-1
Appendix B: List of Papers.....	B-1
Appendix C: Airspace Safety Assessment for the RVSM Post-Implementation in Sovereign Chinese Airspace.....	C-1
Appendix D: RVSM Implementation Status in Asia/Pacific Region	D-1
Appendix E: Task List.....	E-1
Appendix F: Checklist for Transition Coordination.....	F-1

1.1 Introduction

1.1.1 The thirty-third meeting of ICAO Reduced Vertical Separation Minimum Implementation Task Force (RVSM/TF/33 – 90-day review) was held at the Xizibinguan Hotel, Hangzhou, China from 9 to 11 April 2008.

1.2 Attendance

1.2.1 RVSM/TF/33 was attended by 49 participants from China, Hong Kong China, Indonesia, Japan, Republic of Korea, Russian Federation, Singapore, Thailand, United States, Viet Nam, IATA and IFALPA. The purpose of the meeting was to conduct a 90-day post implementation review of the introduction of RVSM in the airspaces of China. A complete list of participants is at **Appendix A** to the 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. Mr. Kyotaro Harano, Regional Officer, Air Traffic Management (ATM), ICAO Asia and Pacific Office served as the Secretary for the meeting.

1.4 Opening of RVSM/TF/33

1.4.1 Mr. Kyotaro Harano opened the meeting and, on behalf of Mr. Mokhtar A. Awan, Regional Director, ICAO Asia and Pacific Office, welcomed the delegates. He took the opportunity to thank China for their warm and generous support in hosting that significant meeting. He remarked that, with the introduction of RVSM in China, departure and enroute delays were significantly reduced, operational efficiency was improved by enabling aircraft to operate closer to their optimum flight levels and airspace capacity was increased. He believed the implementation of RVSM in China was the most productive step coping with the significant traffic growth expected in the Region.

1.4.2 In this regard, Mr. Harano congratulated China and all parties involved for the outstanding results of the RVSM implementation project for the China RVSM, which was implemented on 21 November 2007. The implementation of the RVSM in the Chinese airspace had resulted in the greater enhancement of safety, capacity and efficiency. Finally, Mr. Harano wished the participants a fruitful and successful meeting.

1.4.3 Mr. Kuah Kong Beng welcomed participants. He noted that the price of a barrel of oil has broken the record of US\$100 per barrel. But air travel was becoming increasingly the mode of transportation both for business and leisure. For the benefit of both the airline operators and the traveling public, there was a need to reduce operating costs and minimize delays.

1.4.4 He further remarked that RVSM was one of the ATM initiatives that have brought significant benefits in term of costs and reducing delays. RVSM was successfully implemented in China airspace on 21 November last year. He congratulated Mr. Wang Liya, Deputy Director General of Air Traffic Management Bureau (ATMB), General Administration of Civil Aviation of China (CAAC), and his hard working team for the successful RVSM implementation. States concerned, ICAO, IATA and IFALPA were also congratulated. Their cooperation, hard work and dedication had contributed to this important chapter of ATM initiatives implemented in this Region. However, there was more work to be done. This meeting was the 90-day review of RVSM

implementation in China airspace and all parties concerned should take the opportunity to refine and see where RVSM operations could be further improved.

1.4.5 On behalf of General Administration of Civil Aviation of China (CAAC), new Minister H.E. Mr. Li Jiaxiang, Air Traffic Management Bureau (ATMB) Headquarters, Mr. Wang Liya, Deputy Director General of ATMB, extended his warm welcome to all the delegates to RVSM/TF/33 meeting in Hangzhou.

1.4.6 Mr. Wang remarked that China had maintained close contact with the ICAO Asia and Pacific Office, to summarize the experience and lessons learnt over the past four months, and to take the experience and lessons learnt from neighboring States. China had obtained timely guidance from the Regional Office on RVSM operation in order to facilitate the better operations of RVSM in China.

1.4.7 Mr. Wang informed that China's ATM system had been integrated at the end of September 2007. ATMB Headquarters manages seven regional ATMBs. China's system reform is beneficial to improving efficiency of ATM system.

1.4.8 Mr. Wang hoped that all delegates would have an enjoyable working experience and pleasant stay in Hangzhou. He wished the meeting a complete success.

1.5 **Documentation and Working Language**

1.5.1 The working language of the meeting as well as all documentation was in English. Translation services from Russian to English were provided by the Russian Federation.

1.5.2 Ten Working Papers and six 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/33 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: Future Work – Meeting Schedule
- Agenda Item 8: Other Business

Agenda Item 2: Operational Considerations

Review of RVSM/TF/32

2.1 The meeting reviewed the discussion at RVSM/TF/32 (September 2007, Beijing) to identify the outstanding works to be addressed. It was recalled that the 90-day review meeting would include a review of the safety assessment using the traffic sample data (TSD) collected after RVSM implementation.

90-Day Review by China

2.2 China reported the 90-day review to the meeting. China informed that RVSM was implemented in the Beijing, Guangzhou, Kunming, Lanzhou, Shanghai, Shenyang, Urumqi and Wuhan Flight Information Regions (FIRs) and the Sector 01 (airspace over the Hainan Island) of the Sanya FIR at 1600 UTC on 21 November 2007 as scheduled. China reported that RVSM had been operating safely and smoothly since the implementation. The number of flights handled was 712 805 until 21 March 2008.

2.3 Transition activities between China and adjacent FIRs were operating smoothly. There were nine Chinese FIRs, which were adjacent to 23 FIRs of 12 neighbouring States. Before RVSM was implemented in the Chinese airspace, ICAO compliant feet-based RVSM had been implemented in the adjacent southern FIRs, whereas a metric conventional vertical separation minimum was operating in the adjacent northern FIRs. As such, China had been operating with two different flight level allocation systems in neighboring FIRs. Transitions were difficult and complex process. However, with RVSM implementation, there were benefits and the transition operations were facilitated.

Actions to Keep Safe and Smooth Operation

- 2.4 In order to operate safely and smoothly, ATMB took the following actions:
- a) In order to make sure that transition is safe and smooth, China had signed new letters of agreement (LOAs) with each neighboring FIRs and established new transition procedures in terms of RVSM flight level before the implementation. China also published each LOA in the form of diagram in the AIP supplement that helped the users understand the transition procedures.
 - b) CAAC published China RVSM Policy and Procedures for International Operators & Training Guidance Material at the website: http://www.atmb.net.cn/rvsm/index_eg.asp, which helps operators better understand the China RVSM Policy and Procedures.
 - c) To ensure the safety of airspace and enable the controllers to be familiar with the changes of flight levels and transition procedures, in the past three months, the traffic flow inside China was carefully managed and didn't increase obviously in the first two months after the implementation. RVSM operation was smooth during the period of Chinese Spring Festival when air traffic increased significantly. RVSM operation was becoming familiar to the controllers, and the airspace capacity and operational efficiency would be gradually improved in the Chinese domestic airspace before the August Olympic Games.
 - d) In December 2007 after the RVSM implementation, China conducted the RVSM airspace risk assessment for the second time to further examine the variation and trend of risks after the implementation. China chose December for the traffic sampling because December was the nearest month to that of the RVSM implementation and also a busy month of air transport in China. Also Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) had regionally adopted the month of December each year for collection of Traffic Sample Data (TSD) by all States. The risk assessment based on the December 2007 TSD was carried out in a relatively conservative manner.
 - e) CAAC ATMB was continually keeping in close contact with the international community for any inquiries and feedbacks. After the implementation, ATMB issued letters to ICAO, IATA, IFALPA and the United States Federal Aviation Administration (FAA), introducing their operational situation in general. ATMB expressed their gratitude to all these organizations for the support in RVSM preparation. ATMB had hoped in the letter to keep the relationship. ATMB would welcome and consider any recommendation and proposals.

2.5 China reported that Dr. Taïeb Chérif, Secretary General of ICAO, congratulated China in his response letter for the effort made by CAAC in the work leading up to the implementation, and that the preparatory process ensured a smooth transition into RVSM operations in China.

Review Works Done by China in the Preparation in 2007

2.6 China had established the RVSM website at <http://www.atmb.net.cn/rvsm/index.asp>.

2.7 China had amended regulation and rules such as the Amend China Flight General Law, the Flight Separation rules, and developed the RVSM air traffic control operational manual.

2.8 Training: China developed training materials, produced DVD and posters for RVSM operations. More than 4 700 controllers were trained in 2007, including more than 2 000 enroute controllers. Training for operators was organized, which included 13 188 pilots, 2 211 dispatch staff and 14 204 mechanics.

2.9 Equipment: Eight primary and nineteen backup automation systems equipment were updated and able to process RVSM data.

2.10 Aircraft: Most non-RVSM aircraft were modified to meet the RVSM approval requirement. 1 084 domestic aircraft, which account for more than 90 % of aircraft, were approved for RVSM. 129 foreign airlines had been approved for RVSM in China.

2.11 China had published a series of materials. China also held an RVSM policies and procedures briefing meeting, introducing RVSM policies and procedures. China had promulgated AIP including the conversion procedure chart. Together with IFALPA, China had developed briefing leaflet and conversion table for the pilots. China expressed appreciation to all the States and organizations which had been of help to China for their cooperation.

2.12 China expressed that China had developed a close relationship with international civil aviation community through the implementation of RVSM. China considered that this relationship would benefit the development of civil aviation. China would hold Olympic Games 2008 in Beijing. It would be the first time for China to organize such a big sports event. ATMB would be in charge of providing air traffic services for air transportation to the athletes and guests from all over the world. As such, ATMB would be looking forward to another close coordination with all parties concerned.

2.13 In response to the query from the Russian Federation in regard to the training to controllers, China informed that in June 2007, approximately 30 air traffic managers and controllers representing a cross-section of service providing facilities in China spent a week at the FAA's Fort Worth Air Route Traffic Control Center observing RVSM operations, receiving lectures in FAA RVSM procedures and conducting simulation-based RVSM training using Fort Worth's facilities.

Hong Kong, China

2.14 Hong Kong, China expressed gratitude to China, IATA and IFALPA for their good works provided for the China RVSM. There had been no problem with regard to the operation of RVSM in China. However, Hong Kong, China reported that during the first month of RVSM implementation by China, there were the cases where Hong Kong ATC had to undertake the task to descent the aircraft below FL 280 as the aircraft did not meet the RVSM approval requirement in time.

Russian Federation

2.15 Russian Federation also congratulated China for the RVSM implementation. However, there was no significant increase in airspace capacity in relation to China and the Russian Federation. Russian Federation, while recognizing the difficulties in China, requested China to consider establishing more entry/exit points between the two States concerned. IATA supported the request for more routes as airspace capacity would be increased.

Japan, Thailand, United States and Viet Nam

2.16 Japan, Thailand, the Monitoring Agency for Asia Region (MAAR), the United States and Viet Nam congratulated China for their successful implementation of RVSM.

IATA

2.17 IATA congratulated China for successfully implementing RVSM in the Chinese airspace within such a short period. IATA expressed that there were immense benefits resulting from the implementation of RVSM. There, however, was still the issue on the transition areas and procedures, which had limited the efficient use of the airspace in certain areas due to the different flight levels allocation schemes (FLAS) involving some adjacent FIRs.

IFALPA

2.18 IFALPA expressed its appreciation to China for their efforts to improve the efficiency of the airspace use by introducing RVSM in Chinese FIRs.

2.19 As reported from China, neighboring States and international organizations as above, the meeting noted that RVSM in China was safely and successfully implemented.

Amendment to Annex 2 – Table of Cruising Levels

2.20 In order to proceed with the RVSM implementation, after a study and a formal safety assessment, China had proposed a FLAS that differed from Annex 2 – *Rules of the Air*, Appendix 3 - Tables of Cruising Levels. Subsequently, ICAO circulated the State letter Ref: AN 13/1.8-07/70 dated 7 December 2007 detailing a proposed amendment to the metric flight level tables in Annex 2.

2.21 The Russian Federation informed the meeting that currently they were performing preparatory arrangements to implement RVSM and the work was being carried out to define FLAS to be applied in the Russian airspace.

2.22 Russian Federation noted that, in the framework of the Coordination Council Eurasia comprising Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Belarus and the Russian Federation, the decision had been taken to implement RVSM simultaneously in the member States of the Council and to adopt a single FLAS.

Amendment Proposal to the Regional Supplementary Procedures (Doc 7030)

2.23 The meeting noted that the Regional Supplementary Procedures (SUPPS) provided for the regionally applied RVSM approval basis, the minimum aircraft system performance specification (MASPS), the target level of safety (TLS), operation of aircraft not approved for RVSM and height-keeping monitoring as well as the FIRs where RVSM could be applied. In order to introduce RVSM, the SUPPS should be amended to include the FIRs where RVSM would be applied.

2.24 The President of ICAO Council circulated the Memorandum of President PRES RK/1478 dated 1 February 2008 regarding the amendment APAC-S07/10. On 3 March 2008, the President, on behalf of the Council, approved the proposal for the amendment of the SUPPS to incorporate all the FIRs of China.

Lateral Offset Procedure in Radar Airspace in China

2.25 IATA reported that China required flights to apply a lateral offset procedure in some radar airspace from time to time. The procedure was different from the ICAO PANS-ATM (Doc 4444) strategic lateral offset procedures (SLOP) in that the China procedure was ATC initiated, used left and right offsets and distances greater than 2NM. Reports from airlines indicated that since RVSM implementation, ATC had required pilots to apply lateral offsets with distances ranging from 1 to 4 NM left or right of track. In addition, there was no indication as to the clearance limits, and this had left pilots unsure when they would be expected to resume normal track. This had caused unnecessary confusion amongst some pilots when such instructions were received.

2.26 IATA appreciated that this procedure could have been necessitated by the desire to provide additional safeguards in China's unique set of circumstances in RVSM implementation. IATA, however, could not support the introduction of lateral offsets in radar airspace as a permanent procedure in order to provide mitigation against possible separation breakdown attributable to speculative concerns arising from the current circumstances. It was IATA's view that if there are such underlying causes necessitating the lateral offsets, these should be addressed as soon as possible to provide a long-term and sustainable solution. Otherwise, the appropriate international procedures from the PANS-ATM should be adopted.

2.27 If a lateral offset procedure was required as an interim measure, while the underlying causes were being addressed, China was requested to clarify and publish the interim procedure, and then ensure that it was applied in accordance with the published procedure. The meeting noted that the PANS-ATM contains some related phraseologies as below, which may be applicable.

<i>Circumstances</i>	<i>Phraseologies</i>
12.3.2.9 INSTRUCTIONS ASSOCIATED WITH FLYING A TRACK (OFFSET), PARALLEL TO THE CLEARED ROUTE	a) ADVISE IF ABLE TO PROCEED PARALLEL OFFSET; b) PROCEED OFFSET (<i>distance</i>) RIGHT/LEFT OF (<i>route</i>)(<i>track</i>) [CENTRE LINE] [AT (<i>significant point or time</i>)] [UNTIL (<i>significant point or time</i>)]; c) CANCEL OFFSET (<i>instructions to rejoin cleared flight route or other information</i>).

2.26 IFALPA commented that the lateral offsets should only be initiated to the right of track and should be up to 2 NM in Chinese RVSM airspace within radar cover, as described in PANS-ATM SLOP. In addition, the lateral offsets should not be initiated during the departure phase on standard instrument departure (SIDs) as flight management systems (FMS) do not have this feature on SIDs.

2.27 China agreed that the lateral offset in radar airspace would be, as far as practicable, to the right of track and up to 2 NM under normal circumstances. However, there could be circumstances that would require more than 2 NM offset in either direction. The meeting noted that China could apply offsets in excess of 2 NM in China sovereign airspace if considered necessary by

China to address other circumstances, however urged compliance with the PANS-ATM and related ICAO provisions to the maximum extent possible.

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

There were no matters requiring discussion under this agenda item.

Agenda Item 4: Safety and Airspace Monitoring Considerations

Review of the Eighth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/8)

4.1 The meeting reviewed the outcomes of RASMAG/8 (December 2007, Bangkok).

Post-Implementation RVSM Safety Assessment

4.2 China reported on the scrutiny and safety assessment for the post-implementation of RVSM operations in the Chinese airspace. Based on the traffic sample data (TSD) and the large height deviation (LHD) data collected from the Chinese airspace, China assessed the aircraft approved status and safety risk of the post-RVSM implementation airspace in China, utilizing the internationally accepted collision risk methodology.

4.3 The report, *Airspace Safety Assessment for the RVSM Post-Implementation in Sovereign Chinese Airspace*, provided the post-RVSM implementation scrutiny and safety assessment after the RVSM implementation in the Chinese airspace on 21 November 2007. The report is at **Appendix C** to this report.

4.4 For the completion of the safety assessment, the report presented a comprehensive traffic analysis of the TSD collected in December 2007. In this regard, flight operation statistics, traffic flow characteristics, operator, aircraft profiles and flight levels utilization are given. In the risk estimation for RVSM implementation in sovereign Chinese airspace, the LHD occurrences in sovereign Chinese airspace from January 2006 to February 2008 were examined.

4.5 The report demonstrated that, based on the collected TSD, 98.331% of the aircraft operations in the Chinese airspace where RVSM is implemented had been conducted by RVSM airworthiness approved aircraft and 97.273% by State approved operators and aircraft. The two results showed higher percentages than those in the preliminary risk assessment. However, there were still cases not meeting the RVSM operational approval requirements. This was partly due to the ongoing introduction of the mechanism for approval data collection for the Chinese operators. China RMA would enhance the communication with CAAC inspectors to obtain the up-to-date approval information for the Chinese operators.

