INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT OF THE TWENTY-SIXTH MEETING OF THE RVSM IMPLEMENTATION TASK FORCE (RVSM/TF/26)

TOKYO, JAPAN

4 – 8 JULY 2005

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

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History of the Meeting

Summary Report of the RVSM TF/26 Meeting

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1.1 Introduction

1.1.1 The Twenty-sixth Meeting of the ICAO Reduced Vertical Separation Minimum Implementation Task Force (RVSM/TF/26) was hosted by Japan Civil Aviation Bureau (JCAB), Ministry of Land, Infrastructure and Transport, Japan at "Koku-Kaikan (Aviation Building)" in Tokyo, Japan from 4 to 8 July 2005.

1.2 Attendance

1.2.1 The RVSM/TF/26 meeting was attended by 50 participants from China, Hong Kong China, Indonesia, Japan, Republic of Korea (ROK), Singapore, Thailand, United States, IATA, IFALPA and IFATCA. A complete list of participants is at **Appendix A** to the Report.

1.3 Officers and Secretariat

1.3.1 Mr. Sydney Maniam, Head (Air Traffic Services), Civil Aviation Authority of Singapore (CAAS) continued as 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.

1.3.2 Mr. Hiroshi Inoguchi, Special Assistant to the Director of ATS System Planning Division, JCAB and Mr. Kim Jeong Min, Assistant Director of ATS Planning Division, Civil Aviation Safety Authority (CASA), Republic of Korea co-chaired the ATC Operations Work Group (ATC/WG), Mr. Yusfandri Gona, Head of Performance and Flight Test Section, Directorate General Air Communication, Indonesia continued as Chairperson of the Aircraft Operations and Airworthiness Work Group (OPS/AIR/WG), and Mr. Nopadol Sangngurn, Executive Expert, AEROTHAI was the Chairperson of the Safety and Airspace Monitoring Work Group (SAM/WG).

1.4 Opening of the RVSM/TF/26 Meeting

1.4.1 Mr. Yoshinori Furukawa, Director of the Air Traffic Control Division, JCAB on behalf of Mr. Teiji Iwasaki, Director General of JCAB, extended hearty welcome to all participants of the RVSM/TF/26 meeting.

1.4.2 Mr. Furukawa fully appreciated the expertise and experience that the RVSM Task Force members had, and understood how important it was to have the Task Force involved in the working towards the successful joint implementation of RVSM in the airspace of Republic of Korea and Japan. Without the guidance of the Task Force experts, their implementation project could not have progressed to the present stage. In this regard, Mr. Furukawa expressed his sincere appreciation to the Task Force Chairman, Mr. Sydney Maniam, and the ICAO Asia Pacific Office.

1.4.3 Mr. Furukawa noted that JCAB implemented RVSM in the international airspace over the Pacific together with many other countries in February 2000, and had been operating RVSM safely and effectively. Soon after the oceanic application, JCAB was expected to expand the RVSM application into the domestic airspace. However, such expansion would require deep and careful study of airspace congestion, establishment of appropriate airspace safety assessment system, cost-benefit analysis, and lead-time for aircraft operators' preparation.

1.4.4 Mr. Furukawa said that the RVSM implementation in the domestic airspace in conjunction with Republic of Korea had been regarded as a high priority policy matter in civil

aviation. He wished the meeting fruitful and constructive discussions for the next five days, and personally believed that the outcome would be positive.

1.4.5 Mr. Sydney Maniam, Head (Air Traffic Services), Civil Aviation Authority of Singapore, Singapore welcomed the participants and opened the meeting. He highlighted the benefits of RVSM implementation in other parts of the Asia Pacific Region, in particular the significant reduction in ground delays at international airports and better management of air traffic on major ATS routes.

1.4.6 He added that the coordinated efforts of States had facilitated seamless RVSM operations for traffic flows from Asia to Europe, through the Middle East. The task at hand was to expand the application of RVSM in Naha and Tokyo FIRs in Japan and in Incheon FIR in the Republic of Korea to cater for traffic flows in North East Asia.

1.4.7 Mr. Maniam stressed the importance of the meeting reviewing the overall implementation process and ensuring that key activities were completed to facilitate the introduction of RVSM on 29 September 2005. Therefore, it was necessary to finalize the operational plan which should include the flight level orientation scheme (FLOS), band of usable RVSM levels and corresponding assignment of cruising levels. In addition, the meeting would have to review the readiness of ATS providers and operators, publication of relevant documents, and the safety assessments to demonstrate that RVSM would be implemented in a safe manner. He urged all concerned to cooperate and work closely so that the critical elements of RVSM could be addressed to allow the implementation of RVSM in Naha, Tokyo and Incheon FIRs on 29 September 2005.

1.4.8 Mr. Kyotaro Harano on behalf of Mr. L.B. Shah, Regional Director, ICAO Asia and Pacific Office thanked JCAB for their warm and generous support in hosting this significant meeting, and welcomed all the delegates to the RVSM/TF/26 meeting. Now that the APANPIRG RVSM Implementation Plan had reached this final and crucial stage, and with implementation scheduled on 29 September, this would complete the introduction of RVSM in the majority of the airspace in the Asia and Pacific Region. He was grateful that the RVSM/TF could again return to Tokyo for this important meeting.

1.4.9 Mr. Harano emphasized that RVSM had a significant impact on reducing departure and enroute delays, improving operational efficiency, increasing airspace capacity by enabling aircraft to operate closer to their optimum flight levels and reducing fuel consumption. On the other hand, RVSM brings with it considerable challenges to the civil aviation community, from aircraft manufactures, to aircraft operators, regulatory and safety authorities and ATC providers. He especially paid tribute to the dedicated professionals who had served the RVSM/TF and made it possible for RVSM to be successfully implemented in the region.

1.4.10 In arriving at the decision whether to go ahead with implementation in the Incheon, Naha and Tokyo FIRs, he hoped that issues would be carefully and thoroughly considered. He looked forward to seeing the usual cooperation and teamwork effort for this last stage of the RVSM implementation in the Incheon, Naha and Tokyo FIRs. He hoped the meeting would be able to agree to go ahead with the implementation.

1.5 Documentation and Working Language

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

1.5.2 Sixteen Working Papers and eight Information Papers were presented to the RVSM/TF/26 meeting. A list of papers is included at **Appendix B**.

Agenda Item 1: Adoption of Agenda

1.1 The meeting reviewed the provisional agenda for RVSM/TF/26 and the agendas presented by the Chairpersons of the ATC/WG, the OPS/AIR/WG and the SAM/WG and adopted them as the agendas for the meeting and the Work Groups. These located at **Appendices C, D, E** and **F,** respectively, to the Report.

Agenda Item 2: Operational Considerations

Status of Readiness

2.1 The meeting reviewed the readiness of Japan and the Republic of Korea (ROK) to implement RVSM in domestic airspace of the Naha and Tokyo FIRs, and in Incheon FIR respectively. The meeting considered that good progress had been made in order to meet the target date of 29 September 2005. Details of activities related to the implementation process are outlined below.

Amendment to the Japan Civil Aeronautics Law

2.2 The meeting recalled that at RVSM/TF/23 held in October 2004, Japan informed that RVSM implementation in the domestic airspace required an amendment to the Japan Civil Aeronautics Law and associated regulations, to provide legislative foundations for JCAB to enforce various requirements for safety reasons. Japan informed the meeting that the amendment to the Law passed the National Diet on 30 June 2005.

ATC Training

2.3 Japan and the ROK reported that simulations had been conducted to assess the impact of RVSM on the workload of controllers, and concluded that there would be no adverse impact on ATC.

2.4 In preparation for RVSM implementation, the ROK developed a training program and simulated the RVSM ATC scenario in October 2004. In addition, the ROK sent an Incheon ACC training team and controllers to the Singapore Aviation Academy for RVSM training in April 2005. Based on the experience gained, the training team upgraded the training program as well as the simulation scenario. Basic knowledge training was completed and simulation training will be completed in July 2005. The evaluation test of all controllers for their training accomplishment was scheduled in July 2005, and comprehensive training will be provided to each air traffic controller work shift until the RVSM implementation date of 29 September 2005.

2.5 Japan reported that guidance material on RVSM had been prepared for air traffic controllers who did not have operational experience and sufficient knowledge of RVSM operations. The number of controllers who would require training was more than 400 and mainly from the ACCs. RVSM training which was expected to commence in July 2005 would consist of classroom lectures and radar simulations. The training would be completed by mid-September 2005.

Publication of AIP Supplement/Amendment

2.6 The ROK informed the meeting that the AIP Supplement containing RVSM policy and procedures for the Incheon FIR was published on 1 July 2005. The meeting noted that there were issues which require clarification such as the contingency procedures for non-radar airspace. The ROK agreed to review the procedures and issue an AIP Amendment accordingly.

2.7 Japan informed the meeting that the existing Japan AIP relating to RVSM operations (ENR3.6 10 - Implementation of RVSM in Tokyo FIR and Naha FIR) would be amended to cover the domestic RVSM operations. The AIP Amendment would be published on 4 August 2005, to provide operators with two AIRAC cycles prior to the implementation on 29 September 2005. This amendment would incorporate the Large Height Deviation (LHD) report procedures contained in the existing AIC (Nr. 007/05). As a result, the AIC would be cancelled on 29 September 2005.

Transition Areas

2.8 Japan advised that transition areas would not be required at or near the FIR boundaries with Russia and China where the metric level system was in use. Level changes would be effected within domestic airspace making use of radar.

2.9 The ROK informed the meeting that there would be three transition areas with adjacent FIRs. However, all transitions would be conducted under radar coverage and there would be no double transitions (RVSM-CVSM-metric level system). Details of usable RVSM flight levels and transition areas in the Incheon FIR are shown in Paragraph 6 of the Republic of Korea AIP as shown in **Appendix G** to this Report.

Wake Turbulence and Lateral Offsets

2.10 Japan reported that strategic lateral offsets of 0, 1, 2 NM to the right was applicable in the oceanic airspace, but not in the domestic airspace which were fully covered by radar. In situations when pilots had to deviate from the center line of routes while under radar control in order to mitigate wake turbulence, such deviations would be accommodated by ATC upon request as far as traffic permitted.

2.11 The ROK agreed to review the contingency procedures that had been published in the AIP Supplement on 1 July 2005 and issue an amendment as indicated in paragraph 2.6.

2.12 ICAO informed the meeting that Amendment 4 to the *Procedures for Air Navigation Services − Air Traffic Management* (PANS-ATM, Doc 4444) which would become applicable on 24 November 2005 included procedures for the use of strategic lateral offsets in oceanic and remote continental airspace, as a safety measure to reduce the risk of collision in the event of loss of vertical separation. These procedures were designed to include lateral offsets to mitigate the effects of wake turbulence of preceding aircraft. (Section 15.2.4, Chapter 15, refers).

Non-Compliant Operations

2.13 Japan and the ROK informed the meeting that all operators planning to operate in RVSM airspace must obtain RVSM approval. Non-compliant aircraft would not be allowed to operate in RVSM airspace, except for special cases such as State aircraft, search and rescue, humanitarian, ferry flights, etc. The policy pertaining to non-compliant operations would be promulgated in the respective AIP Amendment or Supplement.

Suspension of Application of RVSM

2.14 Japan and the ROK informed the meeting that procedures for the suspension of the use of the 1 000 ft vertical separation minimum were in place for application by the respective ACCs.