4.6 Based on the collected TSD and LHD reports, the update of the vertical collision risk was performed to determine whether the TLS could continue to be met to support the ongoing safe use of RVSM in China airspace. The estimate of technical risk was 6.216×10^{-12} fatal accidents per flight hour and the total risk attributed to all causes is 1.097×10^{-9} . Both technical and total risks were found to satisfy the agreed regional TLS value of no more than 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 300 m (1 000 ft) respectively. The results of the technical and total risks were comparatively safer than those obtained in the preliminary safety assessment. This new estimates were representative of the TSD after the RVSM implementation in China and the most recent 12 month reporting of LHDs.

4.7 IATA considered that when an error, e.g. in ATC coordination, results in an aircraft operating at the wrong level, the aircraft could be expected to be 1 000 ft or more away from its assigned level under normal circumstances. This event would be regarded as an LHD and be recorded for remedial action as well as being included in the RVSM safety assessments.

4.8 However, in the transition between an FIR operating on an ICAO RVSM feet level system and one of China's FIRs, the same error could result in only a 100 ft misalignment. For example, if an aircraft at FL 311 is transferred from a Chinese FIR to an adjacent FIR which is operating on an ICAO RVSM feet level system at FL 311 when it should be at FL 310, the aircraft would only be 100 ft away from the correct altitude. The scenario in reverse would also apply.

4.9 The meeting discussed whether an event involving an aircraft being 100 ft away from its assigned flight level resulting from an error, should be considered an LHD, noting that the plain language definition of an LHD formulated by RASMAG/7 requires the aircraft to 300 ft or more away from the expected level. The meeting agreed that if the discrepancy arose as a result of an error in the transferring ACC or the pilot flying at the wrong level, the event should not be ignored as it was an incident that should be investigated as part of normal safety management system activities. However, the meeting considered that these kind of events should also be reported to the respective RMAs and be taken into consideration in the overall safety assessment in some other manner even though the event resulted in a 100 ft misalignment only.

4.10 MAAR suggested that the risk calculation methodology be reviewed to properly address the issue of the 100 ft deviation. The meeting agreed to refer the issue to RASMAG for the clarification on the 100 ft error in flight level assignment.

Establishment of China Regional Monitoring Agency

Continued Work for the Establishment of RMA

4.11 China reported that that an RMA must have both the authority and technical competence to carry out its functions. In establishing an RMA, it was necessary to ensure that:

- the organization must be authorized to act as an RMA as the result of decision by a State, a group of States or a planning and implementation regional group (PIRG); and
- the organization acting as an RMA had adequate personnel with the technical skills to carry out the following functions:
 - a) to establish and maintain a database of RVSM approvals;
 - b) to monitor aircraft height-keeping performance and the occurrence of LHDs, and report results appropriately;
 - c) to conduct safety and readiness assessments and report result appropriately;
 - d) to monitor operator compliance with State approval requirements after RVSM implementation; and
 - e) to initiate necessary remedial actions if RVSM requirements are not met.

- 4.12 China reported that they had made progress in the establishment of RMA as follows:
- ATMB had established an RVSM technical group composed of personnel with the technical skills and experience in 2006. The group has completed three risk estimate for Chinese airspace (including: 1st for the assessment for the Shanghai FIR, 2nd for the preliminary assessment for the RVSM airspace to support the Go/No-Go and the 3rd for the post-implementation assessment for 90 day review);
 - The internal arrangement for the application of RMA establishment had been completed and the China RMA would be authorized from CAAC by May 2008.
 - Following regional endorsement by APANPIRG, the China RMA would assume the duty and the responsibilities set for a regional RMA as follows:
 - a) to establish and maintain the database of RVSM approvals;
 - b) to establish and maintain the database of Points of Contact (POC);
 - c) to establish the mechanism of TSD and LHD reports collection, and be able to perform scrutiny assessment and LHD analysis;
 - d) to develop software platform to complete the technical and overall risk estimate automatically;
 - e) to establish Chinese RMA Minimum Monitoring Requirements (MMR) incorporating the provisions of Annex 6 in relation to global airframe monitoring requirements and begin the work of tracking whether operators using Chinese RVSM airspace have met the Chinese MMR; and
 - f) to complete the monitoring training and be able to conduct aircraft height-keeping performance monitoring using Enhanced GPS monitoring unit (EGMU) equipment.

Future Work

- 4.13 China reported that to completed the work for the establishment of RMA, China RMA would:
- continue the work of updating relevant laws and regulations to standardize the duties and responsibilities for China RMA, and define its status after receiving the authorization from CAAC.
 - strengthen communications with Chinese inspectors and operators.
 - complete the development of risk assessment software and China RMA website for the information sharing with other RMAs.
 - continue to track whether operators using Chinese RVSM airspace had met the Chinese MMR and prepare for the ability of providing height-keeping performance monitoring service.

4.14 China would submit formal application materials for the RMA establishment to RASMAG/9 in May 2008. Following an appropriate recommendation from RASMAG, China may be formally authorized by APANPIRG at its 19th meeting in September 2008 and become an APANPIRG authorized RMA.

4.15 China RMA would actively participate in the international cooperation. China RMA would participate in the Special Coordination Meeting for Regional Monitoring Agencies in Montreal, 13 to 15 May 2008. Meanwhile, China RMA will also strengthen her cooperation with other RMAs, sharing her monitoring results and experience in risk assessment.

4.16 The meeting noted the progress of RMA establishment by China and the contacts of China RMA as follows:

China RMA email: rvsmdata@sina.com

Coordinators of China RMA:

Mr. Tang Jinxiang, Aviation Data Communication Corporation of ATMB, CAAC

tangjx@adcc.com.cn (tang_jinxiang@hotmail.com)

Ms. Zhao Jun, Aviation Data Communication Corporation of ATMB, CAAC

lieny1983@gmail.com

4.17 To the query from the Russian Federation, the Secretariat advised that the actual inauguration date of China RMA would be decided by APANPIRG/19 (September 2008) following their review of the recommendations from RASMAG/9 and the establishment of the China RMA would be announced by a State Letter from the Regional Office.

Agenda Item 5: Implementation Management Considerations

Status of RVSM Implementation in Asia and Pacific Region

5.1 The implementation was based on operational needs to increase airspace capacity and enhance the management of air traffic in the Region.

5.2 Remaining airspaces where RVSM had not been implemented yet were the Pyongyang (Democratic People's Republic of Korea) and the Ulaanbaatar (Mongolia) FIRs. In terms of the work programme of the RVSM/TF, it was suggested that particularly Mongolia be assisted to introduce RVSM in the Ulaanbaatar FIR to enhance the seamless RVSM operations for the Transasian routes as early as possible.

5.3 The meeting reviewed the current status of RVSM implementation in Asia and Pacific Region as in **Appendix D** to this report, and instructed the Chairman and the Secretariat to report the reviewed status report to APANPIRG/19 in September through the 18th meeting of ATM/AIS/SAR Sub-Group in June.

5.4 The Secretariat highlighted that virtually all airspaces of the Asia/Pacific Region had now implemented RVSM and that the work of the RVSM Task Force was therefore very close to completion. Accordingly, it was likely that APANPIRG/19 would consider whether the RVSM Task Force should be dissolved, to take effect after the 12-month review of China RVSM implementation

in December 2008, and any residual matters be allocated to the respective ATS Coordination groups and ATM/AIS/SAR Sub-Group for action.

Agenda Item 6: Review of Action Items

6.1 The meeting reviewed and updated Task List and the Check List for Transfer Coordination as shown in **Appendices E** and **F**, respectively, to the Report.

Agenda Item 7: Future Work – Meeting Schedule

7.1 The meeting agreed tentatively on the future work programme of the Task Force as follows:

RVSM/TF/34 (one year review)	December 2008	venue TBD
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Agenda Item 8: Other Business

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

8.1 The meeting reviewed the outcomes of the fourth meeting of the Western Pacific/South China Sea RVSM Scrutiny Group (WPAC/SCS RSG/4, February 2008) at ICAO Asia and Pacific Office, Bangkok, Thailand.

Review of PBN/TF/1

8.2 The meeting reviewed the outcomes of the first meeting of the Performance Based Navigation Task Force (PBN/TF/1, January 2008).

8.3 PBN/TF/1 reviewed the terms of reference (TOR) critically and put forward proposed amendments/observations on the viability of the TOR in terms of PBN implementation. PBN/TF formed two subsidiary groups in order to progress the two primary objectives agreed by the task force.

9. Closing of the Meeting

9.1 On behalf of the ICAO RVSM Implementation Task Force for the Asia Pacific Region, Mr. Kuah Kong Beng thanked to all delegates.

9.2 The meeting was very grateful to the Chairman for his excellent job to keep the meeting focus on specific issues, and for the success of the meeting.

9.3 Mr. Kyotaro Harano, on behalf of ICAO Asia and Pacific Office, expressed his appreciation to the meeting. The RVSM implementation in China was the last major implementation for the Asia/Pacific region and would result in many safety, efficiency and environmental benefits to civil aviation operations.

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RVSM/TF/33
Appendix A to the Report

List of Participants

	Name	Title/Organization	TEL/FAX/E-MAIL
1.	CHINA		
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RVSM/TF/33
Appendix A to the Report

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RVSM/TF/33
Appendix A to the Report

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RVSM/TF/33
Appendix A to the Report

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RVSM/TF/33
Appendix A to the Report

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RVSM/TF/33
Appendix A to the Report

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RVSM/TF/33
Appendix A to the Report

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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, 3, 4	Review of the 32nd Meeting of the RVSM Implementation Task Force (RVSM/TF/32)	Secretariat
WP/3	2, 3, 4	Amendment Proposal to the Regional Supplementary Procedures (Doc 7030)	Secretariat
WP/4	4	Review of the Eighth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/8)	Secretariat
WP/5	5	Task List for Implementation of Reduced Vertical Separation Minimum (RVSM) by China and the Transition Arrangement Check List	Chairman
WP/6	5	Status of RVSM Implementation in Asia and Pacific Region	Secretariat
WP/7	4	Progress of China RMA Construction	China
WP/8	2	Post-RVSM Implementation Risk Assessment for the Sovereign Chinese Airspace	China
WP/9	4	Review RVSM Implementation in Chinese Airspace	China
WP/10	2	Lateral Offset Procedures in China	IATA

INFORMATION PAPERS

NUMBER	AGENDA	INFORMATION PAPERS	PRESENTED BY
IP/1	-	List of Working Papers (WPs) and Information Papers (IPs)	Secretariat
IP/2	-	Terms of Reference of RVSM/TF	Secretariat
IP/3	8	The Fourth Meeting of the Western Pacific/South China Sea RVSM Scrutiny Group	Secretariat
IP/4	8	Proposal for the Amendment of Annexes 4, 11 and 15, PANS-ABC, PANS-ATM and PANP-OPS	Secretariat
IP/5	2	Amendment to Annex 2 – Table Of Cruising Levels	Secretariat
IP/6	5	Global Long-Term Height Monitoring for RVSM Operations	Secretariat

— END —



中国民航缩小垂直间隔安全评估报告

AIRSPACE SAFETY ASSESSMENT FOR THE RVSM POST-IMPLEMENTATION IN SOVEREIGN CHINESE AIRSPACE

提交给：

Submitted to:

国际民航组织亚太地区办公室

ICAO Asia/Pacific Regional Office

国际民航组织亚太地区实施缩小垂直间隔工作组

ICAO Asia/Pacific RVSM Implementation Task Force

民航总局空中交通管理局

Air Traffic Management Bureau (ATMB)

General Administration of Civil Aviation of China (CAAC)

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目 录

摘要.....	4
1.介绍.....	5
2.背景.....	5
2.1 实施 RVSM 的航行情报区	5
2.2 评估所用数据的采集.....	6
3.空域运行情况分析	6
3.1 交通流样本.....	6
3.2 收集的交通流数据.....	6
3.3 航班运行统计	7
3.4 交通流特征.....	14
3.5 航空公司及航空器特征.....	15
3.6 飞行高度层使用情况.....	16
4. RVSM 航空器准备情况评估.....	17
5.大高度偏差事件	20
6.风险评估及安全监督	28
6.1 对碰撞风险评估算法的调整.....	28
6.2 碰撞风险模型参数的计算.....	29
6.3 中国实施 RVSM 的安全监督	30
6.4 安全监督.....	33
参考文献	34
附录 A.....	35
附录 B.....	36

TABLE OF CONTENTS

EXECUTIVE SUMMARY 4

1. INTRODUCTION..... 5

2. BACKGROUND 5

 2.1 FLIGHT INFORMATION REGIONS (FIRs) IMPLEMENTING RVSM..... 5

 2.2 DATA INQUIRY FOR SOVEREIGN CHINESE AIRSPACE RVSM SCRUTINY AND SAFETY ASSESSMENTS 6

3. KNOW YOUR AIRSPACE ANALYSES 6

 3.1 TRAFFIC SAMPLING..... 6

 3.2 RECEIVED TRAFFIC DATA 6

 3.3 FLIGHT OPERATION STATISTICS 7

 3.4 TRAFFIC FLOW CHARACTERISTICS 14

 3.5 OPERATOR AND AIRCRAFT PROFILES 15

 3.6 FLIGHT LEVEL UTILIZATION..... 16

4. RVSM SCRUTINY ASSESSMENT 17

5. LARGE HEIGHT DEVIATION OCCURRENCES 20

6. RISK ASSESSMENT AND SAFETY OVERSIGHT..... 28

 6.1 MODIFICATION OF RISK ASSESSMENT ALGORITHM..... 28

 6.2 ESTIMATE OF THE CRM PARAMETERS..... 29

 6.3 SAFETY ASSESSMENT IN SOVEREIGN CHINESE RVSM AIRSPACE..... 30

 6.4 SAFETY OVERSIGHT..... 33

REFERENCES 34

APPENDIX A 35

APPENDIX B..... 36

摘 要

此报告为 2007 年 11 月 21 日中国实施 RVSM 后的空域提供了一份空域使用情况和风险情况的评估结果以支持 RVSM 工作小组第 33 次会议 (RVSM 实施 90 天回顾) 的检验。

为了安全评估的完整性,此报告提供了对 2007 年 12 月收集的空域交通流情况的详细分析,包括航班运行统计,交通流特征,航空公司和航空器特征,以及飞行高度层使用情况。在本次风险评估中,所使用的大高度偏差(LHD)数据包括了从 2006 年 1 月到 2008 年 2 月的数据。

如报告所示,基于所采集的交通流样本数据,在中国 RVSM 空域内运行的所有航班中,98.331%的航班是由获得了 RVSM 适航许可的航空器承担的,97.273%的航班是由获得了 RVSM 运行许可的航空公司和航空器承担的。以上两个结果明显高于我们在实施前做空域初步评估时获得的结果。然而,在我们的统计结果中仍存在未获得 RVSM 批准的情况。这在一定程度上是由于目前针对中国国内航空公司的航空器获 RVSM 批准情况数据采集制度正在建设中。中国 RMA 将继续加强和中国民航当局检查员的联系沟通,为获得最新的批准情况数据不断努力。

基于以上大高度偏差数据和飞行流样本数据,报告中重新计算了 RVSM 实施后中国空域的技术风险和总风险结果以判断实施后空域是否能继续被安全使用。在评估结果中,技术风险为每飞行小时 6.216×10^{-12} 次事故率,由技术风险和运行风险相加而构成总风险为每飞行小时 1.097×10^{-9} 次事故率,它们分别小于国际民航组织规定的每飞行小时 2.5×10^{-9} 和 5.0×10^{-9} 次事故率,满足目标安全水平,并且它们都分别比实施前初步评估中得到的风险结果要小,这表明实施后中国空域的总体风险有所下降。这个新的评估结果是对实施后飞行流样本数据和最近 12 个月的大高度偏差情况综合分析的结果

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

EXECUTIVE SUMMARY

This report provides the summary of a post-RVSM implementation scrutiny and safety assessment, supporting the RVSM/TF/ 33 (90 day review) after the RVSM implementation in sovereign Chinese airspace on November 21st, 2007.

For the completion of the safety assessment, this report presents a comprehensive traffic analysis of the traffic sample data (TSD) collected in December 2007. In this regard, flight operation statistics, traffic flow characteristics, operator and aircraft profiles, and flight level utilization are given. In regard to the risk estimation for sovereign Chinese airspace RVSM implementation, the large height deviation (LHD) occurrences in sovereign Chinese airspace from January 2006 to February 2008 were examined.

The report demonstrates that, based on the collected TSD, 98.331% of the aircraft operations in the sovereign Chinese airspace where RVSM is implemented have been conducted by RVSM airworthiness approved aircraft and 97.273% by State approved operators and aircraft. Both of the two percentages are obvious higher than the one we obtained in the preliminary risk assessment. It is found that there are still violations of RVSM operational approval requirements. This is partly because that mechanism of Approval data collection for the Chinese operators is still under construction. China RMA will enhance the communication with CAAC inspectors to obtain the up-to-date approval information for the Chinese operators.

Based on the collected TSD and LHD reports, the update of the vertical collision risk was performed to determine whether the TLS continued to be met in support of the ongoing safe use of RVSM since the RVSM implementation in China. The estimate of technical risk is 6.216×10^{-12} fatal accidents per flight hour and the total risk attributed to all causes is 1.097×10^{-9} . Both technical and total risks were found to satisfy the agreed TLS value of no more than 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 300m (1,000ft) respectively, and they were comparatively smaller than the values obtained in the preliminary safety assessment which indicate that both technical and total risks decrease after RVSM implementation. This new estimate was representative of the TSD after the RVSM implementation in China and the most-recent 12-month reporting of large height deviations.

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

1. INTRODUCTION

This report provides the summary of scrutiny and safety assessment for the RVSM implementation in the sovereign Chinese airspace. The content of the report includes:

- Background,
- Summary of Know Your Airspace (KYA) analyses,
- Result of RVSM *scrutiny assessment* (its counterpart is the readiness assessment in the preliminary risk assessment)
- Summary of Large Height Deviation (LHD) occurrences, and
- Results of RVSM technical and overall risk

2. BACKGROUND

At 1600 UTC, November 21st, 2007, China implemented RVSM between 8,900 meters (29,100 feet) and 12,500 meters (41,100 feet), inclusive, in sovereign airspace. According to ICAO *Manual on the implementation of a 300 m (1,000 ft) Vertical Separation Minimum Between FL290 and FL410 Inclusive, ICAO Doc 9574*, a post- RVSM implementation scrutiny and safety assessment of airspace where RVSM is has been implemented is required. The Air Traffic Management Bureau (ATMB) of the General Administration of Civil Aviation of China (CAAC) has assumed this responsibility since 2006, and a group of technical specialists was formed to study the RVSM safety assessment methodology and procedures.

Based on the TSD and LHD data collected from sovereign Chinese airspace, China has endeavored to assess the aircraft approved status and safety risk of the post-RVSM implementation airspace in China, utilizing the internationally accepted collision risk methodology. This report which presents the outcome of the assessments is expected to provide the risk assessment information to the RVSM/TF/ 33 (90 day review).

2.1 Flight Information Regions (FIRs) Implementing RVSM

The geographical area included in the scrutiny and safety assessment is the sovereign Chinese airspace. The FIRs and Area Control Centers (ACCs) included in this airspace are summarized in [Table 1](#).

FIR	ACC	ATC STATUS
Beijing	Beijing	Radar Control
	Taiyuan	Radar Control
	Hohhot	Radar Control
Shanghai	Shanghai	Radar Control
	Qingdao	Radar Control
	Jinan	Radar Control
	Hefei	Radar Control
	Nanchang	Radar Control
	Xiamen	Radar Control
Guangzhou	Guangzhou	Radar Control
	Guilin	Radar Control
	Zhanjiang	Radar Control
	Nanning	Radar Control
	Changsha	Radar Control
Wuhan	Wuhan	Radar Control

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

FIR	ACC	ATC STATUS
	Zhengzhou	Radar Control
Shenyang	Shenyang	Radar Control
	Dalian	Radar Control
	Harbin	Radar Control
	Hailar	Procedural Control
Lanzhou	Lanzhou	Procedural Control
	Xian	Radar Control
Urumqi	Urumqi	Procedural Control
Kunming	Kunming	Radar Control
	Chengdu	Radar Control except the 3 rd Sector
	Lhasa	Procedural Control
	Guiyang	Procedural Control
Sanya(Island)	Sanya	Radar Control

Table 1: FIRs and ACCs in the Sovereign Chinese Airspace Implementing RVSM

In this report, the method of risk assessment is modified by introducing weight factors proportionate to the total flying hours of airspace under different control status to obtain an average weighted risk (For more detail, please refer to Section 6.1). Therefore, all the TSD and LHD analysis are demonstrated separately under Radar Control airspace and Procedural Control airspace.

2.2 Data Inquiry for Sovereign Chinese Airspace RVSM Scrutiny and Safety Assessments

The scrutiny and safety assessments for the RVSM implementation in sovereign Chinese airspace are conducted based on:

- ➔ 1-month traffic sample data (TSD) collected in December,2007,
- ➔ Up-to-date State RVSM approval records of operators and aircraft using RVSM airspace,
- ➔ Monthly Large Height Deviation (LHD) reports collected from January 2006 to February, 2008 and
- ➔ LHD related Incident reports from January, 2006 to May, 2007.

Both TSD and LHD reports are significant pieces of information for estimating risks from technical and operational errors, which would facilitate the review of the safety in the sovereign Chinese airspace where RVSM has been implemented.

3. KNOW YOUR AIRSPACE ANALYSES

3.1 Traffic Sampling

The traffic sample data include the information requested for an individual traffic movement, or flight.

3.2 Received Traffic Data

Table 2 contains a summary of the traffic data collected from 1 to 30 December 2007 for use in the analysis.

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

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 2: Summary of Traffic Data of December 2007 in the Sovereign Chinese Airspace

The results of the KYA analysis of the sovereign Chinese airspace collected TSD received by ATMB of CAAC are presented in the following contents:

- ➔ Flight operation statistics
- ➔ Traffic flow characteristics
- ➔ Operator and aircraft profiles, and
- ➔ Flight level utilization.

3.3 Flight Operation Statistics

The provisional flight operational statistic in the RVSM sovereign airspace in China includes:

- Number of flights by ATC status per day (**Figure 1.1** to **Figure 1.2** for Procedural

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

Control and Radar Control airspace in China)

- Number of flights by ten days of every FIR (**Table 3**)
- Number of flights in sovereign Chinese airspace (**Figure 1.3**)
- Number of flights by FIR per day (**Figure 1.4** to **Figure 1.12** for nine FIRs in China)

As mentioned above, the method of risk assessment in this report is modified by introducing weight factors (For more detail, please refer to Section 6.1). All the TSD data processing was performed separately. The TSD data of separate Air Traffic Control airspace are only used to calculate the risk model parameters for this airspace. **Figure 1.1** to **Figure 1.2** demonstrate the number of flights for Procedural Control and Radar Control airspace in China

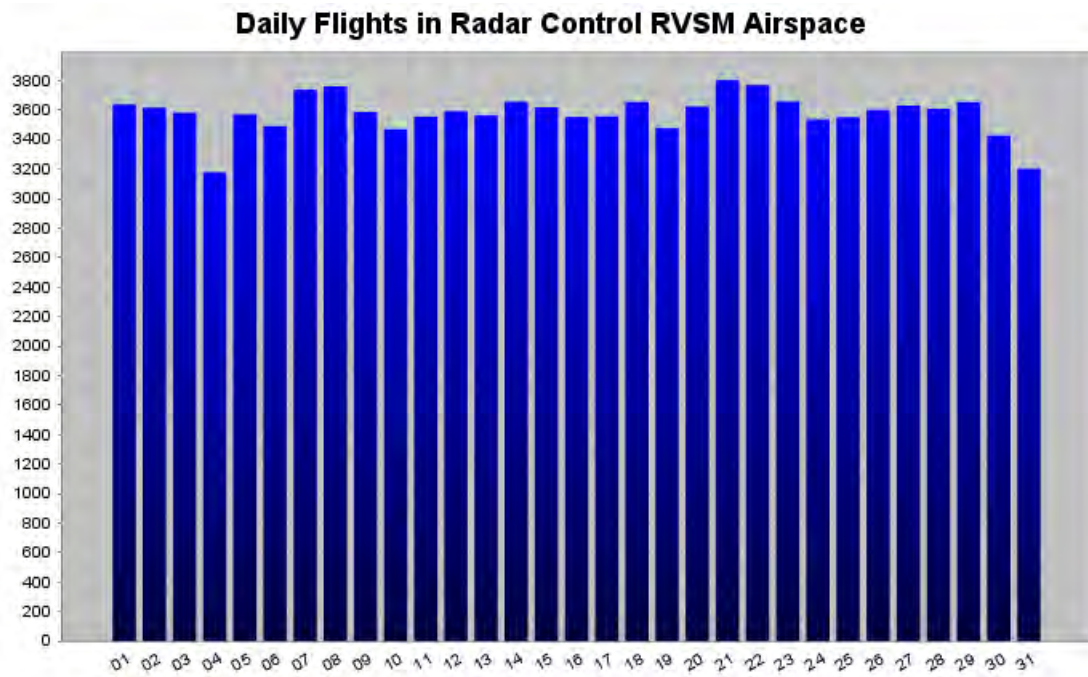


Figure 1.1: Number of Flights per Day in Radar Control Airspace

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

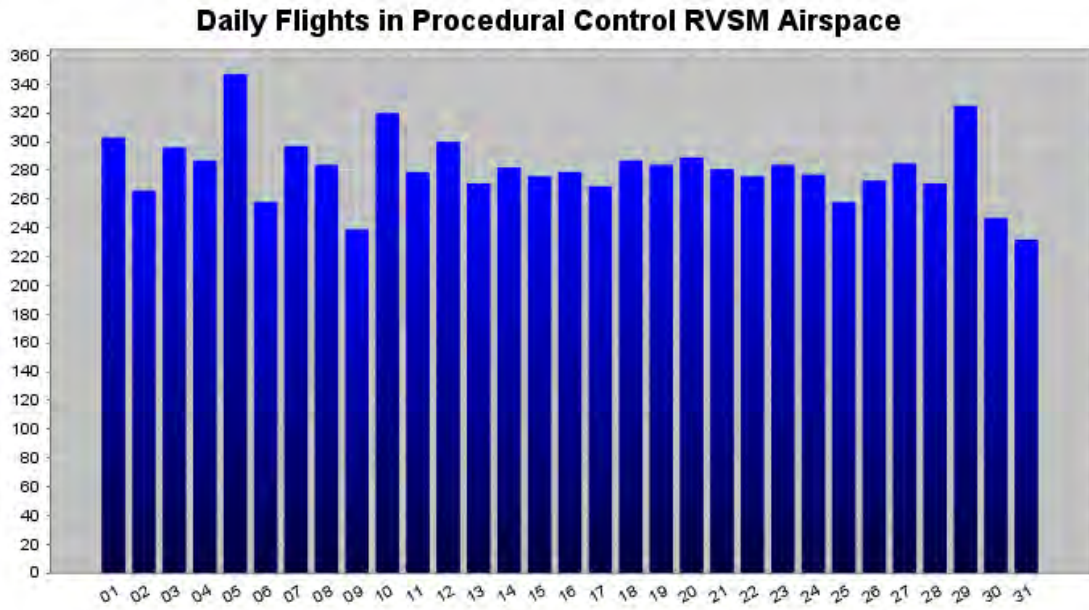


Figure 1.2: Number of Flights per Day in Procedural Control Airspace

FIR	Number of Flights			Total Number
	12/01 - 12/10	12/11 - 12/20	12/21 - 12/31	
Shenyang	4834	4762	5169	14765
Guangzhou	14129	13883	15954	43966
Wuhan	7908	7363	8264	23535
Lanzhou	5196	5102	5452	15750
Urumqi	1785	1776	1821	5382
Kuming	10357	10279	10922	31558
Beijing	8608	8775	9321	26704
Shanghai	14237	15408	17328	46973
Sanya(Island)	1784	1925	1993	5702
Procedural Control	2897	2816	3009	8722
Radar Control	35641	35862	39450	110953
State	36494	36680	40297	113471

Table 3: Number of Flights in Nine FIRs Airspace of China from the Collected TSD

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

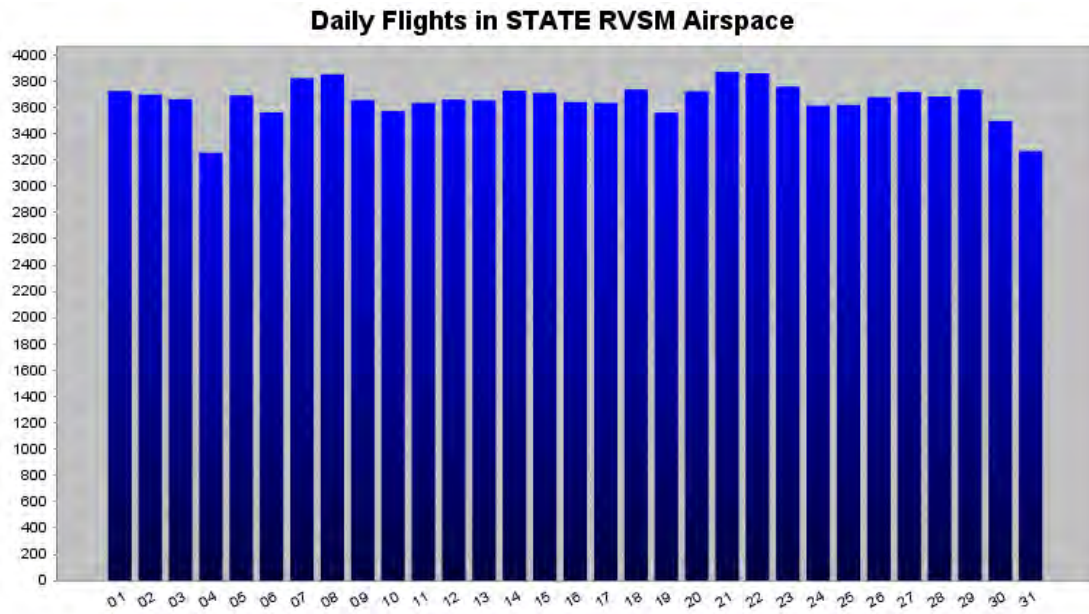


Figure 1.3: Number of Flights per Day in the Sovereign Chinese Airspace

After the data merging of nine FIRs, the total number of Flights in the entire China RVSM airspace is 113,471 flights in December 2007, and 3,660 flights per day.

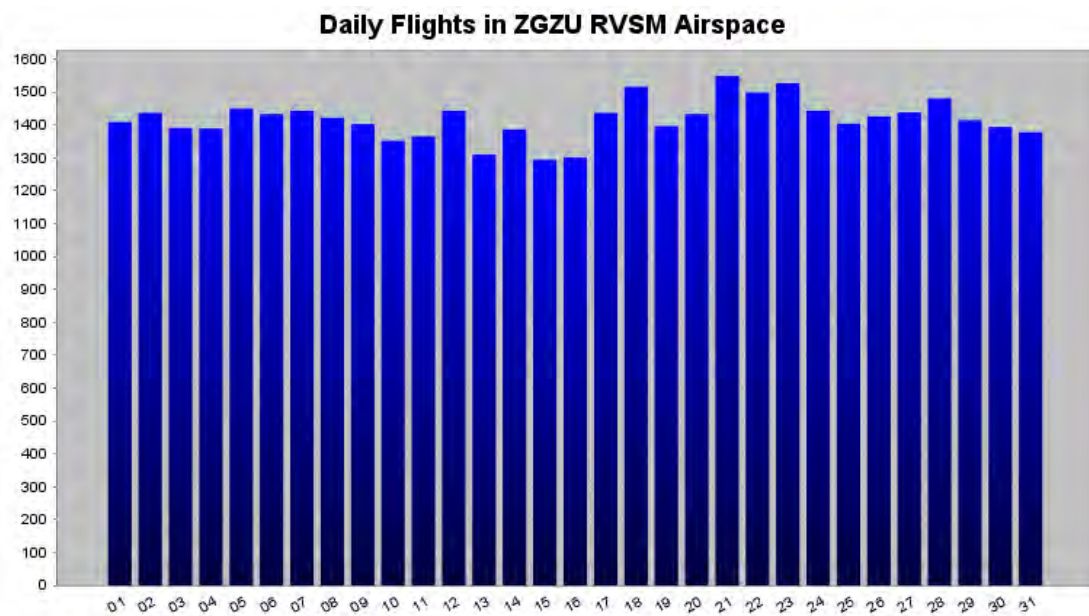


Figure 1.4: Number of Flights per Day in Guangzhou FIR

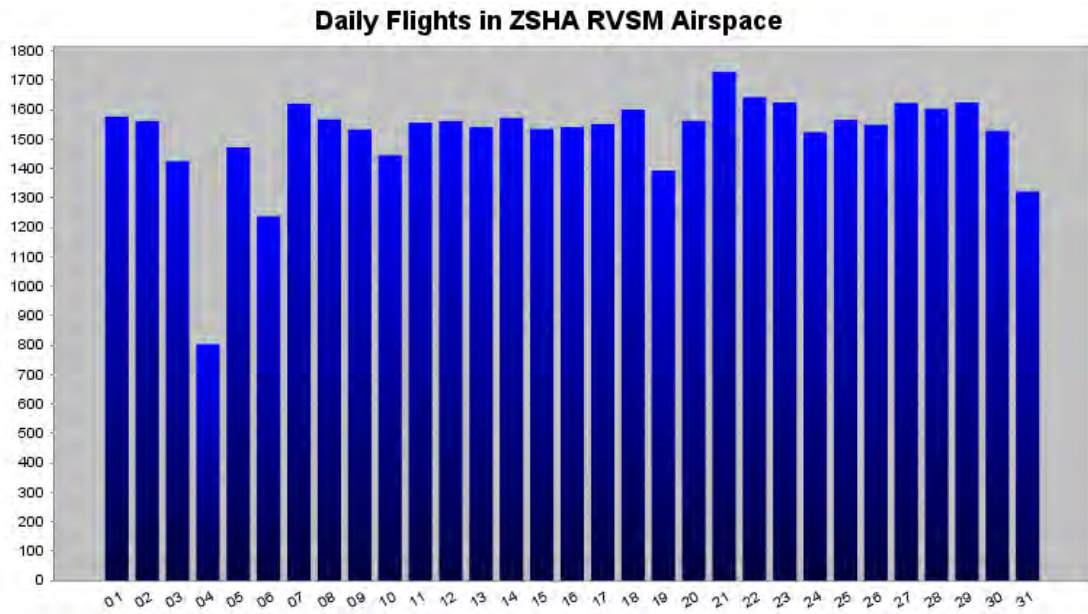


Figure 1.5: Number of Flights per Day in Shanghai FIR

Note: The relatively small numbers of flights on June 4th and 6th are due to the malfunction of statistics software used to collect TSD data automatically.