2.15 The meeting noted that in such situations, the term “Suspension of RVSM Operations” might not be used as Paragraph 5.2.8 b of the *Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410* (Doc 9574) clearly states that

the appropriate ATC authority should consider "temporarily suspending the use of 300 m (1 000 ft) VSM in the affected area". Therefore, the meeting reminded States to develop a more appropriate term to describe situations when the application of the 1 000 ft vertical separation minimum had to be temporarily suspended.

2.16 The meeting also noted that a requirement for procedures to suspend RVSM would be subject to the characteristic of the airspace and could vary from one region (or FIR or portion of airspace) to another region (or FIR or portion of airspace). The meeting therefore agreed that general procedures for suspension of RVSM operations should be reviewed at future meetings.

Large Height Deviation (LHD)

2.17 Japan and the ROK informed the meeting that they would continue to collect LHD reports through existing systems and provide monthly reports to MAAR, as part of safety oversight for the use of RVSM.

Switchover Arrangements

2.18 The meeting examined the traffic situation (density and complexity) based on the two switchover times, i.e. 1600 UTC and 1900 UTC, proposed by the ROK and Japan, respectively. Hong Kong, China, advised that during the proposed period, traffic flow within their airspace would be predominantly the northeast bound. Hence, Hong Kong ACC would not expect any significant difficulty to accommodate the change from the conventional vertical separation minimum (CVSM) to RVSM. The meeting advised that it would be desirable to have a common switchover time in order not to create any misunderstanding or confusion. Japan and the ROK agreed to switchover from CVSM to RVSM at 1900 UTC on 29 September 2005. IATA and IFALPA confirmed that the agreed time was acceptable.

Flight Planning

2.19 The meeting noted that it was essential for operators (domestic and international) to have a thorough understanding of the procedures relating to RVSM operations in the Incheon, Naha and Tokyo FIRs. In particular, the flight planning requirements and arrangements for the switchover from CVSM to RVSM at 1900 UTC on 29 September 2005 should be highlighted. In this regard, Japan and the ROK were requested to provide appropriate briefing to all operators who might operate in their airspaces.

Traffic Management during the Transition

2.20 The meeting noted that certain procedures, e.g. time and location of altitude changes and radio communication failure, should be agreed with adjacent ACCs for the switchover from CVSM to RVSM on 29 September 2005. Particular attention should be given to the use of specific levels, i.e. FL 310, FL 350 and FL 390, since these levels would be used for east bound traffic in the RVSM environment but for west bound traffic in the CVSM environment.

2.21 Japan and the ROK agreed to coordinate and implement appropriate procedures/program to manage traffic during the switchover from CVSM to RVSM on 29 September 2005.

Trigger NOTAM

2.22 Japan and the ROK informed the meeting that the Trigger NOTAM would be issued on 22 September 2005 in accordance with the ICAO procedure in the *Aeronautical Information Manual* (Doc 8126). IATA and IFALPA concurred with the date for the publication of the Trigger NOTAM. The text of the NOTAM would be as follows:

E) TRIGGER NOTAM – PERM AIRAC AIP (AMDT/SUP reference number) EFFECTIVE 1900 UTC 29 SEP 2005 RVSM WILL BE IMPLEMENTED IN (FIR name(s)) FIR(s)

Letters of Agreement (LOA)

2.23 Japan and the ROK informed the meeting that amendments to LOAs between Incheon and Naha/Fukuoka/Tokyo ACCs would be finalized by the end-July 2005. The ROK had no other LOA to be amended. Japan would finalize amendments to LOAs with other adjacent FIRs by mid-August 2005.

Control of Aircraft on A593 and B576

2.24 IATA expressed safety concerns with regard to the current airspace arrangements and operations of the "AKARA Corridor" involving 3 ACCs, namely Fukuoka, Incheon and Shanghai ACCs. This concern was shared by IFALPA.

2.25 Japan explained the contents of the current LOA between Incheon and Fukuoka ACCs, and briefed the meeting on the historical background and development of the AKARA Corridor, and the safe and efficient operations that have been conducted over the last 20 years. The existing LOA addressed coordination procedures between the ACCs in case of communication failure and in-flight emergency. The meeting was also advised that there were suitable two-way direct speech circuit and voice page circuit between Incheon ACC and Fukuoka ACC, which permitted communications to be established instantaneously. Japan and the ROK considered that the current procedures were safe and effective.

2.26 The meeting agreed that existing airspace arrangements relating to the AKARA Corridor were not within the scope of work of the RVSM/TF. IATA urged the States concerned to consider possible procedures to deal with aircraft emergency descents, should they occur at and near the intersection, NIRAT, on A593 and B576. Japan and the ROK noted this specific issue and agreed to coordinate on feasible measures to safeguard aircraft in such emergency situations. However, they informed the meeting that it would not be possible to develop new arrangements before the RVSM implementation date on 29 September 2005.

2.27 The Secretariat informed the meeting that IATA had written to the ICAO Asia and Pacific Office in Bangkok requesting for a review of the current arrangements relating to the AKARA Corridor. A Special Coordination Meeting, under the auspices of ICAO, would be considered possibly to be convened later this year. The RVSM Task Force would be informed of the outcome of the Special Coordination Meeting at the 90-day post RVSM Implementation Review Meeting (scheduled to be held in February 2006).

Report of the Ninth IFATCA North East Asia Traffic Management Meeting (NEAT/9)

2.28 At the RVSM/TF25 meeting (March 2005, Incheon), IFATCA was requested to hold a meeting to investigate whether or not the implementation of RVSM in Incheon, Naha and Tokyo FIRs, scheduled on 29 September 2005 would have an impact on adjacent FIRs. The IFATCA 9th North East Asia Traffic Management meeting (NEAT/9) was held in Manila on 2-3 June 2005 to discuss issues between Naha, Taipei, Manila and Hong Kong FIRs.

2.29 The Representative of IFATCA reported to the meeting on the following agreements regarding flight level allocation scheme (FLAS) between the FIRs as well as other issues such as separation reduction proposals and consideration of new parallel route structures to enhance airspace efficiency.

RVSM implementation Issues at Each FIR

a) Traffic entering Hong Kong FIR at single alternate FLOS would not be compatible with the CVSM FLOS in use on P901 and A1. An evaluation undertaken by Hong Kong on the resulting transition activities involving 26 conflict points concluded it would not be safe to do so. The establishment of unidirectional parallel routes replacing P901 and A1 might minimize transition activities.

b) The current transition tasks in Manila FIR were still within a manageable level, except during the typhoon season. Manila would have difficulty in accepting traffic at a single-alternate level, except on R596 due to the airspace and traffic characteristics, not to mention ATC workload.

c) Naha ACC currently performed transition from single alternate FLOS to modified single alternate FLOS for south-westbound flights via TUNTO direct BONEY. This required transition tasks since B462 was on a single-alternate FLOS, whereas R596 was CVSM. Normally, it was noted that few flights used the latter route, except during the typhoon season.

d) Traffic on A1 and M750 was not much of a problem with the current FLAS between Taipei and Hong Kong. However, with G581 on different FLAS between Naha, Taipei and Hong Kong, problems would be encountered in the Taipei FIR because of the CVSM FLAS. Also, the meeting noted that the possible solution would be the establishment of unidirectional parallel routes.

e) At the NEAT 8 meeting (2004, Taipei), the controllers associations of Hong Kong China, Japan, Philippines and Taipei had agreed that the use of the single alternate FLOS in the SCS area would be preferred when Naha and Incheon FIRs implement RVSM. However, some FIRs had not been ready to implement single alternate FLOS for safety reasons.

LOA Discussions between Taipei ACC and Hong Kong ACC

f) The Taibei Controller Association accepted the current FLAS on A1 and M750. The Hong Kong Controller Association requested Taibei to study the availability of FL 300 on M750 for traffic overflying Taipei FIR. The Taibei Controller Association requested establishment of parallel routes on G86.

g) The Taipei Controller Association requested the Hong Kong Controller Association for the availability of FL 360 for westbound traffic on G86 as well as reduction in longitudinal separation from 10 min. to 5 min.

Transition areas/Transition tasks were confirmed

h) Between Hong Kong and Manila – there would be no change in FLAS, and the LOA would remain the same.

i) Between Hong Kong and Taipei – there would be no change, and the double alternate FLOS would remain the same. The Hong Kong Controller Association requested the Taipei Controller Association to study the availability of FL 300 for traffic overflying Taipei on M750.

j) Between Taipei and Naha – Naha ACC would handle the transition for IGURU to Hengchun and G86, B348. Other routes would be handled by Taipei ACC.

k) Between Taipei and Manila – there would be no change in the flight level assignment scheme (FLAS). Changes in FLAS would occur only on R596.

Proposed Change in FLOS and FLAS for the South China Sea/Western Pacific (WPAC/SCS) Areas

l) Information presented at the RVSMTF/22 meeting regarding the proposed changes of the FLOS and FLAS in the WPAC/SCS areas (submitted by the Philippines in collaboration with Hong Kong, Thailand and Vietnam) was provided for consideration and evaluation by the FIRs concerned.

2.30 IATA thanked IFATCA for the comprehensive report and stated that the information should be included in the official documents. The Secretariat suggested that IFATCA could report the information to the South East Asia ATS Coordination Group and the ATM/AIS/SAR Sub-Group.

Approval of Amendment 4 to PANS-ATM

2.31 The Secretariat reported to the meeting that a State Letter (Ref.: AN 13/2.1-05/51) notifying the approval of Amendment 4 of the PANS-ATM was issued on 29 April 2005, and is included as **Appendix H** to the Report. The nature and scope of the amendments which relates to RVSM operation is as follows:

a) an amendment has been made to unify global and regional communications failure and in-flight contingency procedures, taking advantage of new technologies and current knowledge in the application of these procedures. Simplifying the procedures and securing the highest practical degree of harmonization will facilitate operations and improve the safety of air navigation; and

b) an amendment has been made to include procedures for the use of strategic lateral offsets in oceanic and remote continental airspace, as a safety measure to reduce the risk of collision in the event of loss of vertical separation. These procedures were designed to include offsets to mitigate the effects of wake turbulence of preceding aircraft.

2.32 The meeting noted that States were invited by the Council of ICAO to implement the amended provisions of PANS-ATM on 24 November 2005. Attention was also drawn to the requirement for States to publish in their AIP a list of any significant differences that would exist on 24 November 2005 between the amended provisions of PANS-ATM and State regulations and practices.

Approval of Amendments to Annexes 11 and 6 Parts I, II and III

2.33 The Secretariat reported that the ICAO Council adopted Amendment 43 to Annex 11 – *Air Traffic Services* on 2 March 2005. When adopting the amendment, the Council prescribed 11 July 2005 as the date upon which it would become effective and 24 November 2005 as the applicability date.

2.34 The meeting was advised that a State Letter (Ref.: AN 13/13.1-05/37) notifying the adoption of Amendment 43 to Annex 11 was issued on 24 March 2005 and is included as **Appendix I** to the Report. The State Letter describes the nature and scope of the amendments to Annex 11. In particular, the meeting was informed that the Annex 11 amendment introduces a Standard that requires States to establish a monitoring programme for aircraft height keeping performance in RVSM airspace. Monitoring of aircraft height-keeping performance is one of the underlying assumptions of the safety studies on which RVSM was based. In all regions where RVSM has been implemented, Regional Monitoring Agencies (RMAs) have been established by the appropriate Planning and Implementation Regional Groups (PIRGs) to undertake this function. Amendment to Annex 11 adds a requirement to establish such a monitoring programme.

2.35 The meeting also noted that complementary provisions had been added to Annex 6, which specifies the requirement for all aircraft to hold an approval for operations in RVSM airspace and the responsibility of the relevant State authority with regard to the issuance of these approvals. The height-keeping performance criteria on which the approvals should be based have, until now, been specified only in the *Regional Supplementary Procedures* (Doc 7030) of the regions which have implemented RVSM. For the approvals to be valid globally, it is necessary that all States apply the same criteria when issuing approvals. To ensure standardization, the proposed amendment adds new appendices to Parts I and II of Annex 6, containing the height-keeping performance criteria. Additionally, because monitoring of height-keeping performance was the underlying assumption on which RVSM was based, the amendment introduces new provisions in Annex 6, Parts I and II specifying to take prompt and appropriate action if the monitoring results indicate that the height-keeping performance of a particular aircraft or an aircraft type group exceeds prescribed limits. Amendment 29 to Annex 6 − *International Commercial Air Transport*, Part I − *Aeroplanes* is included in the State Letter (Ref.: AN 11/1.3.18-05/28) reproduced as **Appendix J** to the Report.

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

Operator Readiness and RVSM Approval Status

3.1 The meeting reviewed the readiness of aircraft and operators for RVSM operations on domestic and international routes in the Incheon, Naha and Tokyo FIRs. The meeting noted that approximately 76.5% of aircraft being operated in the domestic airspace of Japan were RVSM-approved. Japan expected this figure to exceed 90% in August 2005, as other operators were in the process of obtaining RVSM approval. For Korean national carriers (i.e. Korean Air and Asiana Airlines), 100% had already obtained RVSM approval. Hence, the target of 90% operator approval for the Japan and ROK RVSM implementation would be achieved.

3.2 The meeting also noted that most general aviation business jet that operated in the Incheon, Naha and Tokyo FIRs were RVSM compliant.

3.3 The meeting reviewed the implementation of ACAS II (TCAS Ver.7) as a mandatory requirement set by ICAO in Annex 6 since January 2003. The meeting noted that aircraft approved for RVSM operations in Japan and ROK were equipped with ACAS II (TCAS Ver.7).

3.4 The meeting reviewed the Registry and Withdrawal Forms (MAAR Forms F2 and F3) as part of the Global RVSM Aircraft Approval Registry Database. The forms would assist States to verify the status of RVSM approval of aircraft operating in their respective areas. The meeting also highlighted the need for States to provide MAAR with updates on RVSM approvals on monthly basis, no later than the 15th day of the following month. Complete details of RVSM approval registry records were available on the MAAR website (www.aerothai.co.th/maar).

Monitoring Program for Height-Keeping Performance

3.5 The meeting reviewed the monitoring program for aircraft height-keeping performance and the LHD reports, and noted the following:

a) During the year of 2004 and up to June 2005, there was only one LHD, which occurred due to a TCAS Resolution Advisory on a KAL aircraft in the Incheon FIR. In the Naha and Tokyo FIRs, there were two LHDs caused by a pilot encounter of a TCAS Resolution Advisory and one LHD caused by aircraft altitude holding system failure. The meeting noted that one LHD in the Tokyo FIR had occurred for 40 minutes due to incorrect operation. There was no LHD caused by adverse weather in the Incheon, Naha and Tokyo FIRs for the year 2004 and up to June 20.

b) The need for State RVSM approval authorities in the Asia and Pacific Region (including Japan and the ROK) was emphasized and they should submit updates on traffic and LHD data on a monthly basis to MAAR and PARMO respectively for safety assessments and continuous monitoring purposes.

Continuous Airworthiness Program and Monitoring

3.6 The meeting agreed that the States concern should improve the procedure applied for continuous airworthiness monitoring and training programs for RVSM operations. The State RVSM approval authorities and operators should ensure that changes to procedures should be consistent with existing ICAO guidelines and approved manuals, and should be harmonized with procedures applied in other areas, e.g. the WPAC/SCS area and the North Pacific.

3.7 The meeting highlighted the need for follow-up on the height-keeping performance of RVSM approved aircraft to maintain the safety of aircraft operations in RVSM environment. To this end, the meeting recommended that operators should ensure that aircraft RVSM primary altimetry systems were reliable and complied with the limit of RVSM system tolerances, by including the provision of altimeter system reliability and trend monitoring program into the maintenance and operations manual.

3.8 The meeting noted that follow-on monitoring for long term continuous airworthiness would be established as a global standard by ICAO in the near future. In this regard, the meeting requested ICAO to distribute the draft requirements to allow airlines and the contracting States to review and provide feedback before implementation. The meeting agreed that RVSM safety in the region could be enhanced if States and operators were allowed to perform self monitoring with the

support of appropriate software and GPS monitoring unit (GMU) equipment provided by the RMA. The meeting also suggested ways to improve compliance of long term continuous airworthiness monitoring requirements such as time period, sampling methodology and population of fleets for monitoring. In addition, there should be flexibility in either using Height Monitoring Units (HMUs) or GMUs for monitoring and to conduct monitoring in other regional monitoring areas.

3.9 The meeting noted operators' concern regarding in-flight rerouting for monitoring requirement to comply with safety monitoring when HMUs are inappropriately located (as was the experience in Europe).

Lateral Offset Procedures

3.10 The meeting reviewed the strategic lateral offset procedures that had been developed by ICAO for application in oceanic and remote continental airspaces and would be incorporated in Chapter 5 of PANS-ATM. IATA sought a clarification in relation to tactical offset within a radar-coverage and stated that within the radar airspace, pilots still could request the use of offset deviations to mitigate for wake turbulence caused by RVSM operation. The secretariat advised the meeting that the strategic lateral offsets procedures were applied only in the oceanic and remote continental airspace and were transparent to controllers. Under radar environment, pilots should request a deviation from controllers. The meeting agreed that this issue should be discussed at a regional level and advised IATA to raise the matter at the APANPIRG ATM/AIS/SAR Sup-Group meeting.

Future OPS/AIR Work Program

3.11 The meeting reviewed a proposal to expand the RVSM level band from FL 290 to FL 450 in order to accommodate future operational needs of new generation aircraft for long range and ultra long range operations. The meeting recommended that this issue should be referred to ICAO through the Separation and Airspace Safety Panel (SASP).

Agenda Item 4: Safety and Airspace Monitoring Considerations

4.1 The SAM/WG reviewed the tasks assigned to MAAR at the RVSM/TF/23 meeting. Regarding the readiness and safety assessments for RVSM implementation in the Naha and Tokyo FIRs (Japan) and Incheon FIR (ROK), MAAR updated the meeting in the following areas:

- Summary of Know Your Airspace (KYA) analyses
- Result of readiness assessment
- Summary of Large Height Deviation (LHD) occurrences
- Results of risk assessment

Review of KYA Analyses

4.2 Based on the traffic sample data provided by Japan and ROK, CASA for the period 1 August to 30 September 2004, the following issues were presented:

- Flight operation statistics, including the number of flights by State and the number of flights by States per day,
- Traffic flow characteristics, including the top 15 State and city pairs,
- Operator and aircraft profiles, including the top 15 operators and aircraft type operating in this airspace, and
- Flight level utilization.

4.3 The information obtained from the KYA analyses was used in conducting the safety assessment of the RVSM implementation in Naha, Tokyo and Incheon FIRs.

Review Readiness Assessment

4.4 The meeting reviewed the result of readiness assessment regarding RVSM implementation in Naha, Tokyo and Incheon FIRs, and noted that approximately 75% of the aircraft operations in the Japan and ROK airspace where RVSM would be implemented have been conducted by State approved operators and aircraft. Nonetheless, approximately 17% of aircraft operations in the collected traffic sample data (TSD) were in the process of obtaining the State RVSM approval and were expected to be completed in September 2005, before the planned RVSM implementation date. Therefore, the meeting noted that approximately 92% of aircraft operations would be RVSM-approved by 29 September 2005.

Review the LHD Occurrences

4.5 The meeting reviewed the LHD occurrences in Japan and ROK airspace since July 2004 as shown the Table 1.

Month-Year	No. of LHD Occurrences	LHD Duration (Min)	Cumulative No. of LHD Occurrences	Cumulative LHD Duration (Min)	Remarks
2004					
Jul	-		1	0.2	1 LHD occurrence in April 04 reported by ROK
Aug	3	1.5	4	1.7	
Sep	2	2.7	6	4.4	
Oct	-		6	4.4	
Nov	1	0.3	7	4.7	
Dec	-		7	4.7	
2005					
Jan	-		7	4.7	
Feb	-		7	4.7	
Mar	-		7	4.7	
Apr	-		7	4.7	
May	-		7	4.7	
Jun	1*	(40)	7	4.7	

Table 1: Summary of LHD Occurrences and Duration in Japan and ROK Airspace

4.6 The meeting noted that there have been seven LHD occurrences, accounted for a duration of 4.7 minutes up to May 2005. Of these occurrences, one was associated with technical error, and incorporated to the technical risk estimation. The rest of the occurrences were associated with operational errors, in which they were subject to TCAS advisory, error in ATC-unit to ATC-unit transfer/transition message, and other causes. *Additionally, in June 2005, there was one LHD occurrence reported by Japan due to incorrect operation associated with the aircraft altimeter system and which accounted for approximately 40 minutes. Such case would not happen in the RVSM environment since the aircraft must be operated under two independent altimetry systems with the difference between them being within 200 ft.

Review of the Risk Assessment

4.7 The meeting noted that the risk calculation undertaken by MAAR for the Japan and ROK RVSM implementation would exceed the agreed overall TLS. This was due to the LHD that had occurred in Japan in June 2005. The meeting also discussed the exact cause of the incident, and established that it was an isolated case of an operational error. The meeting was advised by Japan that positive counter measures had been put in place to prevent the recurrence of such an incident. JCAB also advised the meeting that the agency responsible for the countermeasures was as follows.

Director, Flight Standard Division, Civil Aviation Bureau, Japan
Telephone: 81-3-5253-8732
Facsimile: 81-5253-1661

4.8 In light of the preventive actions taken by Japan and the fact that it was an isolated case, the meeting agreed that this LHD occurrence could be excluded in the risk calculation. As a result, both technical and total risks were as shown in Table 2.

Source of Risk	Lower Bound Risk Estimation	TLS	Remarks
Technical Risk	1.40×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	2.43×10^{-9}	-	-
Total Risk	3.83×10^{-9}	5.0×10^{-9}	Below Overall TLS

Table 2: Risk Estimates for the RVSM Implementation in Japan/ROK Domestic Airspace

4.9 These estimates satisfied the agreed TLS value of no more than 2.5 x 10-9 and 5.0 x 10-9 fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 1,000 ft and to all causes, respectively. In addition, trends of collision risk estimates for each month using the appropriate 12-month interval of LHD reports since April 2004 are provided in Figure 1.