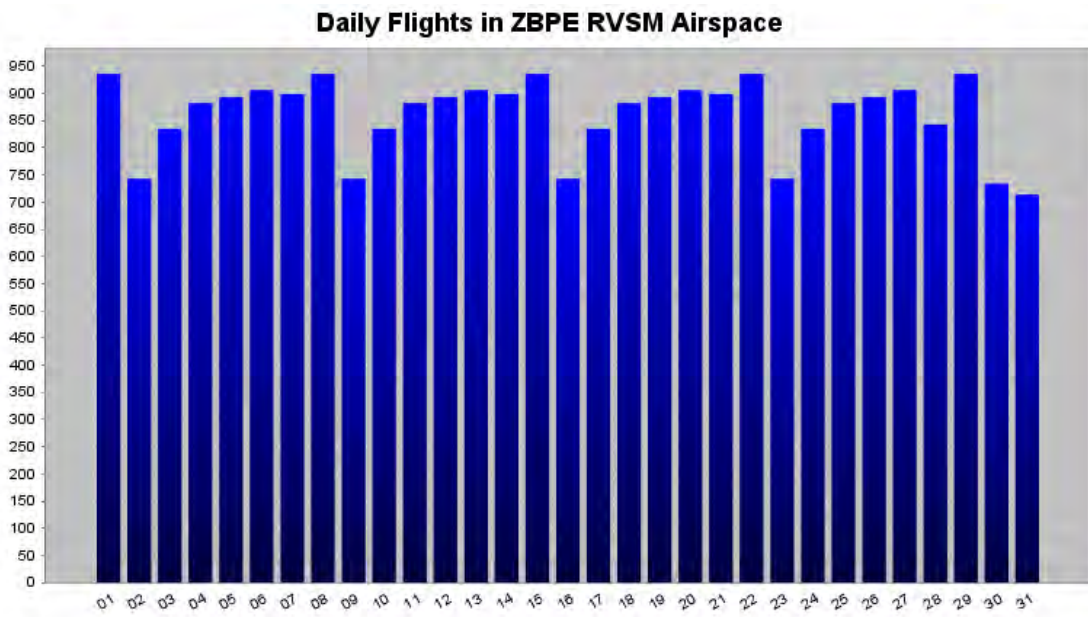


Figure 1.6: Number of Flights per Day in Beijing FIR

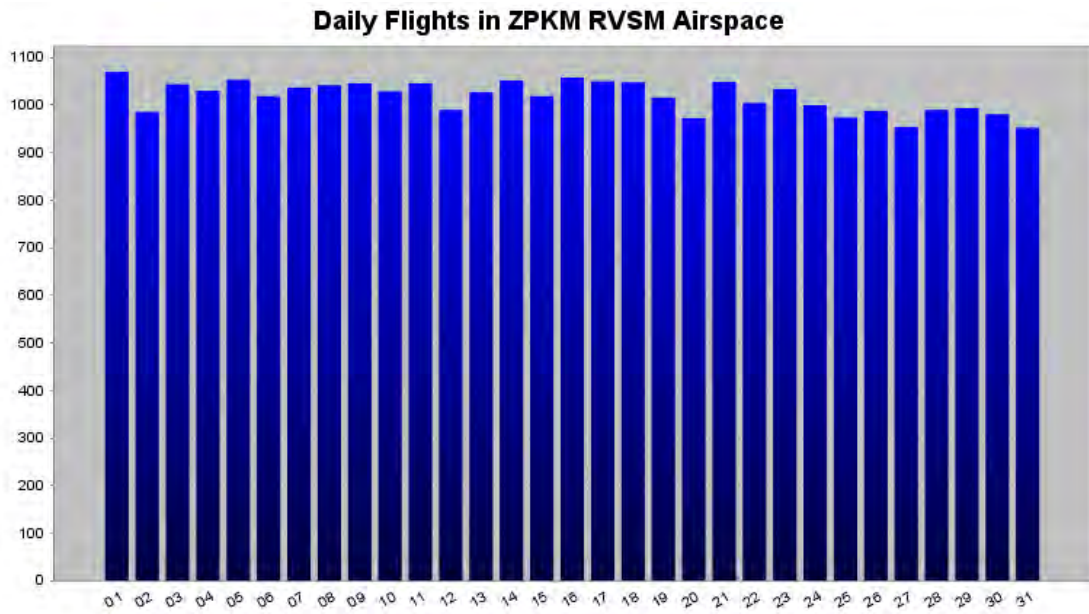


Figure 1.7: Number of Flights per Day in Kunming FIR

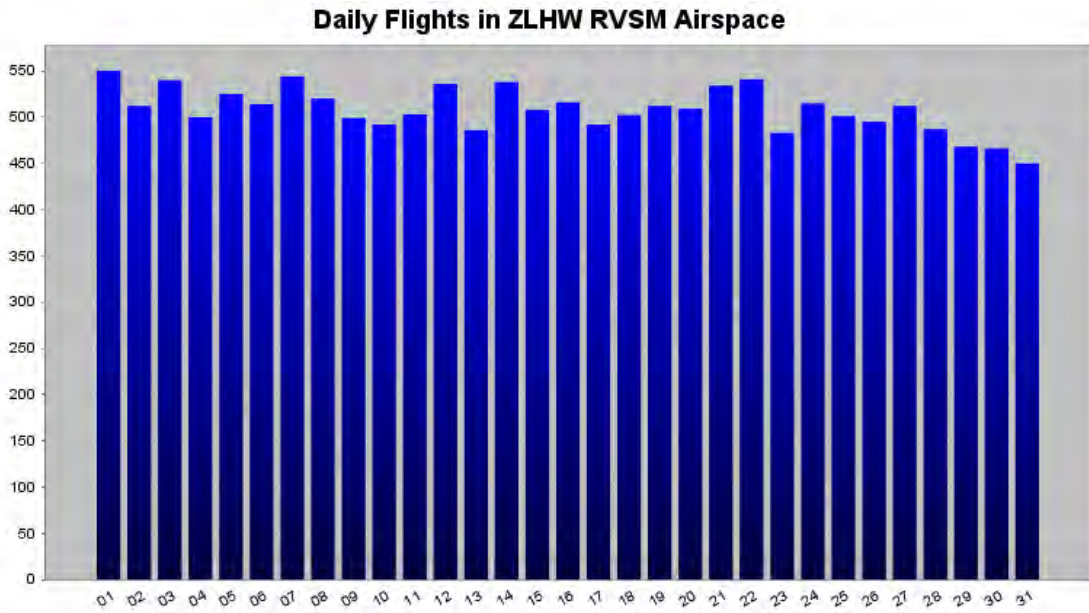


Figure 1.8: Number of Flights per Day in Lanzhou FIR

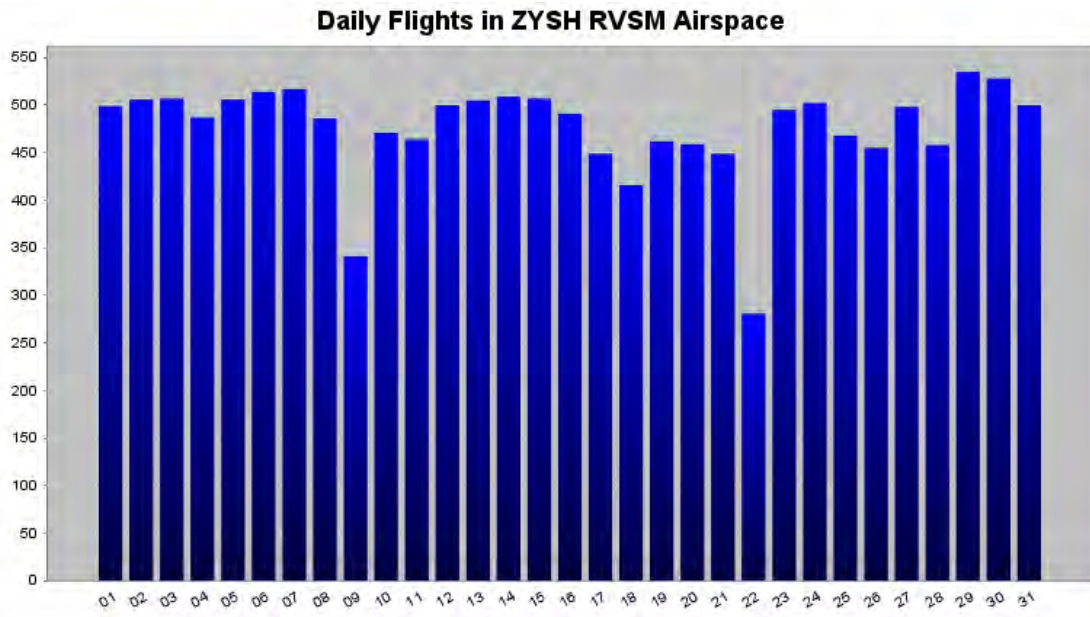


Figure 1.9: Number of Flights per Day in Shenyang FIR

Note: The relatively small numbers of flights on June 9th and 22nd are due to the malfunction of statistics software used to collect TSD data automatically.

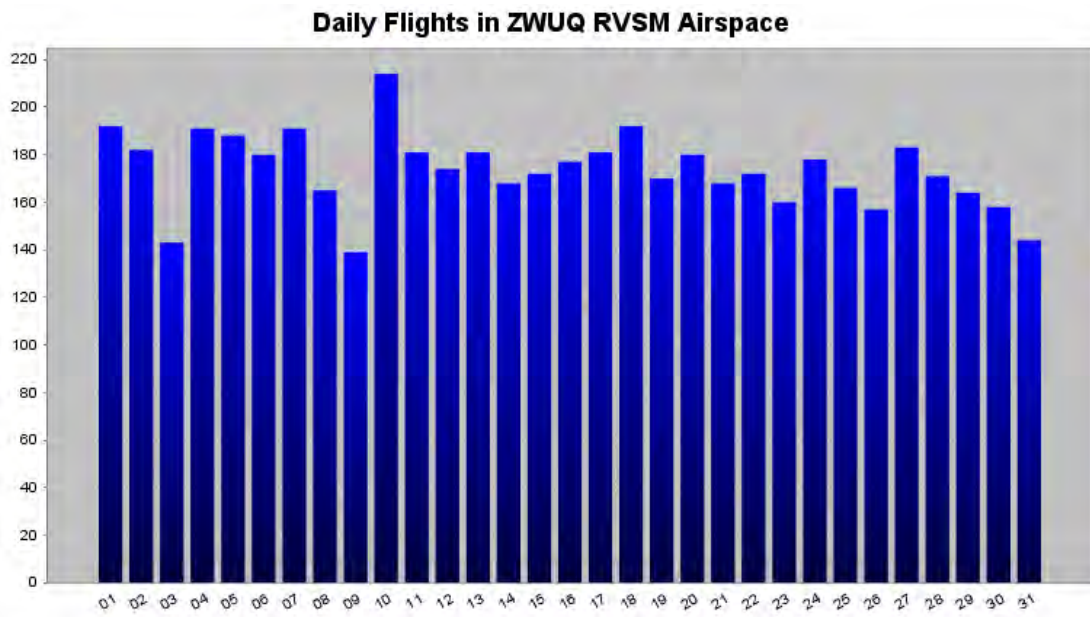


Figure 1.10: Number of Flights per Day in Urumqi FIR

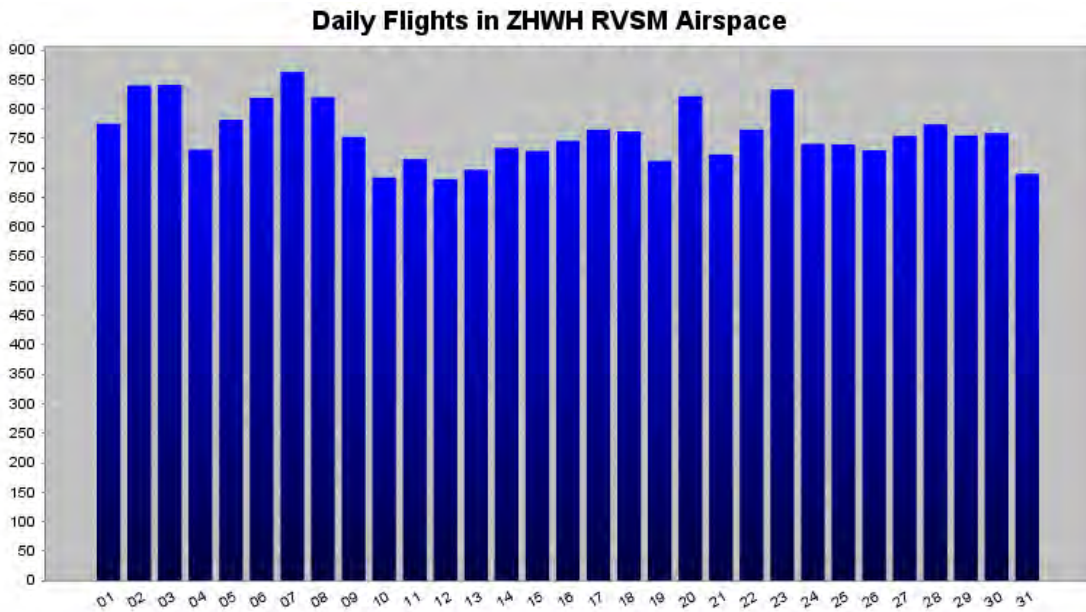


Figure 1.11: Number of Flights per Day in Wuhan FIR

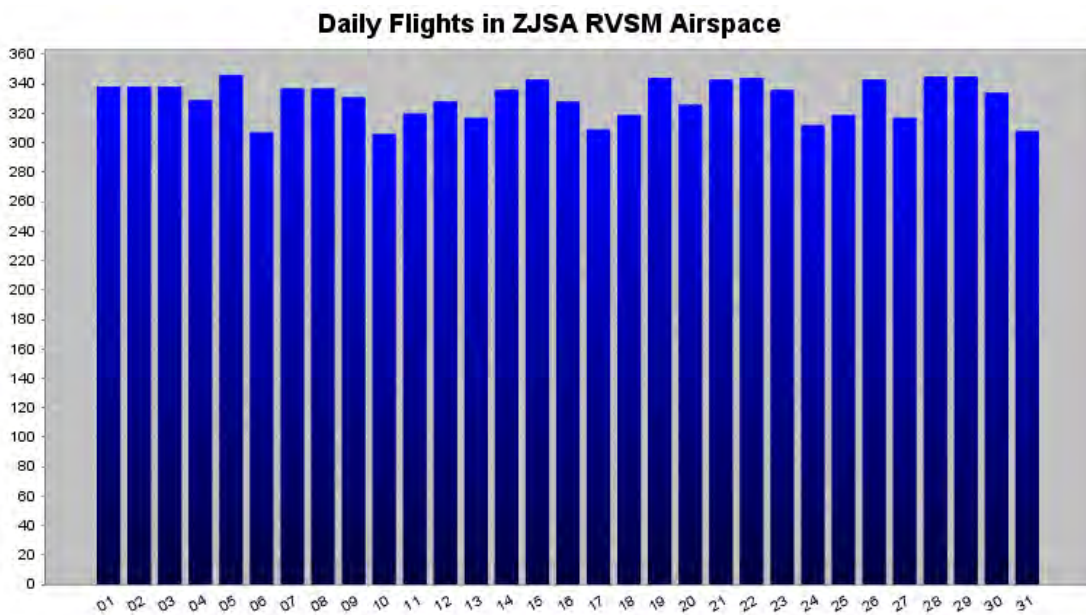


Figure 1.12: Number of Flights per Day in Sanya FIR

3.4 Traffic Flow Characteristics

The analyzed characteristics of traffic flow in the RVSM sovereign airspace in China include:

- Top-15 city pairs (Figure 2)

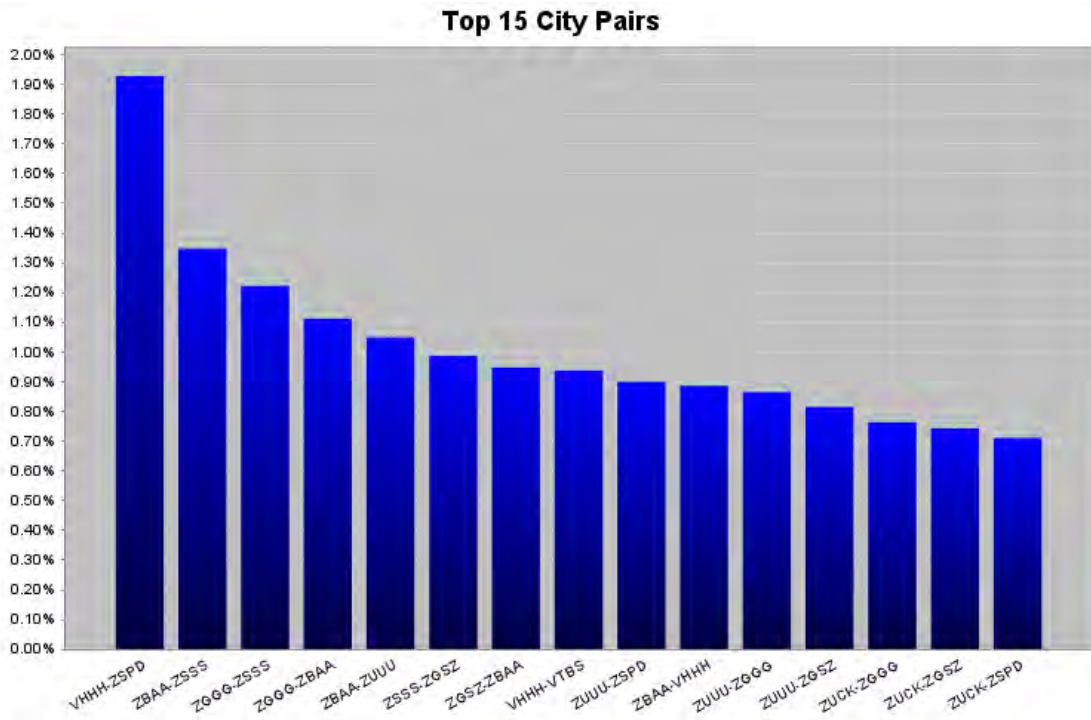


Figure 2: Top-15 City Pairs (the Y-Axis means the Percent of Total Traffics)