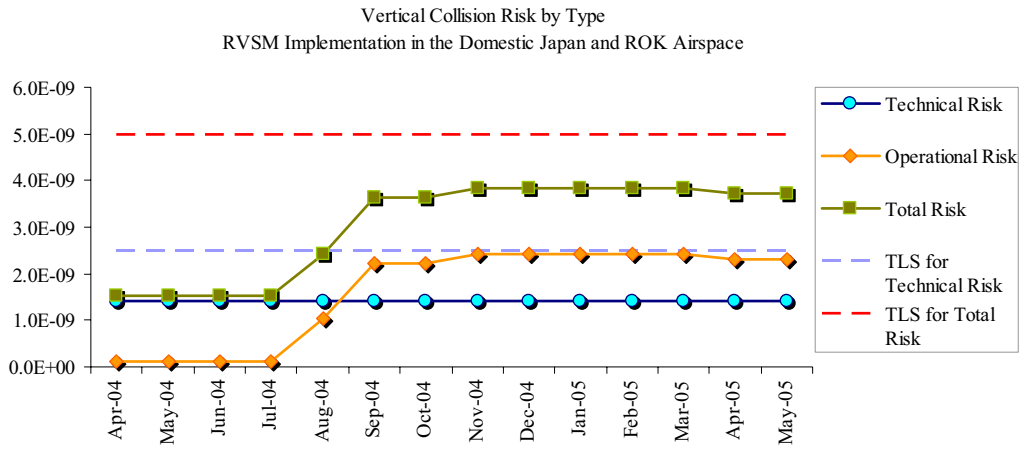

Figure 1: Trends of Risk Estimates for the RVSM Implementation in Japan/ROK Domestic Airspace

4.10 In addition, MAAR noted the high traffic density on the segment between the fixes Jeju (CJU) and DADGA on ATS route B576. Therefore, it was recommended that the ATC unit(s) concerned should manage the air traffic in this area of the planned RVSM airspace with vigilance. As the traffic could likely grow over time, other preventive actions to manage the traffic in this area should also be considered to improve safety. In this regard, the ROK informed the meeting that ATC provides radar vectoring for improving safety in the area.

4.11 IATA raised concern regarding the control of aircraft by two ACCs for traffic operating on ATS routes A593 and B576 at the intersection point of NIRAT. IATA sought clarification whether this operational arrangement was taken into account in the calculation of risk for the Japan and ROK RVSM implementation. MAAR informed that the calculation was conducted based on the aircraft system height-keeping performance and traffic characteristics within the assessed airspace, which derived the level of technical risk for the RVSM implementation. This issue was not included in the calculation as it was related to ATC operations. Nonetheless, from the mathematical and statistical points of view, these indicated that there was no evidence of unacceptable risks involved.

Pre-Implementation Safety Assessment for the Japanese Domestic Airspace

Preliminary Assessment and Route Modification

4.12 Japan reported that they also had completed pre-implementation safety assessment for the Japanese domestic airspace, based on TSD for a period from January 2003 to December 2003. Since the preliminary assessment report in March 2004 showed that the passing frequencies of some segments of ATS route G581 exceeded the criteria of the Global System Performance Specification, JCAB modified the route structure of G581 on 17 February 2005. As a result, the passing frequency on G581 decreased to at least 40% compared with the figure indicated before the route restructure was changed.

Pre-Implementation Assessment and LHD

4.13 A pre-implementation safety assessment was conducted, covering the period 8 July 2004 to 30 June 2005, and assessed the technical risk and operational risk. This assessment superceded the previous assessment presented to the RASMAG/3. Table 3 presents the summary of the LHD reports received during the period.

Month-Year	No. of LHD Occurrences	LHD Duration (Min)	Cumulative No. of LHD Occurrences	Cumulative LHD Duration (Min)
2004				
July	0	0	0	0
Aug	3 (2 by TCAS/ 1 by TRF error)	1.5	3	1.5
Sep	2 (1 by Technical error/ 1 by TRF error)	2.7	5	4.2
Oct	0	0	5	4.2
Nov	1(overshoot)	0.3	6	4.5
Dec	0	0	6	4.5
2005				
Jan	0	0	6	4.5
Feb	0	0	6	4.5

Month-Year	No. of LHD Occurrences	LHD Duration (Min)	Cumulative No. of LHD Occurrences	Cumulative LHD Duration (Min)
Mar	0	0	6	4.5
Apr	0	0	6	4.5
May	0	0	6	4.5
June	1	(40)	7	4.5

Table 3: Summary of LHD reports received from 8 July 2004 to 30 June 2005

4.14 Table 4 provides estimates of technical risk, operational risk and overall risk, calculated for Japanese domestic airspace.

Source of Risk	Lower Bound Risk Estimation [accidents / flight hour]	TLS [accidents / flight hour]	Remarks
Technical Risk	1.5×10^{-9}	2.5×10^{-9}	Below Technical TLS
Operational Risk	2.6×10^{-9}	-	-
Overall Risk	4.1×10^{-9}	5.0×10^{-9}	Below Overall Risk

Table 4: Risk Estimates for the RVSM Implementation in the Japan domestic airspace

4.15 JCAB advised that the results of the safety assessment met the requirements and concluded that RVSM in the Japan domestic airspace could be safely implemented on 29 September 2005.

Review of the Monitoring Requirements

4.16 MAAR presented information to update the meeting on the Asia RVSM Minimum Monitoring Requirements (MMR) which had been adopted by MAAR from 1 July 2005. The MMR was identical to the one currently used by Pacific Approval Registry and Monitoring Organization (PARMO). Details are provided in **Appendix K** to this report.

Future Directions

4.17 Japan informed the meeting that JCAB had established the JCAB Airspace Safety Monitoring Unit (JASMU) in April 2004 in their ATC Division for RVSM implementation in their domestic airspace. With support from the Electric Navigation Research Institute (ENRI), JASMU would have full capability to conduct the safety assessments and monitoring for RVSM operations in Japan domestic airspace within one year after the implementation.

4.18 MAAR informed the meeting of its future direction to continue to provide the safety monitoring services until the 90-day review of the Japan and ROK RVSM implementation. To enable MAAR to complete this task, new TSD would have to be provided for the month of November 2005. The data should be submitted to MAAR no later than 15 December 2005. This would allow MAAR adequate time to conduct the safety assessment for the post RVSM implementation meeting tentatively scheduled in the first week of February 2006.

Review of the Third Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/3)

Review the Airspace Safety Monitoring in the Asia/Pacific Region and the Activities of RMAs

4.19 PARMO reported to the RASMAG/3 meeting that the estimate of the overall vertical collision risk for the Pacific was 1.64×10^{-9} fatal accidents per flight hour, which is approximately 67% below the TLS. MAAR informed the RASMAG/3 meeting that 88 of the WPAC/SCS LHD reports (85%) related to Category M reports − Error in ATC-unit to ATC-unit transfer/transition message. The RASMAG/3 meeting was informed that the total risk for the WPAC/SCS area was provisionally assessed as 4.90×10^{-9}. MAAR expressed their significant concern that the TLS might have been exceeded given the calculated high-risk value and the fact that there was a significant amount of data unavailable from some States.

RVSM Pre-implementation Safety Assessment in the Japan Domestic Airspace

4.20 The RASMAG/3 meeting noted that out of the 10 LHD reports which were reported in the Japan domestic airspace between July 2004 and May 2005, five cases had been caused by ATC operational errors relating to transfer between ATC units. Cooperative actions were undertaken by the ATC units concerned with the aim of preventing further recurrence of similar errors. The RASMAG/3 meeting was advised that no LHD report caused by ATC transfer error had been observed since then, suggesting that the remedial actions taken had been effective. (Updated information is included in Paragraph 4.5)

4.21 The RASMAG/3 meeting noted that initial analyses by the ENRI had found that passing frequency values on ATS route G581 exceeded the Global System Performance Specification "a passing frequency equal to 2.5 opposite-directions passing per aircraft flight hour" described in the ICAO RVSM Manual (Doc. 9574). In order to reduce that excessive passing frequency value, JCAB realigned G581 and developed additional two uni-directional parallel route systems on both sides of G581.

RVSM Monitoring Service Arrangement for Japan/Republic of Korea

4.22 The RASMAG/3 meeting recalled that as PARMO had been heavily committed to the scheduled implementation of RVSM in the USA, Canada and Mexico scheduled for 20 January 2005, MAAR agreed to provide necessary services for the pre-RVSM implementation in Incheon, Naha and Tokyo FIRs scheduled for 29 September 2005.

4.23 The RASMAG/3 meeting recognized that MAAR and PARMO confirmed that MAAR would conduct the safety analyses required for the 90 day post-implementation review of the implementation of RVSM in the Incheon, Naha and Tokyo FIRs. Subsequent to the 90 day review meeting of the RVSM/TF, PARMO would resume responsibility for the Incheon, Naha and Tokyo FIRs. RASMAG/3 was informed that timely coordination amongst MAAR, PARMO, Republic of Korea and Japan would be conducted to make this transition of responsibility.

Non-submission by States of safety-related data

4.24 The RASMAG/2 meeting (October 2004) prepared a draft letter highlighting the concerns about the non-submission of safety-related data and requesting the immediate submission of the safety data. Letters of this type were transmitted by the Regional Office during early December 2004 to 13 States of the Asia and Pacific Regions who were identified as not having submitted data in

accordance with the requirements of approved RMAs. Whilst many States provided safety data in response to the letter, some States have still not provided suitable data to MAAR.

4.25 The RASMAG/3 meeting agreed that it would be preferable to make a strong recommendation to APANPIRG for their consideration as to the action required. To that end, RASMAG/3 drafted conclusions for presentation to APANPIRG. This statement is recorded below.

Draft Conclusion 16/xx1

That, recognizing that some States had not adequately complied with safety management provisions, further implementation of reduced separation minima within the Asia and Pacific Region should only proceed in circumstances where implementing States can demonstrate an ability to comply with Annex 11 Chapter 2 safety management provisions for the continuous monitoring and regular assessment of the safety level achieved.

Draft Conclusion 16/xx2

*That the non provision by States of safety related data to approved monitoring agencies be included in the APANPIRG Deficiencies List in respect of a deficiency in a safety management system, in order to promote the resolution of these issues***.**

4.26 Japan noted that the provisional total risk of 4.90×10^{-9} for the WPAC/SCS area was considered to be high. When considering that the area is vast, it was felt that the risk estimation for the entire area might not be appropriate. Japan suggested that there might be an FIR where risk estimation exceeds the TLS. When the estimated risk exceeds the TLS, remedial action should be taken. From this point, Japan suggested that the risk estimation be conducted for each FIR. The Secretariat will bring this suggestion to the RASMAG.

Introduction of the ICAO Regional Monitoring Agency Manual

4.27 The Secretariat reported that in order to provide guidance to RMAs in the performance of their functions associated with RVSM operations, the draft *Manual of Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the Use of a 300 m (1 000 ft) Vertical Separation Minimum above FL 290* (RMA Manual) was being developed by ICAO. The RASMAG/2 meeting noted that the draft RMA Manual requirements were being reviewed and any updating would be taken into account by all RMAs concerned.

4.28 The meeting noted that the RMA Manual was recently made available within ICAO internally as an unedited version, a copy of which has been reproduced as **Attachment L** to the Report.

4.29 Japan noted that the draft RMA Manual was quite important and requested the Secretariat to circulate it to States once it was finalized. The Secretariat agreed to inform States when the manual was finalized.

Agenda Item 5: Implementation on 29 September 2005 (Go/No Go Decision)

5.1 Based on the update provided by Japan and the ROK, as well as the safety assessments completed by MAAR, the meeting agreed to go ahead with the implementation of RVSM in the Incheon, Naha and Tokyo FIRs on 29 September 2005.

Agenda Item 6: Review of Action Items

6.1 The meeting reviewed and updated the Task List as shown in **Appendix M** 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:

Feb 2006	RVSM/TF/27 (90-Day Review)	Bangkok, Thailand
Feb 2006	RVSM/TF/28 (FLOS Review)	Bangkok, Thailand
Oct/Nov 2006	RVSM/TF/29 (One-year Review)	Bangkok, Thailand

Agenda Item 8: Other Business

Review of the Twelfth Meeting of the South-East Asia ATS Coordination Group (SEACG/12)

8.1 Hong Kong, China expressed concern at the SEACG/12 meeting over the number of changes that had taken place in the SCS airspace in recent years with the introduction of the revised SCS route structure and reduced lateral separation in 2001 followed by RVSM in 2002. Each airspace change requires training to be conducted for their controllers and this was no easy task to schedule and carry out controller conversion training within a short period of time. Too many changes at short notice were extremely disruptive and impacted adversely on staff morale. Hong Kong, China found it difficult to keep readjusting their training schedule. It was suggested that any change to the SCS FLOS should be delayed until after the 90-day review meeting of the Japan and Republic of Korea RVSM implementation.

8.2 SEACG/12 recognized the difficulties of coping with frequent changes to the operational environment and agreed that a period of stability should be allowed for after the Japan and Republic of Korea implementation and requested the RVSM/TF to postpone the FLOS review meeting until after the 90-day review which would be held in January 2006.

8.3 The meeting noted SEACG/12"s concerns and proposed that the FLOS review meeting to be held on the first week of February 2006 in conjunction with the RVSM 90-day review meeting for Japan and the ROK.

RVSM Separation for Formation Flights

8.4 The United States Department of Defense made a short presentation concerning the approval of RVSM separation for formation flights within the U.S. National Airspace System (NAS). The briefing made the meeting aware of the FAA Notice effective 12 May 2005 which authorized RVSM separation for formation flights when the formation flight was comprised of all RVSM

compliant aircraft. This briefing was a copy of what would be presented at the upcoming APANPIRG ATM/AIS/SAR Sub-Group meeting on 25-29 July 2005, encouraging other States and regions to incorporate the same separation for formation flights for a more efficient use of airspace.

RVSM implementation in North America

8.5 The Federal Aviation Administration (FAA), United States provided an update on RVSM implementation in North America on 20 January 2005. The implementation was based on ATS operational issues, safety and airspace monitoring considerations and airworthiness and operational approval process. The representative from the FAA shared with the meeting their experience in implementing the domestic RVSM. The meeting appreciated the FAA for the presentation.

9. Closing of the Meeting

9.1 On behalf of the ICAO RVSM Implementation Task Force for the Asia Pacific Region, Mr. Sydney Maniam expressed sincere appreciation to Japan and the staff of JCAB for the excellent preparations and conduct of the meeting. He also thanked all delegates, in particular Japan and the ROK for their commitment, dedication and efforts to enhance the operational efficiency of air traffic services through the implementation of RVSM.

9.2 Mr. Maniam expressed special appreciation to the Chairpersons of the respective Work Groups and MAAR for their leadership in dealing with and completing key activities in the overall implementation process. This, he added, had contributed significantly to the success of the meeting and enabled the Task Force to unanimously agree to go ahead with the implementation of RVSM in Naha, Tokyo and Incheon FIRs on 29 September 2005.

9.3 Mr. Kyotaro Harano, on behalf of ICAO Asia and Pacific Office, expressed his appreciation to JCAB for the excellent arrangement and support provided for the RVSM/TF/26 meeting. He acknowledged considerable planning and progress that had been made by Japan and the ROK to prepare for RVSM implementation on 29 September. Mr. Harano wished Japan and the ROK success in the RVSM implementation on 29 September 2005.

9.4 Mr. Yoshiki Imawaka, on behalf of JCAB, thanked all the delegates for the efforts to coordinate and progress the RVSM plan for the Incheon, Naha and Tokyo FIRs. He expressed special appreciation to staff members from the ATC Division of JCAB and Air Traffic Controller's Association Japan who had provided the secretarial work for the meeting.

9.5 Mr. Kim Geun Soo, on behalf of CASA, Republic of Korea, expressed sincere appreciation to the Chairpersons, the Secretary and delegates. He particularly thanked JCAB for the excellent preparations and organization of the RVSM/TF/26 meeting and for the outstanding hospitality extended to all delegates.

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LIST OF PARTICIPANTS

STATE/NAME	DESIGNATION/ADDRESS	TEL/FAX/E-MAIL
CHINA		
Mr. Chen Wei	Deputy Director Area Control Center of Shanghai Eastern China ATMB, CAAC Hong Qiao International Airport Shanghai City People's Republic of China	Tel: +86-21-51120603 Fax: +86-21-59233303 E-mail: shatmb@cnenws.cn
Mr. Sun Yongjun	Deputy Director ATM Department of Qigndao ATC Station, CAAC Qingdao Liuting International Airport People's Republic of China	Tel: +86-53-86126601 Fax: +86-53-86126078 E-mail: qdatmsyj@163.com
HONG KONG, CHINA		
Mr. Fan Wai Chuen, Lucius	Senior Safety and Quality Officer Civil Aviation Department 4F, Air Traffic Control Complex Hong Kong International Airport Lantau Hong Kong, China	Tel: +852-2910 6448 Fax: +852-2910 0186 E-mail: lwcfan@cad.gov.hk
Mr. Wong Tat Ming, Ben	Air Traffic Control Officer II Civil Aviation Department 4F, Air Traffic Control Complex Hong Kong International Airport Lantau Hong Kong, China	Tel: +852-2910 6808 Fax: +852-2910 0186 E-mail: btmwong@cad.gov.hk
INDONESIA		
Mr. Yusfandri Gona	Head of Flight Test and Performance Directorate of Airworthiness Certification Directorate General Air Communication (DGAC) DEPHUB, Gd. Karya Lt. 22 Jln Medan Merdeka Barat No.8, Jakarta, 10110 Indonesia	Tel: +62-21-350 6664 +62-21-3506665 Fax: +62-21-350 6663 E-mail: yugo_gona2001@yahoo.com
JAPAN		
Mr. Yoshiki Imawaka	Director for International Policy Coordination ATS Systems Planning Division Civil Aviation Bureau (JCAB) Ministry of Land, Infrastructure and Transport (MLIT) 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100 8918 Japan	Tel: +81-3-5255 8739 Fax: +81-3-5253 1663 E-mail: imawaka-y2ys@mlit.go.jp
Mr. Hiroshi Inoguchi	Special Assistant to the Director ATS Systems Planning Division JCAB, MLIT 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100 8918, Japan	Tel: +81-3-5255 8739 Fax: +81-3-5253 1663 E-mail: inoguchi-h2hh@mlit.go.jp

STATE/NAME	DESIGNATION/ADDRESS	TEL/FAX/E-MAIL
Ms. Keiko Tsukuda	Special Assistant to the Director ATC Division, ATS Department JCAB, MLIT 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100 8918 Japan	Tel: +81-3-5253 8749 Fax: +81-3-5253 1664 E-mail: tsukuda-k2eh@mlit.go.jp
Mr. Hiroshi Inamitsu	Special Assistant to the Director ATC Division, ATS Department JCAB, MLIT 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100 8918 Japan	Tel: +81-3-5253 8749 Fax: +81-3-5253 1664 E-mail: inamitsu-h2db@mlit.go.jp
Mr. Hiroyuki Nakano	Chief Operations Section ATC Division, ATS Department JCAB, MLIT 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100 8918 Japan	Tel: +81-3-5253 8749 Fax: +81-3-5253 1664 E-mail: nakano-h2rn@mlit.go.jp
Mr. Takashi Imuta	Airspace Safety Monitoring Section ATC Division, ATS Department JCAB, MLIT 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100 8918 Japan	Tel: +81-3-5253 8749 Fax: +81-3-5253 1664 E-mail: imuta-t2in@mlit.go.jp
Mr. Shigeo Kimura	Director for Engineering Planning Flight Standards Division Engineering Department JCAB, MLIT 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100 8918 Japan	Tel: +81-3-5253 8731 Fax: +81-3-5253 1661 E-mail: kimura-s2np@mlit.go.jp
Mr. Hideki Chiba	Airworthiness Engineer Airworthiness Division Engineering Department JCAB, MLIT 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100 8918 Japan	Tel: +81-3-5253 8735 Fax: +81-3-5253 1661 E-mail: chiba-h2sa@mlit.go.jp
Mr. Masakatsu Fujisaki	Flight Standards Division Engineering Department JCAB, MLIT 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100 8918 Japan	Tel: +81-3-5253 8731 Fax: +81-3-5253 1661 E-mail: fujisaki-m24a@mlit.go.jp
Mr. Takeshi Imoto	Airspace Manager Naha Area Control Center 334 Kaganji, Naha-City Okinawa 901 0142 Japan	Tel: +81-98-858-7235 Fax: +81-98-858-7419 E-mail: imoto-t04os@nacc.mlit.go.jp

STATE/NAME	DESIGNATION/ADDRESS	TEL/FAX/E-MAIL
Mr. Atsunori Suzuki	Air Traffic Controller Tokyo Area Control Center 12, Namiki 1-chome, Tokorozawa-shi, Saitame 359 0042 Japan	Tel: +81-4-2992-1317 Fax: +81-4-2992-1195 E-mail: suzuki-a036y@tacc.mlit.go.jp
Dr. Sakae Nagaoka	Group Leader Separation Minima Research Group Development Division Electronic Navigation Research Institute (ENRI) Japan	Tel: +81-422-41-3171 Fax: +81-422-41-3176 E-mail: nagaoka@enri.go.jp
Mr. Osamu Amai	Senior Researcher Separation Minima Research Group Development Division, ENRI Japan	Tel: +81-422-41-3171 Fax: +81-422-41-3176 E-mail: amai@enri.go.jp
Dr. Masato Fujita	Researcher Separation Minima Research Group Development Division, ENRI Japan	Tel: +81-422-41-3171 Fax: +81-422-41-3176 E-mail: m-fujita@enri.go.jp
Mr. Yoshiro Nakatsuji	Director Air Traffic Control Association Japan 1-6-6 Haneda-Airport, Ota-ku Tokyo 144-0041 Japan	Tel: +81-3-3747-1231 Fax: +81-3-374741-0856 E-mail: naka@atcaj.or.jp
REPUBLIC OF KOREA		
Mr. Kim, Geun Soo	Director ATS Planning Division Civil Aviation Safety Authority (CASA) Ministry of Construction and Transportation (MOCT) 274 Gwahae-dong, Gangseo-gu Seoul Republic of Korea, 157-711	Tel: +82-2-2662 5271 Fax: +82-2-6342 7289 E-mail: kimgs@moct.go.kr
Mr. Choi, Seung Yeon	Deputy Director ATS Planning Division CASA, MOCT 274 Gwahae-dong, Gangseo-gu Seoul Republic of Korea, 157-711	Tel: +82-2-2669 6427 Fax: +82-2-6342 7289 E-mail: SYLCHOI@moct.go.kr
Mr. Choi, Chul Young	Assistant Director Flight Standards Division CASA, MOCT 274 Gwahae-dong, Gangseo-gu Seoul Republic of Korea, 157-711	Tel: +82-2-2669 6474 Fax: +82-2-6342 7269 E-mail: cyoungc@moct.go.kr
Mr. Kim, Jeong Min	Assistant Director of ATS Planning Division CASA, MOCT 274 Gwahae-dong, Gangseo-gu Seoul Republic of Korea, 157-711	Tel: +82-2-2669 6422 Fax: +82-2-6342 7289 E-mail: kimida@moct.go.kr