3.5 Operator and Aircraft Profiles

The information regarding the airspace users for the RVSM sovereign airspace in China includes:

- Top-15 operators (Figure 3)
- Top-15 aircraft types (Figure 4)

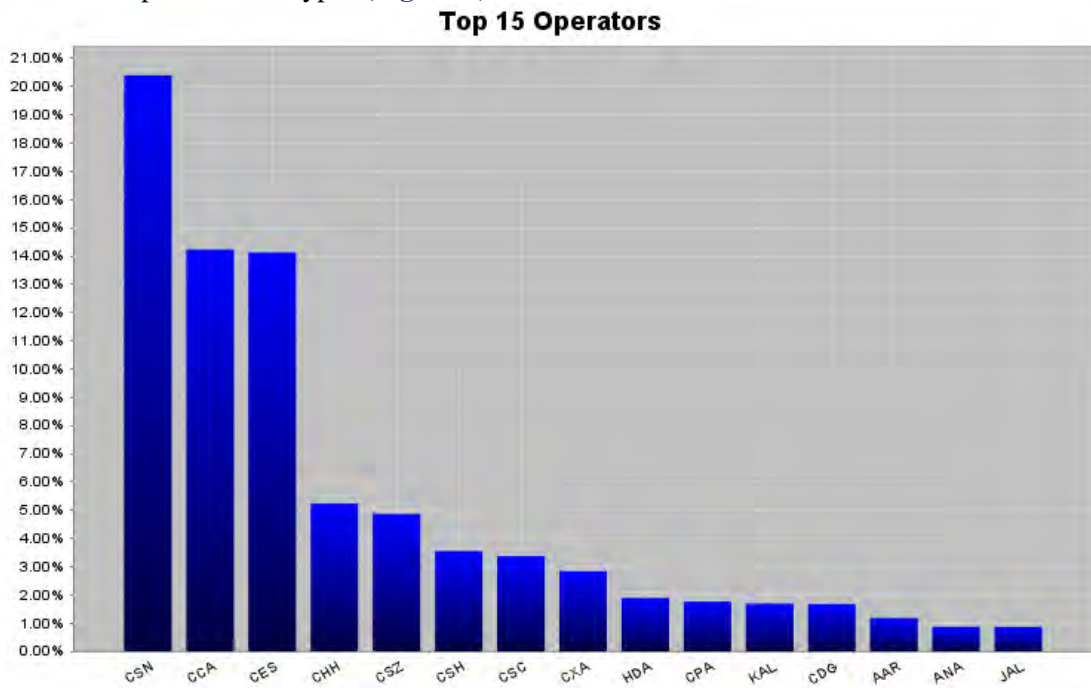


Figure 3: Top-15 Active Operators in the Sovereign Chinese Airspace

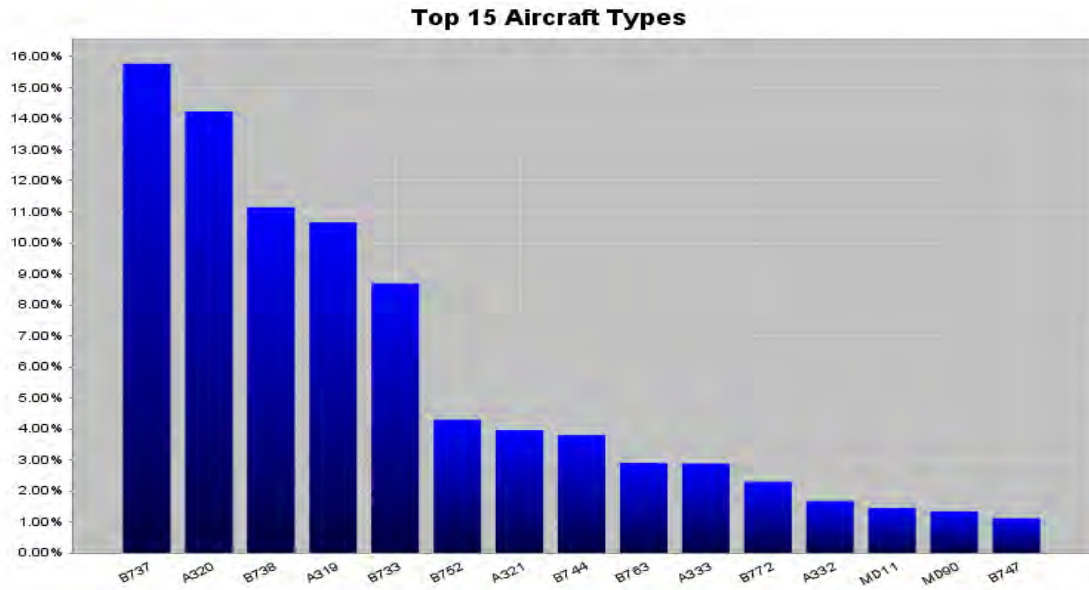


Figure 4: Top-15 Aircraft Types Operated in the Sovereign Chinese Airspace

It is important to note that the top-15 operators and aircraft types represent more than 78 percent and approximately 80 percent of the operations observed in the TSD.

3.6 Flight Level Utilization

In China RVSM airspace, the Single Alternate Flight Level Orientation Scheme (FLOS) is applied full band between 8900(FL291) and 12500(FL411). Accordingly, odd and even flight levels are assigned to the traffic in the Eastbound and Westbound directions, respectively. From the received traffic sample, **Figure 5(A) and 5(B)** demonstrate the flight level utilization in the RVSM airspace between 8,900 and 12,500 meters *before* and *after* RVSM was applied.

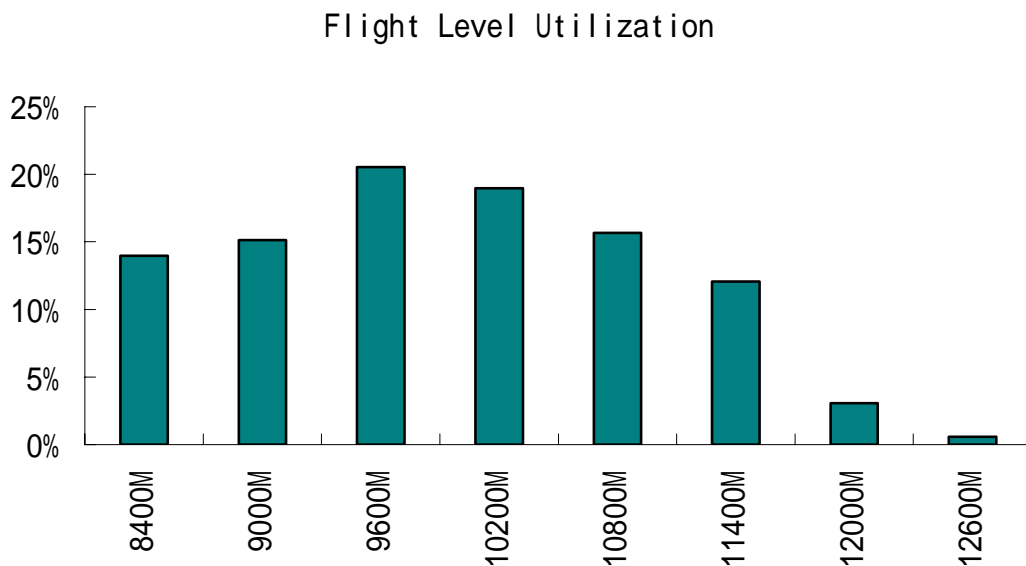


Figure 5(A): Flight Level Utilization in the Planned RVSM Airspace of China *before* RVSM was applied

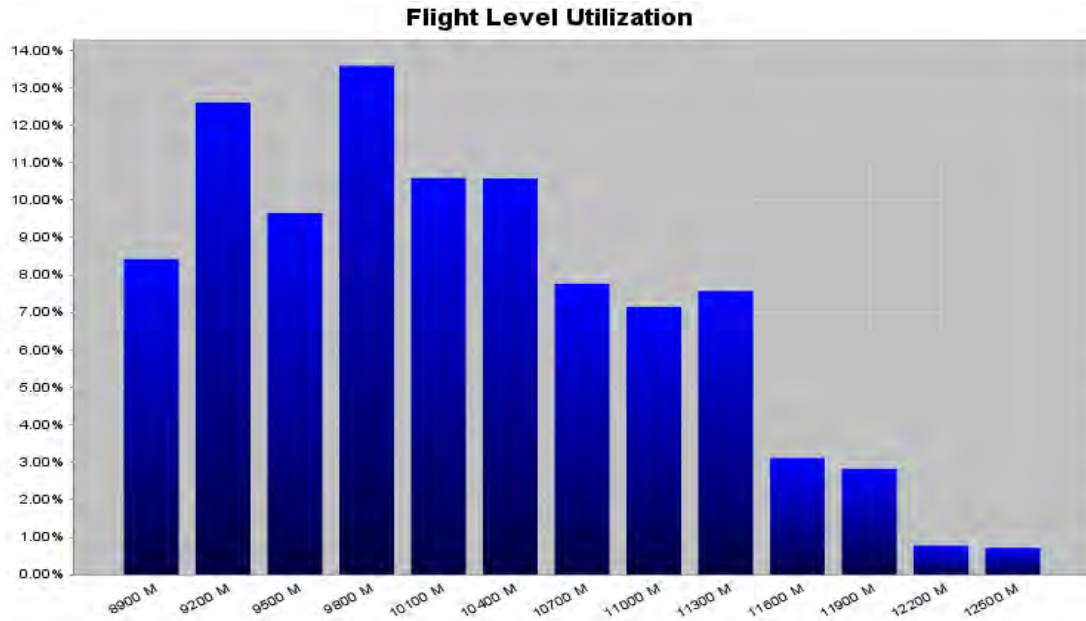


Figure 5(B): Flight Level Utilization in the Sovereign Chinese Airspace *after* RVSM was applied

4. RVSM SCRUTINY ASSESSMENT

This section provides the results of the scrutiny assessment using the traffic sample data from 1st to 31st December 2007 within the airspace of China. After the RVSM implementation in China, all the operators and aircraft observed in the sample of traffic movements should be RVSM approved except the special flights conducted by the aircrafts indicated in the ICAO 9574 document.

The collected TSD were compared to the latest data from the CAAC and other RMAs around the world of:

- AFI RMA,
- Atlantic(NATCMA),
- CAAC,
- Canada,
- Caribbean and South American Monitoring Agency (CARSAMMA),
- Eurocontrol,
- France,
- Monitoring Agency for Asia Region (MAAR),
- Middle East Monitoring Agency (MID RMA),
- Pacific Approval and Registry Monitoring Organization (PARMO), and
- US MASPS

Note that the RVSM approval records provided by China were last updated on February 2008. The list of RVSM approval files provided by PARMO can be founded in the **Appendix A**.

Table 4.1 and **Table 4.2** demonstrate the percentage of the State RVSM approval status of operators and aircraft observed in the sample of traffic movements before and after the RVSM implementation. **Table 4.1** shows that more than 97.97 percent of the operations have been conducted by RVSM Airworthiness Approved aircraft in the airspace of China planned for RVSM implementation, and 93.3 percent by RVSM operationally approved operators and

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

aircraft. Compared with the examination result of 88 percent of Airworthiness Approved and 84 of RVSM approved displayed in **Table 4.2**, we can see an obvious improvement.

Approval Category	Number of Operations in Traffic Sample	Percent Of Total Sample
RVSM Airworthiness Approved Only	110480	98.331%
RVSM Airworthiness Unapproved	1875	1.668%
RVSM Operational-approved	109291	97.273%
Non RVSM Operational-approved	3064	2.727%
Total	112355	100%

Table 4.1: Summary of the Readiness of Operators and Aircraft Types Operating in the RVSM airspace after RVSM implementation

Approval Category	Number of Operations in Traffic Sample	Percent Of Total Sample
RVSM Airworthiness Approved Only	100201	88.218%
RVSM Airworthiness Unapproved	13382	11.782%
RVSM Full-approved	95426	84.0143%
Non RVSM Full-approved	18157	15.987%
Total	113583	100%

Table 4.2: Summary of the Readiness of Operators and Aircraft Types Operating in the RVSM airspace before RVSM implementation

Based on the results of the scrutiny assessment, it was found that a number of the aircraft currently operating in the airspace of China are in the process of obtaining the RVSM Full-approval. **Table 5.1** lists the top 15 non RVSM operationally approved Operator-Type, as well as the number of traffic operations and its proportion (in percent) in the collected traffic sample data *after* the RVSM implementation in China. **Table 5.2** lists the top 15 Non RVSM operationally approved Operator-Type information in the preliminary assessment report submitted *before* the RVSM implementation as a comparison.

Operator	Operator ICAO Code	AC Type	Total Operations Observed in Sample	Percent of Total Operations in Sample
<i>Sichuan Airlines</i>	<i>CSC</i>	<i>E145</i>	256	0.2252%
AIR FRANCE	AFR	B777	97	0.0853%
OMAN AIR	OMA	CRJ	89	0.0783%
GOBIERNO DEL ESTADO DE CHIHUAHUA	GDC	B738	82	0.0721%
AIR CHINA CARGO	CAO	B747	81	0.0713%
	CAO	B742	53	0.0466%
Air Macau	AMU	A30B	79	0.0695%

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

Air Nippon Airways Co., Ltd.	ANA	B762	69	0.0607%
China United Airlines	CUA	B738	67	0.0589%
OKAYJET	OKA	B733	65	0.0572%
Vietnam Airlines	HVN	A330	60	0.0528%
CARGOLUX AIRLINES INTERNATIONAL	CLX	B747	59	0.0519%
CEBU PACIFIC AIR	CEB	A319	57	0.0502%
JAL WAYS	JAZ	B772	56	0.0493%
MALAYSIAN AIRLINES SYSTEM	MAS	B742	54	0.0475%

Table 5.1: List of TOP 15 Relatively High Proportions of Non-RVSM Approved Chinese Aircraft Operating in the RVSM airspace after RVSM implementation

Operator	Operator ICAO Code	AC Type	Total Operations Observed in Sample	Percent of Total Operations in Sample
<i>Sichuan Airlines</i>	CSC	A320	1879	1.654%
		A319	1303	1.123%
		A321	798	0.703%
		E145	378	0.333%
Hainan Airlines	CHH	A319	975	0.858%
Spring Airlines	CQH	A320	958	0.843%
Senzhen Airlines	CSZ	B733	892	0.785%
		B739	342	0.301%
Lucky Air	LKE	B737	454	0.400%
DEER JET	DER	B733	349	0.307%
China Southern Airline	CSN	E145	364	0.283%
China Eastern Airlines	CES	CRJ2	256	0.225%
United Eagle Airlines	UEA	A319	250	0.220%
Eaststar Airlines	DXH	A319	249	0.219%
China United Airlines	CUA	B737	248	0.218%

Table 5.2: List of TOP 15 Relatively High Proportions of Non-RVSM Approved Chinese Aircraft Operating in the RVSM airspace before RVSM implementation

It can be found that the top 15 non-approved Operator-Type in **Table 5.2** has already obtained RVSM approval with the exception of the following OPERATOR-TYPE:

Operator	Operator ICAO Code	AC Type
<i>Sichuan Airlines</i>	<i>CSC</i>	<i>E145</i>

It is also found that there are still violations of RVSM operational approval requirements. This is partly because that mechanism of Approval data collection for the Chinese operators is still under construction. China RMA will enhance the communication with CAAC inspectors to obtain the up-to-date approval information for the Chinese operators. China RMA will also

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

keep contact with other RMAs and share the approval data with them. Therefore, we are confident that the result of scrutiny assessment will improve in the near future.

5. LARGE HEIGHT DEVIATION OCCURRENCES

This section provides the summary of the large height deviation (LHD) occurrences associated with the RVSM implementation in the sovereign Chinese airspace. The data collected from the LHD reports around China are used to estimate risk due to operational errors, which is a very important part in the post- RVSM implementation safety assessment.

Data collection method

The milestone for the LHD data collection in China is the RVSM LHD data collection meeting held in May, 2007. During this meeting, the attendant supervisors and controllers from all the area control centers around China were given a detailed introduction and explanation of RVSM, LHD and the way to collect LHD data from their daily work.

All the control centers around China were requested to provide the monthly LHD reports, starting from January 1st 2006 using the LHD report template we distributed. We made some modifications to the suggested form recommended in the RMA handbook to embody the metric-based feature and to obtain further information about the height deviation occurrences due to levels transitioned without clearance which occur in the sovereign Chinese airspace.