STATE/NAME	DESIGNATION/ADDRESS	TEL/FAX/E-MAIL
Mr. Yang, Seon Hwan	Assistant Director of Airspace Division Air Traffic Control Center CASA, MOCT P.O. Box 26, Incheon Airport Woonseo-Dong, Joong-Gu Incheon City 400-650 Republic of Korea, 157-711	Tel: +82-32-880 0221 Fax: +82-32-880 2376 E-mail: goodsheep@moct.go.kr
Mr. Lee, Deuck Kyun	Assistant Director of ATC Division Air Traffic Control Center CASA, MOCT P.O. Box 26, Incheon Airport Woonseo-Dong, Joong-Gu Incheon City 400-650 Republic of Korea, 157-711	Tel: +82-32-880 0233 Fax: +82-32-889 2381 E-mail: dglee41@moct.go.kr
Mr. Kim, Do Hun	Manager, Korean Air 1370 Gonghang-dong, Gangseo-gu Seoul Republic of Korea	Tel: +82-2-2656 6273 Fax: +82-2-2656 6289 E-mail: dohun@koreanair.co.kr
Mrs. Bae, Eun Hyung	Assistant Manager, Asiana Airlines Asiana Town #47, Osae-Dong Kangseo-ku Seoul 157 600 Republic of Korea	Tel: +82-2-2669 3686 Fax: +82-2-2669 3530 E-mail: ehbae52m@flyasiana.com
SINGAPORE		
Mr. Sydney Maniam	Head (Air Traffic Services) Civil Aviation Authority of Singapore Singapore Aviation Academy 1 Aviation Drive Singapore 499867	Tel: +65-6540 6247 Fax: +65-6542 9890 E-mail: sydney.maniam@caas.gov.sg
THAILAND		
Mr. Nopadol Sangngurn	Executive Expert Aeronautical Radio of Thailand Ltd (AEROTHAI) 102 Soi Ngarmduplee Tungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-285 9054 Fax: +66-2-285 9488 E-mail: Nopadol@aerothai.co.th
Dr. Paisit Herabat	Executive Officer, Systems Engineering Air Traffic Services Planning Department AEROTHAI 102 Soi Ngarmduplee Tungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-285 9191 Fax: +66-2-285 9716 E-mail: paisit@aerothai.co.th
Mr. Nuttakajorn Yanpirat	Senior Systems Engineer Air Traffic services Planning Department AEROTHAI 102 Soi Ngarmduplee Thungmahamek, Sathorn Bangkok 10120 Thailand	Tel: +66-2-287 8268 Fax: +66-2-285 9716 E-mail: nuttakajorn.ya@aerothai.co.th

STATE/NAME	DESIGNATION/ADDRESS	TEL/FAX/E-MAIL
UNITED STATES		
Mr. Dale Livingston	Air Traffic Organization-Planning U.S. Federal Aviation Administration William J. Hughes Technical Center Atlantic City, NJ 08405 U.S.A.	Tel: +1-609 485 4163 Fax: +1-609 485 5117 E-mail: dale.livingston@faa.gov
Mr. Allan D. Storm	Civil/Military Aviation Issues Division Policy Board on Federal Aviation United States Air Force (USAF) 1535 Command Dr, Suite D/E Andrews Air Force Base, MD 20762 U.S.A.	Tel: +1-240 857 2146 Fax: +1-240 857 3194 E-mail: allan.storm@andrews.af.mil
Mr. Mike Bishop	5 AF Director of Aviation Affairs HQ 5th Air Force, USAF Unit 5087 Yokota Air Base Fussa-shi, Tokyo 197-0001 Japan	Tel: +81-42-552 2510 ext 54467 Fax: ext 55675 E-mail: michael.bishop@yokota.af.mil
Mr. Jeffrey Kawada	Major USFJ/J3 HQ 5th Air Force, USAF Unit 5087 Yokota Air Base Fussa-shi, Tokyo 197-0001 Japan	Tel: +81-42-552 2510 ext 52013 Fax: ext 55675 E-mail: jeffrey.kawada@usfj.mil
Mr. Art Griffenkranz	Aviation Affairs 5th Air Force, USAF Unit 5087 Yokota Air Base Fussa-shi, Tokyo 197-0001 Japan	Tel: +81-42-552 2510 ext 54516 Fax: ext 55675 E-mail: arthur.griffenkranz@yokota.af.mil
IATA		
Mr. Soon Boon Hai	Assistant Director – Safety, Operations & Infrastructure – Asia/Pacific International Air Transport Association 77 Robinson Road #05-00 SIA Building Singapore 068896	Tel: +65-6239 7267 Fax: +65-6536 6267 E-mail: soonbh@iata.org
Capt. Aric Oh	Deputy Chief Pilot (Technical) Flight Operations Technical SINGAPORE AIRLINES SIA Training Centre, 04-C 720 Upper Changi Road East Singapore 486852	Tel: +65-6540 3694 Fax: +65-6542 9564 E-mail: aric_oh@singaporeair.com.sg
Mr. Julian Fung	Assistant Manager – Route Development International Affairs Department CATHAY PACIFIC AIRWAYS 9/F Central Tower, Cathay Pacific City 8 Scenic Road Hong Kong International Airport Lantau, Hong Kong, China	Tel: +852 2747 3818 Fax: +852 2141 3818 E-mail: julian_fung@cathaypacific.com

STATE/NAME	DESIGNATION/ADDRESS	TEL/FAX/E-MAIL
Mr. Makoto Fujino	Manager, Flight Operations JAPAN AIRLINES INTERNATIONAL 3-3-2 Haneda Airport, Ota-ku Tokyo 144-0041 Japan	Tel: +81-3-5756 3134 Fax: +81-3-5756 3527 E-mail: makoto.fujino@jal.com
Mr. Toshifumi Sasaki	Manager, Flight Operations JAPAN AIRLINES INTERNATIONAL 3-3-2 Haneda Airport, Ota-ku Tokyo 144-0041 Japan	Tel: +81-3-5756 3133 Fax: +81-3-5756 3527 E-mail: toshifumi.sasaki@jal.com
Mr. Kazuo Nakata	Manager, Flight Dispatch Pacific Division NORTHWEST AIRLINES INC. P. O. Box 161, Narita Airport, Narita Chiba 282-0011 Japan	Tel: +81-476-32-7319 Fax: +81-476-32-7427 E-mail: kazuo.nakata@nwa.com
Mr. Masami Masumoto	Manager, Flight Standards All Nippon Airways Co., Ltd. (ANA) 3-3-2 Haneda Airport, Ota-ku Tokyo 144-0041 Japan	Tel: +81-3-5757 5317 Fax: +81-3-5757 5404 E-mail: masumoto@ana.co.jp
Mr. Teruo Ikeda	Assistant Manager, Flight Standards All Nippon Airways Co., Ltd. (ANA) 3-3-2 Haneda Airport, Ota-ku Tokyo 144-0041 Japan	Tel: +81-3-5757 5313 Fax: +81-3-5757 5404 E-mail: teru.ikeda@ana.co.jp
IFALPA		
Capt. Ng Kok Seong	IFALPA Representative c/o ALPA Singapore 47 Limau Grove Singapore 467841	Tel: +65-6444 9425 Fax: +65-6444 9425 E-mail: kokseong@singnet.com.sg
Capt. Koichi Sano	ALPA Japan 5-11-4 Phoenix Bldg. 2F Haneda, Ota-ku Tokyo 144-0043 Japan	Tel: +81-3-5705 2770 +81-45-845 2154 Fax: +81-3-5705 3274 +81-45-845 2154 E-mail: office@alpajapan.org sano-koichi@alpajapan.org
Mr. Tsutomu Mizozoe	First Officer c/o ALPA Japan 5-11-4 Phoenix Bldg. 2F Haneda, Ota-ku Tokyo 144-0043 Japan	Tel: +81-3-5705 2770 +81-45-790 5969 Fax: +81-3-5705 3264 +81-45-790 5969 E-mail: office@alpajapan.org mizozoe-tsutomu@alpajapan.org
IFATCA		
Mr. Koji Kato	IFATCA Representative	Tel: +81-423-9675 Fax: +81-423-9675 E-mail: koji358@infoseek.jp
ICAO		
Mr. Kyotaro Harano	Regional Officer, ATM ICAO Asia & Pacific Office P.O.Box 11 Samyaek Ladprao Bangkok – 10901 Thailand	Tel: +66-2-5378189 Fax: +66-2-5378199 E-mail: kharano@bangkok.icao.int

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

WORKING PAPERS

NUMBER	AGENDA	WORKING PAPERS	PRESENTED BY
WP/1	1	Provisional Agenda RVSM/TF/26	Chairperson
WP/2	1	Proposed Agenda for the ATC Operations Work Group (ATC/WG)	Co-Chairs of ATC/WG
WP/3	1	Proposed Agenda for the Aircraft Operations/Airworthiness Work Group (OPS/AIR/WG)	Chairperson of OPS/AIR/WG
WP/4	1	Proposed Agenda for the Safety and Airspace Monitoring Work Group (SAM/WG)	Chairperson of SAM/WG
WP/5	2	Approval of Amendment 4 to the PANS-ATM	Secretariat
WP/6	2	RVSM Switch Over Plan	Republic of Korea
WP/7	2	Trigger NOTAM	Secretariat
WP/8	2	Regularising Air Traffic Management at the A593/B576 Intersection	IATA
WP/9	2, 7	Review of the Twelfth Meeting of the South-East Asia ATS Coordination Group (SEACG/12)	Secretariat
WP/10	3, 4	Approval of Amendment 43 to Annex 11, Amendment 29 to Annex 6 Part I, Amendment 24 to Annex 6 Part II and Amendment 10 to Annex 6 Part III.	Secretariat
WP/11	3, 4	Introduction of the ICAO Regional Monitoring Agency Manual	Secretariat
WP/12	3, 4	Review of the Third Meeting of the Regional Airspace Safety Monitoring Advisory Group	Secretariat
WP/13	6	Task List for the Implementation of the Reduced Vertical Separation Minimum (RVSM) by Japan and Republic of Korea	Chairman
WP/14	8	Provision of FL230 on Eastbound Flights on A593	IATA
WP/15	4, 5	Airspace Safety Assessment Supporting the Go/No-go Decision for the RVSM Implementation in Japan and the Republic of Korea	MAAR
WP/16	2	Switchover Date and Time and Procedures for RVSM Implementation	Japan

INFORMATION PAPERS

NUMBER	AGENDA	INFORMATION PAPERS	PRESENTED BY
IP/1	-	List of Working Papers (WPs) and Information Papers (IPs)	Secretariat
IP/2	2	RVSM Readiness in the Incheon FIR	Republic of Korea
IP/3	2	Approval of Amendment APAC 05/1-ATS to the BANP – Establishment of the Fukuoka FIR	Secretariat
IP/4	3, 4	Future Direction of MAAR	MAAR
IP/5	4	Updated Asia RVSM Minimum Monitoring Requirements	MAAR
IP/6	2	Report of the Ninth North East Asia Traffic Management Meeting (NEAT9)	IFATCA
IP/7	2, 3, 4	RVSM Readiness in Japan	Japan
IP/8	4	Summary of RVSM Pre-implementation Safety Assessment in the Japanese Domestic Airspace	Japan

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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 on 29 September 2005 (Go/No Go Decision)
Agenda Item 6:	Review of Action Items
Agenda Item 7:	Future Work – Meeting Schedule
Agenda Item 8:	Other Business

AGENDA FOR THE ATC OPERATIONS WORK GROUP (ATC/WG)

Agenda Item 1: Review the Terms of Reference in preparedness for RVSM implementation

Agenda Item 2: Review the preparedness of States ahead of RVSM implementation, including:

a) Planning of ATC workload and training requirements
b) AIS including status of AIP SUP
c) Safety assessments to support implementation

Agenda Item 3: Review the transition arrangements between States, including:

a) Confirmation of transition areas
b) Vertical transition procedures for RVSM and CVSM airspace