The information of the events was submitted as literal descriptions, and then reviewed, checked and assured by the responsible supervisors from the local RVSM administrative group of each Flight Information Region (FIR). Finally, the completed LHD reports were sent to ATMB by email at the beginning of every month.

The LHD data collection method remained the same after the RVSM implementation in sovereign Chinese airspace on November 21st.

Data Source

The source data for the LHD reports, collected during January 1st 2006 to February 29th 2008, were composed of the historical records and the records submitted directly by controllers from Area Control Centers (ACCs).

The historical records were the ones between January 2006 and May 2007. This information was mainly from two data resources. One was extracted from the Incident reports resource from ATMB. This resource kept records of those events that lead to airborne conflicts and in-flight incidents, among which some were due to height deviation. Other data were the records from the area control centers which kept records of those events in the past that also had a height deviation equal to or more than 90 meters but not serious enough to cause airborne conflicts. From midnight June 1st 2007 UTC time, all the LHD events are directly recorded by the controllers on duty.

Table 6 lists the summary of LHD reports from 9 FIRs during January 1st 2006 to February 29th 2008:

FIR Name	Received		Remarks
	From	To	
Beijing	Jan 06	Feb 08	
Guangzhou	Jan 06	Feb 08	
Kunming	Jan 06	Feb 08	
Lanzhou	Jan 06	Feb 08	
Sanya	Jan 06	Feb 08	Only the LHD events inside Hainan island are included. LHD events occurred in the oceanic area are reported to MAAR

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

FIR Name	Received		Remarks
	From	To	
Shanghai	Jan 06	Feb 08	
Shenyang	Jan 06	Feb 08	
Urumqi	Jan 06	Feb 08	
Wuhan	Jan 06	Feb 08	

Table 6: Summary of LHD Reports Received since January 2006

In this section, the LHD data analysis is demonstrated separately by radar and Procedural Control status. Based on the received LHD reports shown in Table 6, the LHD occurrences in the sovereign Chinese airspace since Jan. 2006 are summarized as follow:

- Number of LHD occurrences by FIR;
- Number of LHD occurrences and associated LHD duration by month and Number of LHD occurrences by cause in *Radar Control Airspace*;
- Number of LHD occurrences and associated LHD duration by month and Number of LHD occurrences by cause in *Procedural Control Airspace*;

In the LHD analysis section of preliminary assessment report, we analyzed all the LHD events as a whole and didn't separate them by Air Traffic Control status. And it was observed that some LHD occurrences which were due to the negative transfers or incorrect transfers of control responsibilities (Category E) from several FIRs which are adjacent to China, and which have been identified as sources of disproportionately high negative transfer errors in the Asia Pacific region. We didn't count those events in to obtain the risks.

In this report, the method of Operational risk calculation is modified by introducing weight factors proportionate to the total flying hours of airspace under different control status to obtain an average weighted risk (For more detail, please refer to Section 6.1). Therefore, all the LHD data (including those mentioned above) are included in to calculate the final risks.

Figure 6 demonstrates the number of LHD occurrences by FIR in the whole sovereign Chinese airspace during January 1st 2006 to February 29th 2008:

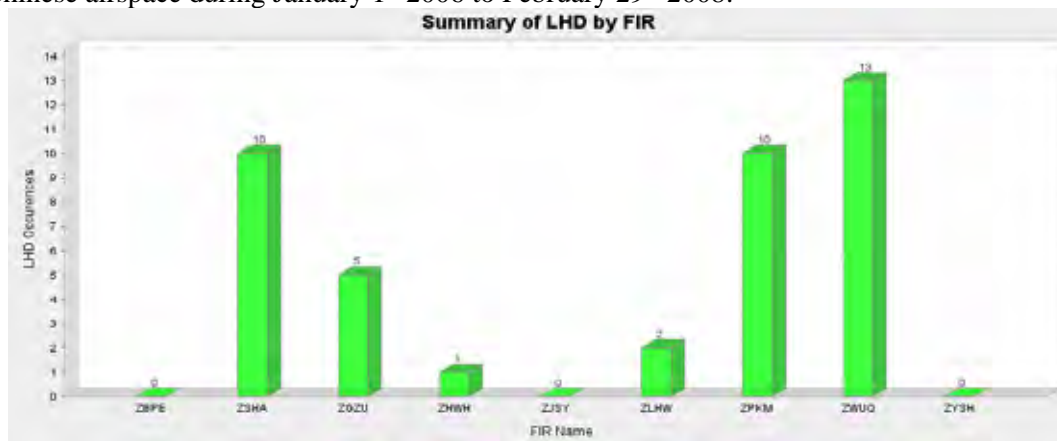


Figure 6: Summary of LHD by FIR in the Sovereign Chinese Airspace

Table 7.1 and Figure 7.1 summarize the number of LHD occurrences in Radar Control airspace during January 1st 2006 to February 29th 2008:

Month-Year	No. of LHD Occurrences	Cumulative No. of LHD Occurrences of recent 12 months	LHD Duration (minutes)	Cumulative LHD Duration of recent 12 months (minutes)	No. of flight levels transitioned without clearance
2006					
Jan-06	0	0	0	0	0

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

Month-Year	No. of LHD Occurrences	Cumulative No. of LHD Occurrences of recent 12 months	LHD Duration (minutes)	Cumulative LHD Duration of recent 12 months (minutes)	No. of flight levels transitioned without clearance
Feb-06	0	0	0	0	0
Mar-06	0	0	0	0	0
Apr-06	1	1	0	0	2
May-06	1	2	0	0	1
Jun-06	1	3	4	4	0
Jul-06	1	4	0.55	4.55	1
Aug-06	0	4	0	4.55	0
Sep-06	0	4	0	4.55	0
Oct-06	0	4	0	4.55	0
Nov-06	2	6	4	8.55	1
Dec-06	0	6	0	8.55	0
2007					
Jan-07	4	10	3.034	11.584	0
Feb-07	2	12	4	15.584	0
Mar-07	3	15	1.5	17.084	2
Apr-07	0	14	0	17.084	0
May-07	1	14	1	18.084	1
Jun-07	3	16	1.317	15.401	0
Jul-07	2	17	0.4	15.251	3
Aug-07	1	18	0	15.251	1
Sep-07	0	18	0	15.251	0
Oct-07	1	19	0.1	15.351	0
Nov-07	1	18	0	11.351	1
Dec-07	1	19	0.1	11.451	0
2008					
Jan-08	2	17	0	8.417	5
Feb-08	0	15	0	4.417	0

Table 7: Summary of LHD Occurrences in Radar Control airspace

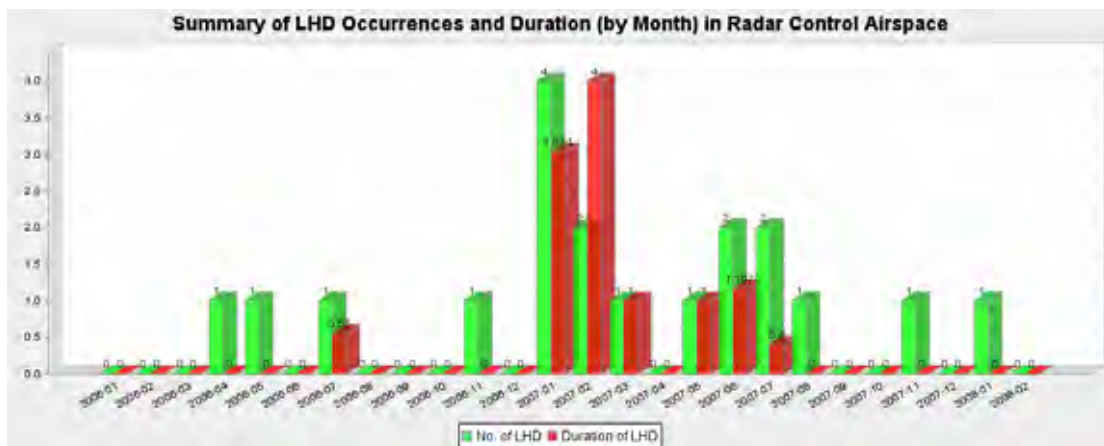


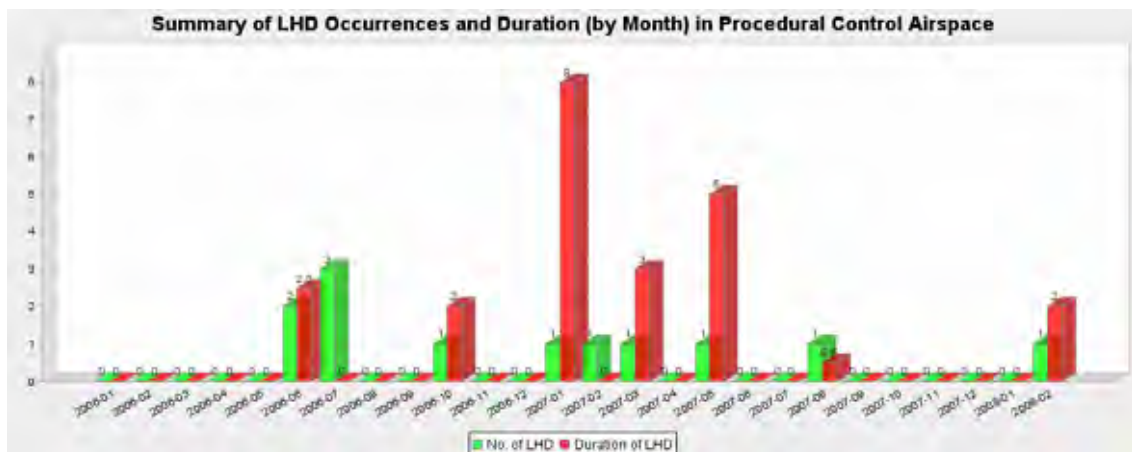
Figure 7.1: Summary of LHD Occurrences and Duration (by Month) in Radar Control airspace

Table 7.2 and Figure 7.2 summarize the number of LHD occurrences in Procedural Control airspace during January 1st 2006 to February 29th 2008:

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

Month-Year	No. of LHD Occurrences	Cumulative No. of LHD Occurrences of recent 12 months	LHD Duration (minutes)	Cumulative LHD Duration (minutes) of recent 12 months	No. of flight levels transitioned without clearance
2006					
Jan-06	0	0	0	0	0
Feb-06	0	0	0	0	0
Mar-06	0	0	0	0	0
Apr-06	0	0	0	0	0
May-06	0	0	0	0	0
Jun-06	2	2	2.5	2.5	0
Jul-06	4	6	5	7.5	7
Aug-06	1	7	12	19.5	0
Sep-06	0	7	0	19.5	0
Oct-06	1	8	2	21.5	0
Nov-06	0	8	0	21.5	0
Dec-06	0	8	0	21.5	0
2007					
Jan-07	1	9	8	29.5	0
Feb-07	1	10	0	29.5	2
Mar-07	1	11	3	32.5	0
Apr-07	0	11	0	32.5	0
May-07	1	12	5	37.5	0
Jun-07	0	10	0	35	0
Jul-07	0	6	0	30	0
Aug-07	1	6	0.5	18.5	0
Sep-07	0	6	0	18.5	0
Oct-07	0	5	0	16.5	0
Nov-07	0	5	0	16.5	0
Dec-07	0			16.5	0
2008					
Jan-08	0	4	0	8.5	0
Feb-08	1	4	2	10.5	0

Table 7.2: Summary of LHD Occurrences in Procedural Control airspace



POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

Figure 7.2: Summary of LHD Occurrences and Duration (by Month) in Procedural Control airspace

Figure 8 demonstrates the number of flight levels transitioned without clearance (both climbing and descending included) in Radar Control airspace during January 1st 2006 to February 29th 2008:

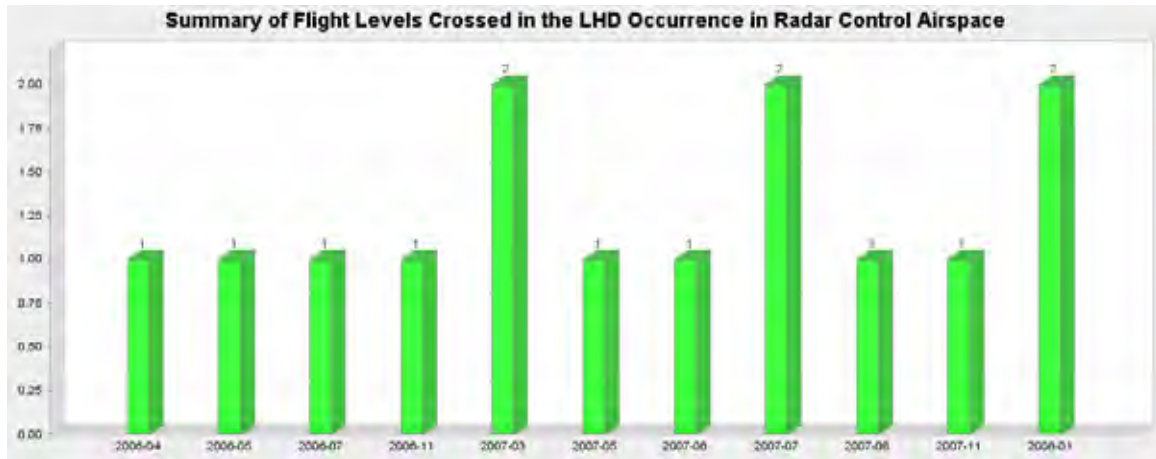


Figure 8: Summary of Flight Levels transitioned without clearance in Radar Control airspace

Figure 9 demonstrates the number of flight levels transitioned without clearance (both climbing and descending included) in Procedural Control airspace during January 1st 2006 to February 29th 2008:

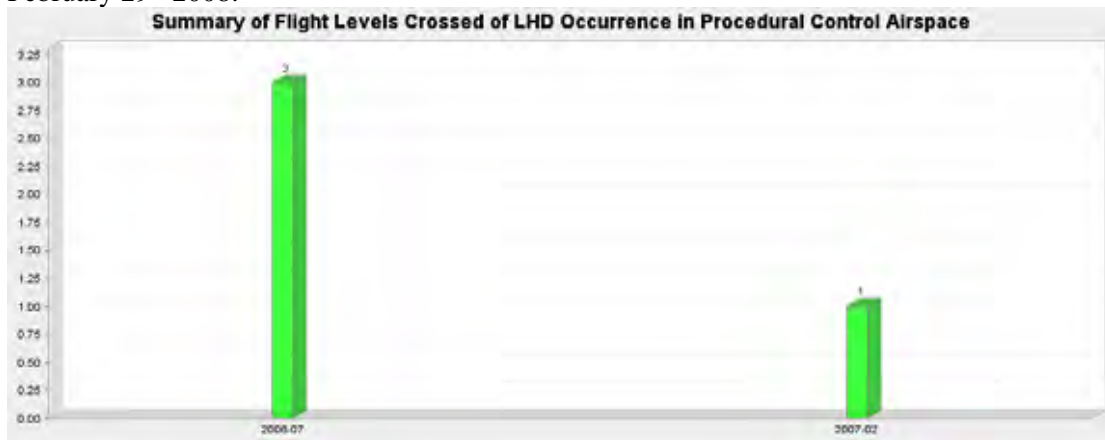


Figure 9: Summary of Flight Levels transitioned without clearance in Procedural Control airspace

Figure 10 demonstrates the number of LHD occurrences by LHD category in Radar Control airspace during January 1st 2006 to February 29th 2008:

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

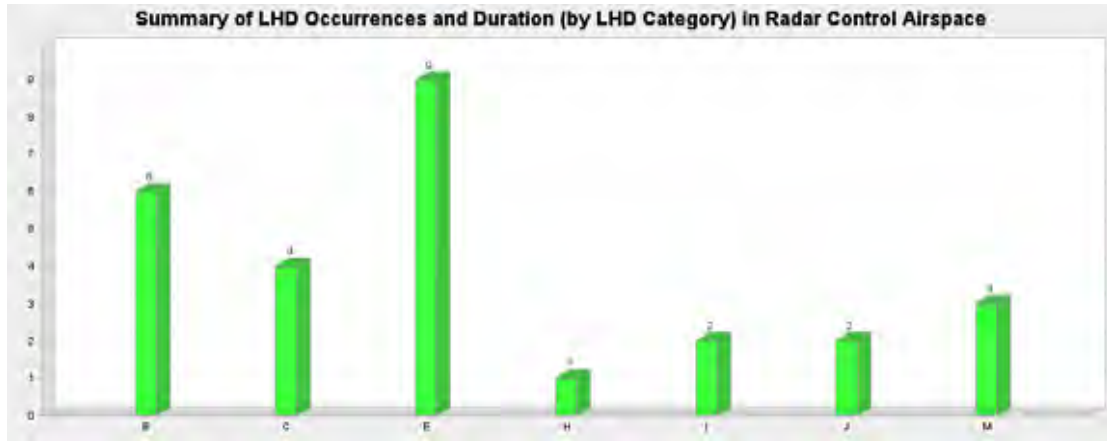


Figure 10: Summary of number of LHD occurrences by LHD category in Radar Control airspace

Figure 11 demonstrates the number of LHD occurrences by LHD category in Procedural Control airspace during January 1st 2006 to February 29th 2008. In this report, the analyzing result of the LHD events categorization is based on the latest version of LHD category proposed in RASMAG/7. Table 8.1 presents the summary of the total number of LHD occurrences by the cause of deviation, using the LHD letter-coding scheme in Table 8.2.

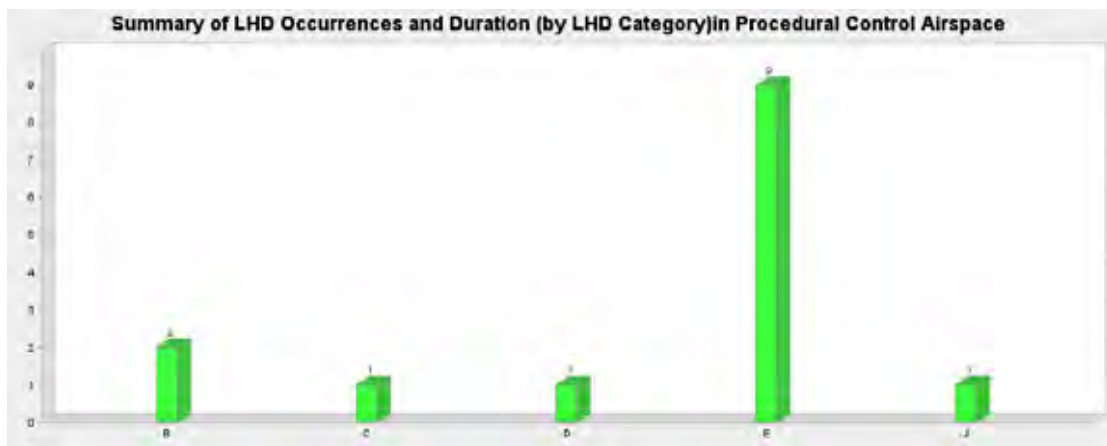


Figure 11: Summary of number of LHD occurrences by LHD category in Procedural Control airspace

Code	No. of LHD in the sovereign Chinese Airspace	Duration	Remarks
A	0	0.00	
B	8	2.883	
C	4	1.00	
D	1	0.00	
E	18	55.034	
F	0	0.00	
G	0	0.00	
H	1	0.1	
I	2	0.234	
J	3	0.5	
K	0	0.00	
L	0	0.00	
M	2	0.25	Note *

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

Code	No. of LHD in the sovereign Chinese Airspace	Duration	Remarks
SUM	41	60.00	

Table 8.1: Cause of LHD Occurrences in the Sovereign Chinese Airspace

Note *: Category M in this report refers to the deviation caused by display error of ATC automatic system and deviation caused by station interference.

Deviation Code	Cause of Deviation
Operational Errors	
A	flight crew failing to climb/descend the aircraft as cleared;
B	flight crew climbing/descending without ATC clearance;
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);
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message);
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);
F	coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues;
Aircraft Contingency Events	
G	aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure);
H	airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors);
Deviation due to Meteorological Condition	
I	turbulence or other weather related causes;
Deviation due to TCAS RA	
J	TCAS resolution advisory; flight crew correctly following the resolution advisory;
K	TCAS resolution advisory; flight crew incorrectly following the resolution advisory
Others	
L	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RSVM approval but aircraft not approved, ATC misinterpretation of flight plan)
M	Other <ul style="list-style-type: none"> ➤ <u>Deviation due to display error of ATC automatic system</u> ➤ <u>Deviation due to station interference</u>

Table 8.2: Latest Version of Codes Defining Causes of LHD Occurrences

In light of the above, the LHD occurrences in the sovereign Chinese airspace are summarized as follow:

LHD events Analysis

- Total of 41 LHD occurred in the sovereign Chinese airspace, account for 60 minutes of duration and 27 flight levels transitioned without proper clearance since Jan. 2006, in which:

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

- 27 events occurred in Radar Control airspace with 20 minutes of duration and 18 flight levels transitioned without proper clearance, and
- 14 events occurred in Procedural Control airspace with 40 minutes of duration and 9 flight levels transitioned without proper clearance
- 18 of these occurrences which account for 55.03 minutes of duration are due to the negative transfers or incorrect transfers of control responsibilities (Category E) from several FIRs which are adjacent to China, and which have been identified as sources of disproportionately high negative transfer errors in the Asia Pacific region.
- 19 LHD occurred in the *recent 12 months* since March 2007, account for 14.92 minutes of duration and 13 flight levels transitioned without proper clearance, in which:
 - 15 events occurred in Radar Control airspace with 4.42 minutes of duration and 13 flight levels transitioned without proper clearance, and
 - 4 events occurred in Procedural Control airspace with 10.5 minutes of duration and 0 flight levels transitioned without proper clearance
- Within these 19 LHD occurrences:
 - 4 events with duration of 1.33 minutes and 2 levels transitioned without proper clearance were due to flight crew climbing/descending without ATC clearance;
 - 2 events with duration of 1 minutes and 2 levels transitioned without proper clearance were due to incorrect operation or interpretation of airborne equipment
 - 5 events with duration of 11.5 minutes and 0 level transitioned without proper clearance were due to coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues
 - 1 event with duration of 0.1 minutes and 0 level transitioned without proper clearance was caused by airborne equipment failure leading to unintentional or undetected change of flight level
 - 2 events were with duration of 0.23 minutes and 3 levels transitioned without proper clearance caused by turbulence or other weather
 - 2 events with duration of 0.5 minutes and 2 levels transitioned without proper clearance were caused by TCAS resolution advisory - flight crew correctly following the resolution advisory, and
 - 3 occurrences of 0.15 minutes and 3 levels transitioned without proper clearance involved deviation caused by display error of ATC automatic system and deviation caused by station interference (Category M)
- Within these 19 LHD occurrences, 2 events were reported after the RVSM implementation in China:
 - 1 event with duration of 0 minutes and 1 level transitioned without proper clearance were caused by incorrect operation or interpretation of airborne equipment
 - The other with duration of 2 minutes and 0 level transitioned without proper clearance were caused by incorrect operation or interpretation of airborne equipment

Conclusion

Based on the analyzing result of LHD data received, we found that:

- The events occurred in Radar Control airspace had more flight levels transitioned without proper clearance and the events in Procedural Control airspace had longer duration.
- The events due to coordination errors in the ATC-to-ATC transfer of control responsibility (Category E) contribute the most to the operational risks.
- The amount of LHD reports collected obviously reduced ever since the RVSM implementation in China.

Additional Observations

In the conclusion of LHD data analysis, we mentioned that the amount of monthly reported LHD events obviously reduced ever since the RVSM implementation in China. This partly contributes to the high attention we paid to the safety of this transition period and the benefits brought by the RVSM implementation (especially for the international flight), but we cannot neglect there might be some potential LHD that should have been reported were omitted.

It is important to note that the operational risk estimation has been demonstrated to be the major contributor in the overall vertical-risk estimation for the sovereign Chinese airspace. We will conduct more actions to ensure that operational errors are collected in a continuous basis by all the FIRs around China and sent in due time to the China RMA on a monthly basis. ATS providers should continue to forward reports of large height deviations of 90 meter or more to the China RMA on a monthly basis. A ‘NIL report’ (where applicable) is as valuable as a report containing actual incidents.

6. RISK ASSESSMENT AND SAFETY OVERSIGHT

6.1 Modification of risk assessment algorithm

In the preliminary assessment report, we mentioned that there were a number of LHD occurrences which were due to the negative transfers or incorrect transfers of control responsibilities (Category E) from several FIRs which are adjacent to China, and if we computed these LHD in the Operational Risk, the Total Risk of Sovereign Chinese Airspace would more than the TLS of 5.0×10^{-9} fatal accidents per flight hour. So in the last assessment, these data were not included in the risk calculation and the Total Risk of Sovereign Chinese Airspace was smaller than the TLS.

In order to reflect the risk of airspace more accurately, we make some changes to the former methodology of risk calculation this time by introducing the Traffic Flying hours into the model as a weight. The approach is as follows:

- 1) First, the Technical Risk and Operational Risk under different control status were computed separately:

The data we used to calculate the parameters in the collision risk model were separated: the TSD and LHD data from the Radar Control area were only used to compute the risks for the Radar Control area, and those collected from Procedural Control area were used to calculate the risks of Procedural Control area.

By completing this step, we can obtain the following results:

- The Technical Risk and Operational Risk for the whole Radar Control airspace of China
- The Technical Risk and Operational Risk for the whole Procedural Control airspace of China

- 2) Second, the Total Technical Risk and Operational Risk risks for the entire sovereign Chinese airspace were computed by using weight factors:

The weight factors for the risks of Radar Control airspace and Procedural Control airspace were proportionate to the total flying hours of these areas separately. The weight factors were used to obtain an average of the risks we calculated in the first step, and the results were the average weighted Technical Risk and Operational Risk for the entire Chinese RVSM airspace.

We believe that this method is better and more scientific than the former one, and it will provide a more precise description of risks for the Sovereign Chinese Airspace.

6.2 Estimate of the CRM Parameters

Table 9 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)	0.3899	Estimated by FAA Technical Center
$P_z(S_z)$	Prob. that 2 aircraft nominally separated by the vertical separation minimum S_z are in vertical overlap.	2.041×10^{-10}	Estimated by FAA Technical Center
$P_y(0)$	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	6.88×10^{-7}	Value used in the Western Pacific/South China Sea safety assessment
$ \overline{h(\theta)} $	Average relative horizontal speed during overlap for aircraft pairs on routes with crossing angle θ (let $\theta=45^\circ$)	367.4 knots	Value used in Western Pacific/South China Sea safety assessment (corresponds to an average aircraft speed of 480 knots)
$ \overline{y} $	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
$ \overline{z} $	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
λ_x	Average aircraft length	0.02345Nm	Estimated based on the collected TSD
λ_y	Average aircraft wingspan	0.02073Nm	
λ_z	Average aircraft height	0.0070 Nm	
λ_h	Diameter of the disk representing the shape of an aircraft in the horizontal plane	0.02345Nm	

Table 9 Estimate of the empirical Parameters in the CRM

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

Table 10 summarizes the value for estimating values of parameters in the CRM, which we estimated on the basis of TSD collected. They are demonstrated separately by air traffic control status and used to calculate separate Technical Risk and Operational Risk under these two conditions.

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{\Delta V} $	Radar	53.889 knots	Average relative along-track speed between aircraft on same direction routes
	Procedural	91.966 knots	
$ \overline{V} $	Radar	447.78 knots	Average absolute aircraft ground speed
	Procedural	455.93 knots	

Table 10 Estimate of the Parameters based on the collected TSD in separately ATC status

6.3 Safety Assessment in Sovereign Chinese RVSM Airspace

This section summarizes the results of the safety assessment for the sovereign Chinese RVSM airspace computed by using weight factors. **Figure 12** presents the Technical Risk computed by the TSD collected in December, 2007 and the final result computed by weight factors.

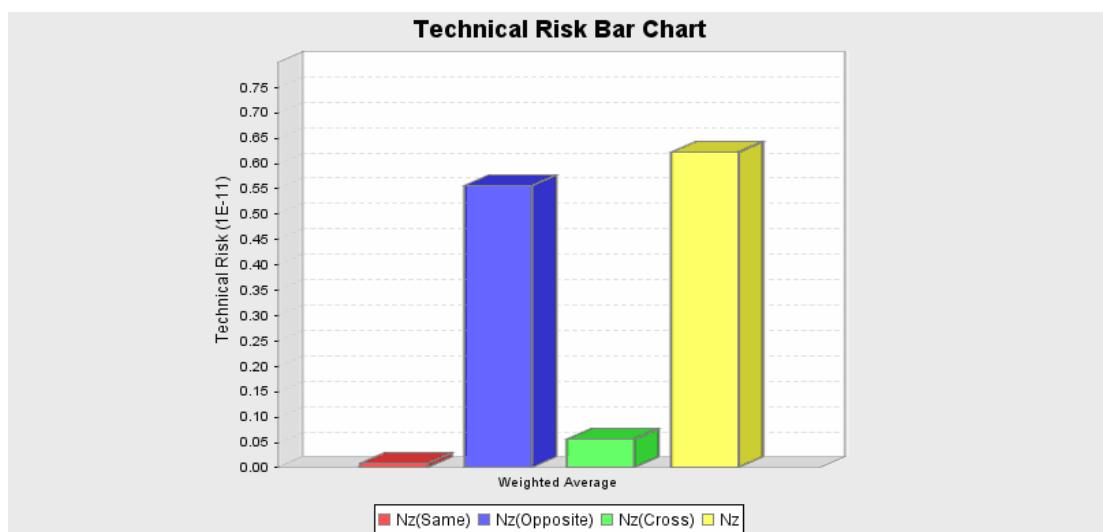


Figure 12 Technical Risk Bar Chart computed by the TSD collected in December, 2007.

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

After computing the Technical Risk using weight factors, we also computed the Operational Risk in the same way. **Table 11** provides the estimates of 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	6.216×10^{-12}	2.5×10^{-9}	Below Technical TLS
Operational Risk	1.091×10^{-9}	-	-
Total Risk	1.097×10^{-9}	5.0×10^{-9}	Below Overall TLS

Table 11 Risk Estimates in Sovereign Chinese RVSM Airspace

Figure 13 presents the trends of collision risk estimates for each month using the new risk calculation methodology:

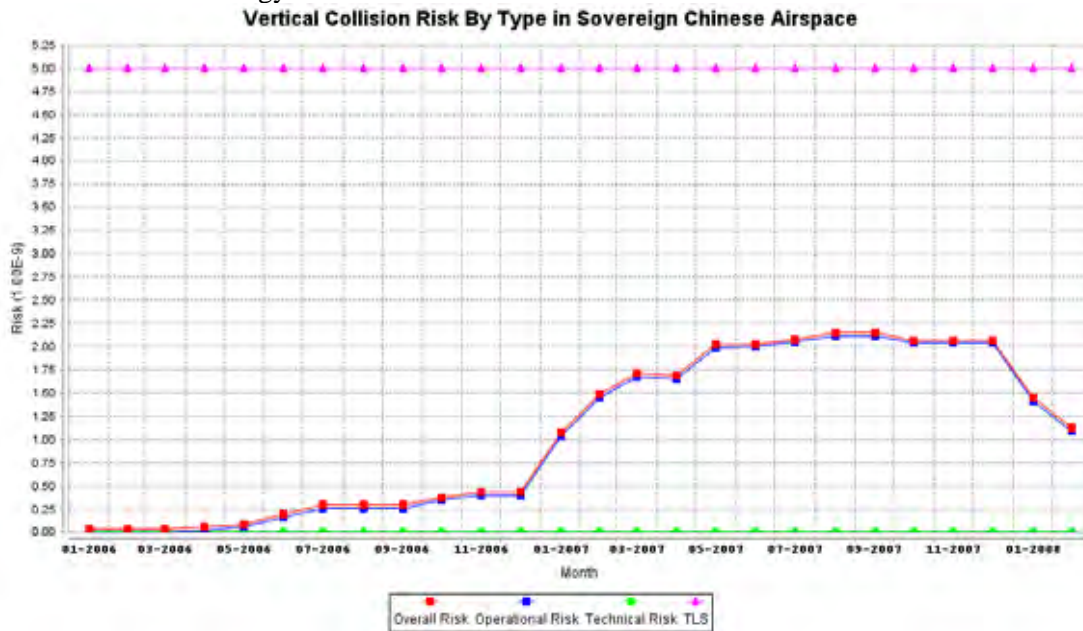


Figure 13: Trends of Risk Estimates in Sovereign Chinese RVSM Airspace

To make a comparison between the former and current risk calculation methodology and demonstrate the changes, we recomputed the Operation Risk and Total Risk from January 2006 to July 2007.