Agenda Item 4: Review the operational plan, operational readiness and related procedures, including:

a) Wake turbulence and Lateral offsets
b) Non-compliant operations and procedures for suspension of RVSM
c) Large Height Deviation (LHD) reporting arrangements

Agenda Item 5: Review RVSM operational implementation plan, including:

a) Cutover time-frame
b) Flight Planning
c) Traffic Management
d) Trigger NOTAM

Agenda Item 6: Review status of Letters of Agreement between adjoining FIRs

Agenda Item 7: Review of assigned action items under RVSM Task List

Agenda Item 8: Any other matters relating to the operational plan for RVSM implementation in the Incheon, Naha and Tokyo FIRs

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AGENDA FOR THE AIRCRAFT OPERATIONS/AIRWORTHINESS WORK GROUP (OPS/AIR/WG)

Agenda Item 1: Review of OPS/AIR Proposed Agenda

Agenda Item 2: Review of Readiness Assessment of Implementation

a) State Authority Readiness Reporting
b) Airlines Approved Status (Airworthiness & Operational Approved)
c) Review State Authority and Operator Implementation of ACAS II

Agenda Item 3: Review of Aircraft Height-Keeping Performance Monitoring Program

a) Minimum Monitoring Requirement (MMR)
b) Operational Large Height Deviations
c) Large Scale Weather Deviations

Agenda Item 4: Review RVSM Approval Process and Procedures

a) Airworthiness and Operational Process
b) Approval Record and Withdrawal (MAAR Forms F2 and F3)
c) In flight Contingency Procedures

Agenda Item 5: Review Task List OPS/AIR

Agenda Item 6: Future OPS/AIR Work Program

a) Long Term Monitoring Requirement Issue
b) Expansion of RVSM Flight Level

Agenda Item 7: Report to ICAO RVSM Task Force

AGENDA FOR THE SAFETY AND AIRSPACE MONITORING WORK GROUP (SAM/WG)

Agenda Item 1: Complete the Tokyo, Naha and Inchoen FIRs Readiness Assessment

Agenda Item 2: Review the monitoring requirements for Tokyo, Naha and Inchoen FIRs

Agenda Item 3: Complete the Tokyo, Naha and Inchoen FIRs Safety Assessment

Agenda Item 4: Review the RVSM TF Task List for the Tokyo, Naha and Inchoen FIRs

Agenda Item 5: Future SAM Work Program

Agenda Item 6: Any Other Business

RVSM Policy and Procedures in the Incheon FIR

1. Introduction

1.1. The International Civil Aviation Organization (ICAO) Third Asia/Pacific Regional Air Navigation Meeting (RAN/3) recommended that Reduced Vertical Separation Minimum (RVSM) should be introduced in the Asia and Pacific region. This is due to the significant benefits to be gained by aircraft operators and air traffic services (ATS) providers. ICAO Document 9574, *Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum between FL 290 and FL 410 Inclusive* contains an explanation of RVSM.

1.2. Benefits to be gained from RVSM include:

(a) adoption of an ICAO endorsed navigation requirement;

(b) improved utilization of airspace for ATC conflict resolution;

(c) fuel savings of 1% for flight closer to optimum cruise altitude; and

(d) reduction in ground delays.

1.3. CONTENT. The ICAO Asia/Pacific RVSM Task Force has harmonized the basic content of this document. The following policies are addressed in the paragraphs of this document:

2.0 Identification of RVSM Airspace
3.0 Airworthiness and Operational Approval and Monitoring
4.0 ACAS II and Transponder Equipage
5.0 In-flight Procedures within RVSM Airspace
6.0 Transition Areas
7.0 Flight Planning Requirements
8.0 Procedures for Operation of Non-RVSM Compliant Aircraft in RVSM Airspace
9.0 Delivery Flights for Aircraft that are RVSM Compliant on Delivery
10.0 Suspending the use of 300 m (1 000 ft) VSM in the affected area
11.0 Guidance for Pilot and Controller for Actions in Event of Aircraft System Malfunction or Turbulence Greater than Moderate
12.0 Procedures for Air-Ground Communication Failure

2. Identification of RVSM Airspace

2.1. Effective 29 September 2005, RVSM airspace is prescribed within the Incheon FIR within all ATS routes between FL 290 and FL 410 (inclusive) except the following ATS route segments:

(a) Between TENAS and KANSU on B467 ATS route

(b) Entire airway of B332 within the Incheon FIR

(c) Between LAMEN and SADLI on A593 ATS route

3. Airworthiness and Operational Approval and Monitoring

3.1. APPROVAL DATE. Operators must obtain operational approval from the State of Registry to conduct RVSM operations.

3.1.1. Operator/aircraft of national carriers shall submit the application for RVSM airspace operation to CASA by 25 days before flying within RVSM airspace.

3.2. APPROVAL PROCESS. (Source Document: FAA Interim Guidance (IG) 91-RVSM/JAA TGL #6) Operators must obtain airworthiness and operational approval from the State of Registry or State of the Operator, as appropriate, to conduct RVSM operations. On behalf of the ICAO Asia and Pacific Office, the FAA is maintaining a website (http://www.faa.gov/ats/ato/rvsm1.htm) containing documents and policy for RVSM approval.

3.3. AIRCRAFT MONITORING. (Source Document: IG 91-RVSM/TGL #6, Pacific Minimum Monitoring Requirements) Operators are required to participate in the RVSM aircraft monitoring program. This is an essential element of the RVSM implementation program in that it confirms that the aircraft altitude-keeping performance standard is being met. The PARMO/MARR will process the results of monitoring. For further information on RVSM monitoring, the PARMO web site can be accessed by accessing the "RVSM Documentation" section of the FAA RVSM website and clicking on the link to the PARMO/MAAR website.

3.3.1. Implementation of reduced vertical separation minimum (RVSM) shall be based on an airspace safety assessment. In order to conduct the airspace safety assessment prior to the implementation referred to ICAO Doc 9574, Large Height Deviation reports already started to collect from March 2004. Collection of those will be continued for the purpose of airspace safety monitoring after the completion of implementing RVSM. Information contained in the collected reports shall be used only for airspace safety assessment and safety monitoring.

3.3.1.1. Action to be taken by Pilots. Pilots of aircraft operating in accordance with IFR, when deviate for any reason, 300 feet or more from cleared by ATC unit between FL290 and FL410 inclusive within the RVSM airspace prescribed in paragraph 2.1 above shall submit reports using the Attachment A or radio to ATC unit on each occurrence of an altitude deviation. Such shall be submitted independently of "RA reports".

3.3.1.2. Aircraft operators involvement. CASA approval Operators shall collect all Large Height Deviation reports referred in paragraph 3.3.1.1 and dispatch them as soon as possible to the following address:

ATS Planning Division, Civil Aviation Safety Authority
Tel : +82-2-2669-6422
Fax : +82-2-6342-7289
Email: g_atmcasa@moct.go.kr

3.3.2. Monitoring accomplished for other regions can be used to fulfill the monitoring requirements for the Asia/Pacific region. The PARMO or MAAR will coordinate with other monitoring agencies to access this information.

3.3.2.1. For monitoring services in the Asia/Pacific region, operators should contact the PARMO/MAAR monitoring contractor as follows:

(a) PARMO:
Phone: +1 202 863 2175
Fax: +1 202 862 2398
Email: monitor@cssiinc.com

(b) MAAR:
Phone: +66-2-287-8154
Fax: +66-2-287-8155
Email: maar@aerothai.co.th

4. ACAS II and Transponder Equipage

4.1. The ICAO Asia/Pacific RVSM Implementation Task Force recommends that those aircraft equipped with ACAS and operated in RVSM airspace be equipped with ACAS II. (TCAS II systems with Version 7.0 incorporated meet ICAO ACAS II standards).

4.1.1. Operators must take action to inform themselves of ACAS II equipage requirements and plan for compliance. ICAO and individual States have established policies requiring ACAS II equipage and schedules for compliance. In addition, the APANPIRG has endorsed early ACAS II equipage in the region.

5. In-flight Procedures within RVSM Airspace

5.1. Before entering RVSM airspace, the pilot should review the status of required equipment (see Appendix 4 of FAA IG 91-RVSM for pilot RVSM procedures). The following equipment should be operating normally:

(a) two primary altimetry systems;

(b) one automatic altitude-keeping device;

(c) one altitude-alerting device; and

(d) one SSR altitude reporting transponder.

5.2. See Attachment B to this AIP Supplement or Appendix 5 of FAA IG 91-RVSM for pilot and controller actions in contingencies. The pilot must notify ATC whenever the aircraft:

(a) is no longer RVSM compliant due to equipment failure; or

(b) experiences loss of redundancy of altimetry systems; or

(c) encounters turbulence that affects the capability to maintain flight level.

5.2.1. In the event that ATC units are notified by the Pilot of any such condition, as described in paragraph 5.2, 2,000 feet (600m) vertical separation or proper lateral separation shall be applied in the Incheon FIR.

5.2.2. In the event of Non-Radar environment the contingency procedures prescribed Regional Supplement Procedures (ICAO SUPPS – Doc 7030 MID/ASIA/RAC-4) will be applied in the Incheon FIR.

5.3. TRANSITION BETWEEN FL's. During cleared transition between levels, the aircraft should not overshoot or undershoot the assigned FL by more than 150 ft (45 m).

5.4. PILOT LEVEL CALL. Except in radar environment, pilots shall report reaching any altitude assigned within RVSM airspace.

6. Transition Areas

6.1. Transition area, its FLOS and procedures for transition from RVSM to non-RVSM airspace within Incheon FIR are as follows:

6.1.1. RVSM transition area will be established on the following airway segments adjoining Shanghai and Pyeongyang FIR:

(a) A593 : SADLI to 10NM West of NIRAT (46 NM)

(b) B467 : INTOS to TENAS (20 NM)

(c) G597 : NOPIK to AGAVO (83 NM)

(d) Y64 : AGAVO to ARIVA (86 NM)

* All transition areas are within the VHF Radio and Radar coverage.

6.1.2. RVSM Transition areas and Procedures. Single Alternate FLOS will be used within Incheon FIR.

(a) Transition Area and FLOS: G597 (AGAVO ← NOPIK, 83NM)

AGAVO	180°□359°	NOPIK	Remarks
12,000m(FL394) 10,800m(FL354) 9,600m(FL315)	← ← ←	FL400 FL360 FL320	

(b) Transition Area and FLOS: Y64 (AGAVO → ARIVA, 86NM)

AGAVO	0°□179°	ARIVA	Remarks
12,600m(FL413) 11,400m(FL374) 10,200m(FL335) 9,000m(FL295)	→ → → →	FL410 FL370 FL330 FL290	

(c) Transition Area and FLOS: A593 (SADLI ↔ 10 NM West of NIRAT, 46NM)

SADLI	0°□179°	10NM West of NIRAT	Remarks
FL370 FL330 FL270*	→ → →	FL370 FL330 FL270*	* CVSM Level

SADLI	180°□359°	10NM West of NIRAT	Remarks
FL350 FL310 FL260*	← ← ←	**FL340** **FL320** FL260*	FL350 ← **FL340** FL310 ← **FL320** * CVSM Level

Note. These flight levels are applicable to aircraft operation on airway segment between SADLI-NIRAT-CJU and/or ATOTI-NIRAT-SADLI.