Figure14 (A and B) presents Trends of Risk Estimates for the RVSM Implementation in Sovereign Chinese Airspace with and without the Disproportionately High Negative Transfer Errors using the *former* risk estimate methodology presenting in the preliminary risk assessment report in 2007:

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

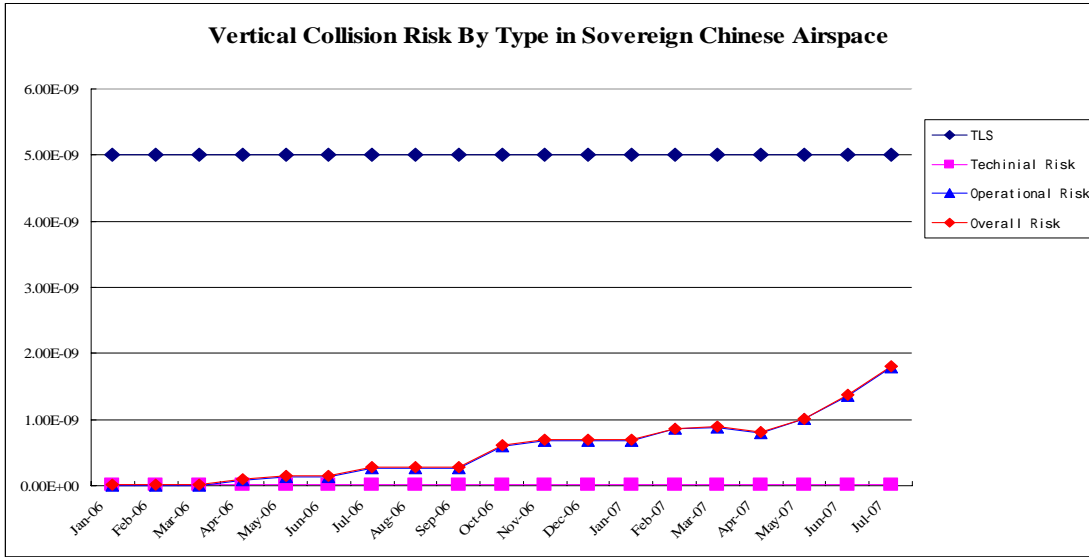


Figure 14 (A) Trends of Risk Estimates for the RVSM Implementation *without* the Disproportionately High Negative Transfer Errors

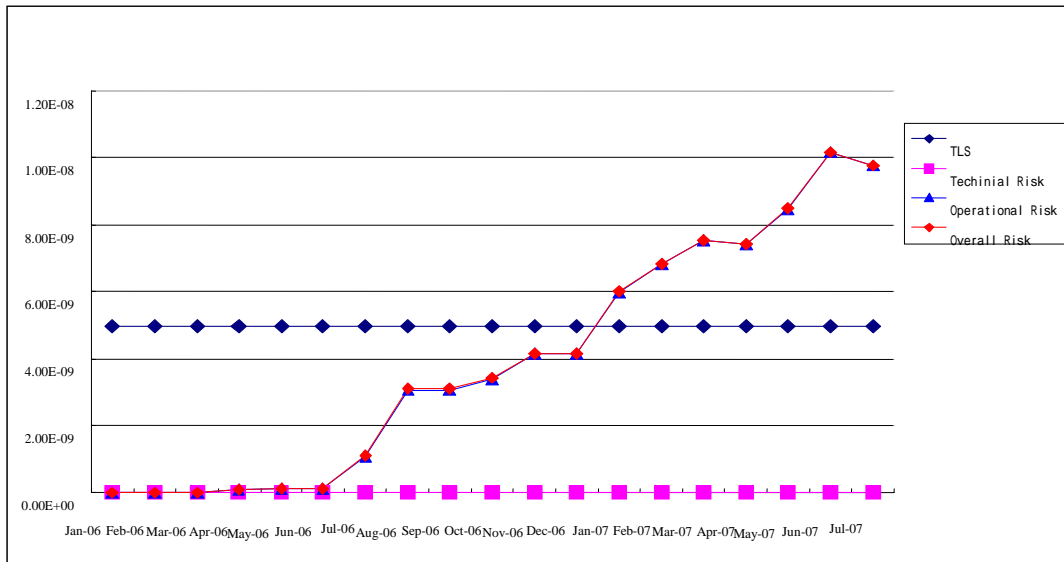


Figure 14 (B) Trends of Risk Estimates for the RVSM Implementation in Sovereign Chinese Airspace *with* Inclusion of the Disproportionately High Negative Transfer Errors

Figure 15 presents average weighted Trends of Risk Estimates for Sovereign Chinese Airspace from January 2006 to July 2007 using the *new* risk estimate methodology:

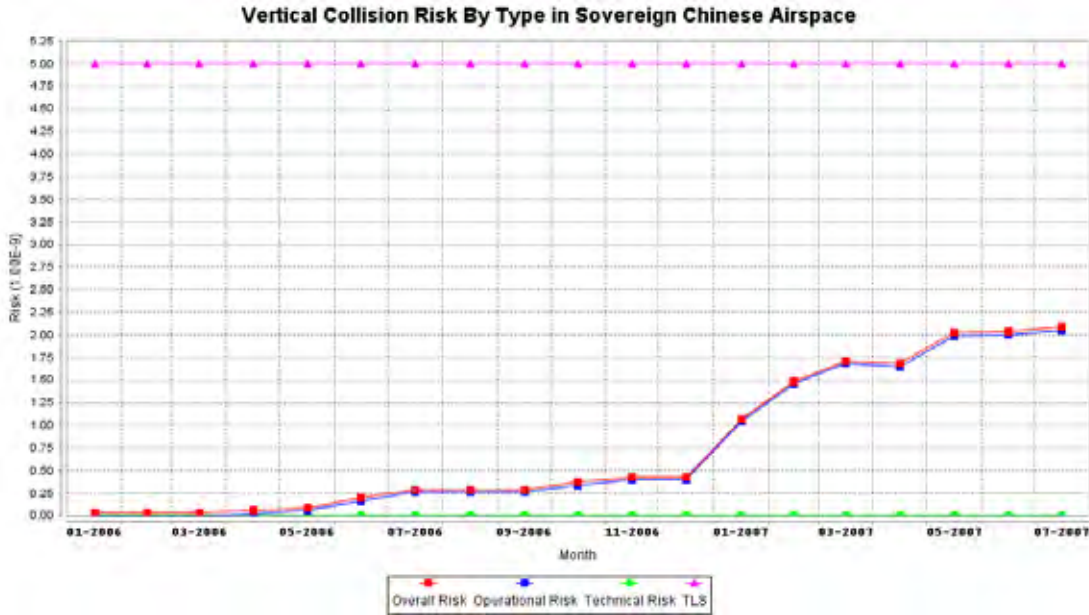


Figure 15: Trends of Risk Estimates in Sovereign Chinese RVSM Airspace

Form the time series plot, we can find that the Operation and Total Risk computed by the new arithmetic (Figure 15) were less than the risk in Figure 14 (B), and we take into account those LHD occurrences which were due to the negative transfers or incorrect transfers of control responsibilities (Category E) into the Total risk. The modified of the risk assessment is introducing weight factors proportionate to the total flying hours of airspace under different control status to obtain an average weighted risk. In fact, the operational risk presented in Figure 14 (B) by using the former algorithm is bigger than the actual situation.

Based on the collision risk estimate for the received TSD and LHD reports, both technical and operational risk in china RVSM airspace are less than before. Technical risk in sovereign Chinese RVSM airspace is 6.216×10^{-12} fatal accidents per flight hour. The total risk attributed to all causes is 1.097×10^{-9} . 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 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour and this result is smaller than the one from last assessment.

6.4 Safety Oversight

Based on the examination of the State RVSM approval status of operators and aircraft observed in the sample of traffic movements collected from the sovereign Chinese airspace where RVSM is applied, we still find that there are violations of RVSM operational approval requirements. This is partly because that mechanism of Approval data collection for the Chinese operators is still under construction. China RMA will also enhance the communication with other RMAs and share the approval data with them. Therefore, we are confident that the result of scrutiny assessment will improve in the near future.

China RMA will also continue to request that ATS providers forward reports of large height deviations of 90 meter or more to her on a monthly basis to ensure that operational errors are collected in a continuous basis by all the FIRs around China and sent in due time. A 'NIL report' (where applicable) is requested when zero large-height-deviation events occurs.

REFERENCES

1. *Airspace Safety assessment for The RVSM Implementation in Japan/republic of Korea domestic airspace*, July 2005, ICAO Asia/Pacific RVSM Implementation Task Force26 WP, MAAR
2. *Manual on Implementation of a 300 m (1,000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive*, International Civil Aviation Organization, Doc 9574, Montreal, March 1992.
3. *Review of the General Concept of Separation Panel*, Sixth Meeting, Montreal, 28 November – 15 December 1988, ICAO Doc 9536, RGCSP/6, Volumes 1 and 2.
4. *Review of the General Concept of Separation Panel*, Seventh Meeting, Montreal, 30 October – 20 November 1990, ICAO Doc 9572, RGCSP/7.
5. *Post Implementation Estimate of the Risk Associated with the Domestic Reduced Vertical Separation Minimum (D-RVSM)*, 1 June 2005, FAA Technical Center
6. *Airspace Safety assessment for the RVSM Implementation in sovereign Chinese airspace*, August 2007, China RMA,

POST-IMPLEMENTATION ASSESSMENT OF SOVEREIGN CHINESE AIRSPACE

APPENDIX A

RVSM APPROVAL RECORDS OF OPERATOR AND AIRCRAFT OPERATED IN THE AIRSPACE OF SOVEREIGN CHINESE AIRSPACE BASED ON COLLECTED TRAFFIC SAMPLE DATA SORTED BY FLIGHTS

THE APPROVAL FLIES USED IN THIS SCRUTINY ASSESSMENT:

Approval (alphabetical)	Approval File
AFIRMA	AFIRMA Approvals 09 July 2007.xls
Atlantic	NATCMA Approvals (15 May 07) QMAS.xls
CAAC	Approval Data from CAAC
Canada	RVSM 07 Aug 07 (Canada RVSM DB).xls
CARSAMMA	CARSAMMA Approvals (15 Aug 07).xls
Euro	Euro_Approvals (17 July 2007).xls
France	DGAC France Approvals_current as of 2007_01_22 .xls
MAAR	MAAR Approval Data completed on 2008-03-13.xls
Mecma	MECMA_Approvals (22 May 04).xls
Mexico	Mexico RVSM (19 Aug 2007).xls
MIDRMA	MIDRMA_Approvals (10 September 2006).xls
PARMO	2008_03_19_APARMOSnapshot.xls
US	2007_08_21_US_MASPSsnapshotACI_TrafficScrutiny.xls

APPENDIX B

Abbreviations

ACC	Area Control Center
ATMB	Air Traffic Management Bureau
CAAC	Civil Aviation Administration of China
CARSAMMA	Caribbean and South American Monitoring Agency
CRM	Collision risk model
FIR	Flight Information Region
FL	Flight Level
ICAO	International Civil Aviation Organization
LHD	Large Height Deviation
MAAR	Monitoring Agency for Asia Region
MASPS	Minimum Aviation System Performance Standards
MID RMA	Middle East Monitoring Agency
NATCMA	North Atlantic Central Monitoring Agency
PARMO	Pacific Approvals Registry and Monitoring Organization
RMA	Regional Monitoring Agency
RVSM	Reduced vertical separation minimum
TCAS	Traffic Alert and Collision Avoidance System
TLS	Target Level of Safety
TSD	Traffic Sample Data

RVSM/TF/33
Appendix D to the Report

RVSM IMPLEMENTATION STATUS IN THE ASIA/PACIFIC REGION

FIRs	RVSM Implementation Date	Comments
Anchorage Arctic	24 Feb 2000	Implemented
Anchorage Continental	24 Feb 2000	Implemented
Anchorage Oceanic	24 Feb 2000	Implemented
Auckland Oceanic	24 Feb 2000	Implemented
Bali	31 Oct 2002	Implemented
Bangkok	21 Feb 2002	Implemented on specific routes on 21 Feb 2002. Whole FIR on 27 Nov 2003.
Beijing	21 Nov 2007	Implemented
Brisbane	24 Feb 2000	Implemented in the Oceanic East of Australia on 24 Feb 2000 - Remainder of FIR on 1 Nov 2001.
Calcutta	27 Nov 2003	Implemented
Chennai	27 Nov 2003	Implemented
Colombo	27 Nov 2003	Implemented
Delhi	27 Nov 2003	Implemented
Dhaka	27 Nov 2003	Implemented
Guangzhou	21 Nov 2007	Implemented
Fukuoka	24 Feb 2000	Implemented over the Pacific Oceanic on 24 Feb 2000. Remainder on 29 September 2005.
Hanoi	31 Oct 2002	Implemented
Ho Chi Minh	21 Feb 2002	Implemented
Hong Kong	31 Oct 2002	Implemented
Honiara	24 Feb 2000	Implemented
Incheon	29 Sep 2005	Implemented
Jakarta	31 Oct 2002	Implemented
Karachi	27 Nov 2003	Implemented
Kathmandu	27 Nov 2003	Implemented
Kota Kinabalu	21 Feb 2002	Implemented
Kuala Lumpur	21 Feb 2002	Implemented in the eastern part on 21 Feb 2002. Western part on 27 November 2003.

RVSM/TF/33
Appendix D to the Report

FIRs	RVSM Implementation Date	Comments
Kunming	21 Nov 2007	Implemented
Lahore	27 Nov 2003	Implemented
Lanzhou	21 Nov 2007	Implemented
Male	27 Nov 2003	Implemented
Manila	21 Feb 2002	Implemented
Melbourne	1 Nov 2001	Implemented
Mumbai	27 Nov 2003	Implemented
Nadi	24 Feb 2000	Implemented
Nauru	24 Feb 2000	Implemented
New Zealand (Domestic)	13 July 2000	Implemented
Oakland Oceanic	24 Feb 2000	Implemented
Phnom Penh	21 Feb 2002	Implemented
Port Moresby	13 Apr 2000	Implemented
Pyongyang		
Sanya	31 Oct 2002	Implemented on N892 on 21 February 2002. Whole FIR on 21 Nov 2007.
Shanghai	21 Nov 2007	Implemented
Shenyang	21 Nov 2007	Implemented
Singapore	21 Feb 2002	Implemented
Tahiti	24 Feb 2000	Implemented
Taibei	21 Feb 2002	Implemented
Ujung Pandang	31 Oct 2002	Implemented
Ulaanbaatar		
Urumqi	21 Nov 2007	Implemented
Vientiane	31 Oct 2002	Implemented
Wuhan	21 Nov 2007	Implemented
Yangon	27 Nov 2003	Implemented

—END—

RVSM/TF/33
Appendix E to the Report

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		Ongoing	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	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
33	Assess operator readiness	12-Mar-07	18-Sep-07	Completed	China, OPS/AIR/WG

RVSM/TF/33
Appendix E to the Report

SN	Activity Completed	Start	Target Date	Present Status	Group Responsible
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 & mntee) 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 Verification				
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		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
65	Special Coordination Meeting (SCM)	16-May-07	18-May-07	Completed	China, Mongolia, Russia, Chairpersons, IATA, ICAO Regional Office, Kazakhstan

RVSM/TF/33
Appendix E to the Report

SN	Activity Completed	Start	Target Date	Present Status	Group Responsible
66	Special Coordination 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		RVSM Task Force
70	Task Force/34 (TBD) - one year review China implementation - 3 days	Jan-09	Jan-09		RVSM Task Force
		Dec-08	Dec-08		

RVSM/TF/33
Appendix F to the Report

Chinese FIRs	Adjacent FIRs	Airways (boundary) Airways	Transition Process	ACC Responsible for Transition	√ when coordination completed
Beijing	Ulaanbaatar	B339 (POLHO) B339/M520/ G218	China RVSM – 500 metre CVSM	Beijing ACC	√
		A575 (INTIK) A575		Beijing ACC	√
Guangzhou	Hanoi	R474 (TEBAK) R474	China RVSM – Feet	Nanning ACC	√
	Hong Kong	A470 (DOTMI) A470	China RVSM – Feet	Guangzhou ACC	√
A202 (SIKOU) A202		Hong Kong ACC			
Kunming	Hanoi	R471 (KUNHA KATBO)	China RVSM – Feet	Kunming ACC	Ongoing√
	Kathmandu	B345 (NONIM) B345	China RVSM – Feet	<u>Kunming ACC/ Kathmandu ACC</u>	Ongoing√
	Vientiane	A581 (SAGAG) A581	China RVSM – Feet	Kunming ACC	√
	Yangon	A599 (LINSO) A599	China RVSM – Feet	Kunming ACC	√
Lanzhou	Ulaanbaatar	B330 (MORIT) B480/B330	China RVSM – 500 meter CVSM	Lanzhou <u>ACC/ Ulaanbaatar ACC</u>	√
Sanya	Hanoi	A202 (ASSAD) A202	China RVSM – Feet	Sanya ACC	√
	Ho Chi Minh		N/A	N/A	-
	Hong Kong		N/A	N/A	-
	Manila		N/A	N/A	-
Shanghai	Fukuoka	A593 (SADLI) A593	China RVSM – Feet	Shanghai ACC	√
	Incheon	A593 (SADLI) A593	China RVSM – Feet	Shanghai ACC	√
		G597/A591 (AGAVO) G597/Y64		Incheon ACC	√
	Taibei		N/A	N/A	-
Shenyang	Chita	A345 (TELOK) A91	China RVSM – 500 meter CVSM	Hailar ACC	√
	Khabarovsk	G212 (ARGUK) G212	China RVSM – 500 meter CVSM	Harbin ACC	√
	Pyongyang	B332 (TOMUK) B332	China RVSM – 500 meter CVSM	Shenyang ACC/ Pyongyang ACC	√

RVSM/TF/33
Appendix F to the Report

Chinese FIRs	Adjacent FIRs	Airways (boundary) Airways	Transition Process	ACC Responsible for Transition	√ when coordination completed
		A575/A345 (GOLOT) A345/A575		Shenyang ACC/ Pyongyang ACC	
	Vladivostok	B451 (BISUN) B451	China RVSM – 500 meter CVSM	Shenyang ACC/ Vladivostok ACC	√
	Blagoveshchensk	A588 (SIMLI) G494	China RVSM – 500 meter CVSM	Harbin ACC/ <u>Blagoveshchensk ACC</u>	√
	Ulaanbaatar		N/A	N/A	-
Urumqi	Almaty	A460 (REVKI) A360/B142	China RVSM – 500 meter CVSM	Almaty ACC/ Urumqi ACC	√
	Barnaul	B206 (GOPTO) B206	China RVSM – 500 meter CVSM	Urumqi ACC	√
	Bishkek	A468 (KAMUD) UB351/UB357/ UB358	China RVSM – 500 meter CVSM	<u>Bishkek ACC</u>	Ongoing √
	Lahore	B215 (PURPA) G325*	China RVSM – Feet	<u>Lahore ACC/Urumiqi ACC</u>	Ongoing √
	Semipalatinsk	A368 (SARIN) A368/G155	China RVSM – 500 meter CVSM	Semipalantinsk ACC/ Urumiqi ACC	√
	Ulaanbaatar	G588 (TEBUS) G558	China RVSM – 500 meter CVSM	Ulaanbaatar ACC/ Urumiqi ACC	√