(d) Transition Area and FLOS: B467 (INTOS ↔ TENAS, 20NM)

INTOS	0°□179°	TENAS	Remarks
FL390 FL370 FL330 FL290	→ → → →	12,100m(FL397) 11,100m(FL364) 10,100m(FL331) 9,100m(FL299)	

INTOS	180°□359°	TENAS	Remarks
FL380 FL340 FL320	← ← ←	11,600m(FL381) 10,600m(FL348) 9,600m(FL315)	

(e) FLOS on B576/A586

ATOTI/RUGMA	0°□179°	CJU	Remarks
FL370 FL350 FL330 FL310 FL270*	→ → → → →	FL370 FL350 FL330 FL310 FL270*	* CVSM Level

ATOTI/RUGMA	180°□359°	CJU	Remarks
FL360 FL340 FL320 FL260*	← ← ← ←	FL360 FL340 FL320 FL260*	* CVSM Level

(f) FLOS on G203

PSN	0°□179°	KALEK	Remarks
FL410 FL390 FL370 FL350 FL330 FL310 FL290	→ → → → → → →	FL410 FL390 FL370 FL350 FL330 FL310 FL290	

PSN	180°□359°	KALEK	Remarks
FL380	←	FL380	
FL340	←	FL340	
FL300	←	FL300	

(g) FLOS on G339

PSN	0°□179°	INVOK	Remarks
FL410	→	FL410	
FL390	→	FL390	
FL370	→	FL370	
FL350	→	FL350	
FL330	→	FL330	
FL310	→	FL310	
FL290	→	FL290	

PSN	180°□359°	INVOK	Remarks
FL400	←	FL400	
FL360	←	FL360	
FL320	←	FL320	

(h) FLOS on A582

PSN	0°□179°	APELA	Remarks
FL410	→	FL410	
FL390	→	FL390	
FL370	→	FL370	
FL350	→	FL350	
FL330	→	FL330	
FL310	→	FL310	
FL290	→	FL290	

PSN	180°□359°	APELA	Remarks
FL380	←	FL380	
FL340	←	FL340	
FL300	←	FL300	

Note. Altitude assignment in RVSM Airspace not listed above will be applied in accordance with the LOA between the ACC concerned based on Single Alternate FLOS.

6.2. Within transition areas on G597/Y64/B467, aircraft transition will be made directly between RVSM level and metric level.

6.3. When transitioning between levels, the aircraft will not overshoot or undershoot the assigned FL by more than 150ft(45m).

6.4. 2,000 feet(600 m) vertical separation shall be applied between RVSM approval aircraft and Non-RVSM compliant aircraft operating within RVSM transition areas.

7. Flight Planning Requirements

7.1. Except Paragraph 8.4 and 8.5 below, RVSM approval is required for operators and aircraft to operate within designated RVSM airspace. The operator must determine that the appropriate State authority has granted them RVSM operational approval and they will meet the RVSM requirements for the filed route of flight and any planned alternate routes. The letter “W” shall be inserted in item 10 (Equipment) of the ICAO standard flight plan to indicate that both the aircraft and operator are RVSM approved.

7.2. All operators of RVSM approved aircraft shall also include the letter "W" in Item Q of the repetitive flight plan (RPL), regardless of the requested flight level. If a change of aircraft operated in accordance with a repetitive flight plan results in a modification of the RVSM approval status as stated in Item Q, a modification message (CHG) shall be submitted by the operator.

8. Procedures for Operation of Non-RVSM Compliant Aircraft in RVSM Airspace

8.1. FLIGHT PRIORITY. It should be noted that RVSM approved aircraft will be given priority for level allocation over non-RVSM approved aircraft.

8.2. VERTICAL SEPARATION APPLIED. The vertical separation minimum between non-RVSM aircraft operating in the RVSM stratum and all other aircraft is 2,000 ft.

8.3. PHRASEOLGY. Phraseologies to be used for RVSM operations are listed in Chapter 12 of the ICAO PANS-ATM. (Doc 4444)

8.4. CONTINUOUS CLIMB/DESCENT OF NON-COMPLIANT AIRCRAFT THROUGH RVSM AIRSPACE. Non-RVSM compliant aircraft may be cleared to climb to and operate above FL410 or descend to and operate below FL290 provided that they:

(a) Do not climb or descend at less than the normal rate for the aircraft and

(b) Do not level off at an intermediate level while passing through the RVSM stratum.

8.5. SPECIAL COORDINATION PROCEDURES FOR CRUISE OPERATION OF NON-RVSM COMPLIANT AIRCRAFT IN RVSM AIRSPACE. Non-RVSM compliant aircraft may not flight plan between FL290 and FL410 inclusive within RVSM airspace except for the following situations:

(a) The aircraft is being initially delivered to the State of Registry or Operator (see Paragraph 9 for additional details and information); or

(b) The aircraft was formally RVSM approved but has experienced an equipment failure and is being flown to a maintenance facility for repair in order to meet RVSM requirements and/or obtain approval; or

(c) The aircraft is transporting a spare engine mounted under the wing; or

(d) The aircraft is being utilized for mercy or humanitarian purposes; or

(e) State aircraft (those aircraft used in military, custom and police services shall be deemed state aircraft)

Note: These procedures are intended exclusively for the purposes indicated above and not as a means to circumvent the normal RVSM approval process.

8.5.1. The assignment of cruising levels to non-RVSM compliant aircraft listed in paragraph 8.5 (a) to (e) shall be subject to an ATC clearance. But, In case of the aircraft listed in paragraph 8.5 (e), LOA or practical procedures between Incheon ACC and facilities concerned will be applied.

8.5.1.1. Aircraft operators of non-RVSM compliant Aircraft listed in paragraph 8.5 (a) to (e) shall include the "STS/APVD NONRVSM" in Field 18 of the ICAO Flight Plan. The pilot must use the phraseology including “NEGATIVE RVSM” when requesting IFR Clearance, ATC facilities concerned shall notify this information to Incheon ACC.

8.5.2. When necessary, the Air Traffic Control Center may be contacted as follows:

Incheon Area Control Center –
Telephone: 82-32-880-0260
AFTN: RKRRZQZX, RKRRYFYX
FAX: 82-32-889-5906
E-mail: aisd@moct.go.kr

9. Delivery Flights for Aircraft that are RVSM Compliant on Delivery

9.1. An aircraft that is RVSM compliant on delivery may operate in RVSM airspace provided that the crew is trained on RVSM policies and procedures applicable in the airspace and the responsible State issues the operator a letter of authorization approving the operation. State notification to the PARMO should be in the form of a letter, e-mail or fax documenting the one-time flight. The planned date of the flight, flight identification, registration number and aircraft type/series should be included.

10. Suspending the use of 300 m(1 000 ft) VSM in the affected area

10.1. Air traffic services will consider suspending the use of 300 m (1 000 ft) VSM in the affected areas of the Incheon FIR when there are pilot reports of greater than moderate turbulence. Within areas where RVSM procedures are suspended, the vertical separation minimum between all aircraft will be 2,000ft.

11. Guidance for Pilots and Controllers for Actions in the Event of Aircraft System Malfunction or Turbulence Greater than Moderate

11.1. See Attachment B for guidance in these circumstances.

12. Procedures for Air-Ground Communication Failure

12.1. The air-ground communication failure procedures specified in ICAO PANS-ATM Doc 4444 should be applied.

Attachment A

Report of an Altitude Deviation of 300 ft or More Between FL 290 and FL 410 **[FL290 FL410 (300)]**	
Reporting agency (□□□□)	
Location of deviation (□□□□)	
Date of occurrence (UTC) (□□□□ (UTC))	
Flight identification and type (□□□□/□□)	
Flight level assigned (□□□□)	
Observed/reported final level Mode C/Pilot report (Mode C □□□□/□□□ □□ □□□□)	
Duration at flight level (□□□□ □□ □□/□□)	
Cause of deviation (□□□□)	
Other traffic (□□ □□□□)	
Crew comments, if any, when noted (□□ □□□ □□)	
Remarks (□□)	

Report to CASA when an altitude deviation of 300 feet or more, including those due to TCAS, turbulence and contingency events. Report to following address:
(TCAS, □□ □ □□□□ □□□ □□ 300 □□ □□ □□□□ □□□□□ □ □□□ □□□□ □□ □□□□ □□□□ □□□□.)

ATS Planning Division, Civil Aviation Safety Authority
□□□□□□ □□□□□

Tel : +82-2-2669-6422
Fax : +82-2-6342-7289
Email: g_atmcasa@moct.go.kr

ATTACHMENT B

CONTINGENCY SCENARIOS. The following paragraphs summarize pilot actions to mitigate the potential for conflict with other aircraft in certain contingency situations.

***Scenario 1: All automatic altitude control systems fail (e.g., Automatic Altitude Hold).**

The Pilot should	**ATC can be expected to**
Initially	
Maintain Cleared Flight Level(CFL)	
Evaluate the aircraft's capability to maintain altitude through manual control.	
Subsequently	
Watch for conflicting traffic both visually and by reference to ACAS, if equipped.	
If considered necessary, alert nearby aircraft by 1) making maximum use of exterior lights; 2) broadcasting position, FL, and intentions on 121.5MHz (as a back-up, the VHF inter-pilot air-to-air frequency, 123.45MHz, may be used.)	
Notify ATC of the failure and intended course of action. Possible courses of action include:	Obtain pilots intentions, and pass essential traffic information.
1) maintaining the CFL and route, provided that the aircraft can maintain level.	1) If the pilot intends to continue in RVSM airspace, assess traffic situation to determine if the aircraft can be accommodated through the provision of lateral, longitudinal, or conventional vertical separation, and if so, apply the appropriate minimum.
2) requesting ATC clearance to climb above or descend below RVSM airspace if the aircraft cannot maintain CFL and ATC cannot establish lateral, longitudinal or conventional vertical separation.	2) If the pilot requests clearance to exit RVSM airspace, accommodate expeditiously, if possible.
	3) Notify adjoining ATC facilities/ sectors of the situation.

***Scenario 2: Loss of redundancy in primary altimetry systems**

The Pilot should	**ATC can be expected to**
If the remaining altimetry system is functioning normally, couple that system to the automatic altitude control system, notify ATC of the loss of redundancy and maintain vigilance of altitude keeping. If unable to confirm primary altimeter system accuracy, follow pilot actions listed in the Scenario 3.	Acknowledge the situation and continue to monitor progress

Scenario 3: All primary altimetry systems are considered unreliable or fail

The Pilot should	ATC can be expected to
Maintain CFL by reference to the standby altimeter (if the aircraft is so equipped).	
Alert nearby aircraft by 1) making maximum use of exterior lights; 2) broadcasting position, FL, and intentions on 121.5 MHz (as a back-up, the VHF inter-pilot air-to-air frequency, 123.45MHz, may be used).	
Consider declaring an emergency. Notify ATC of the failure and intended course of action. Possible courses of action include:	Obtain pilot's intentions, and pass essential traffic information.
1) maintaining CFL and route provided that ATC can provide lateral, longitudinal or conventional vertical separation.	1) If the pilot intends to continue in RVSM airspace, assess traffic situation to determine if the aircraft can be accommodated through the provision of lateral, longitudinal, or conventional vertical separation, and if so, apply the appropriate minimum.
2) requesting ATC clearance to climb above or descend below RVSM airspace if ATC cannot establish adequate separation from other aircraft.	2) If the pilot requests clearance to exit RVSM airspace, accommodate expeditiously, if possible.
	3) Notify adjoining ATC facilities/sectors of the situation.

Scenario 4: The primary altimeters diverge by more than 200ft (60m)

The Pilot should
Attempt to determine the defective system through established trouble-shooting procedures and/or comparing the primary altimeter displace to the standby altimeter (as corrected by the correction cards, if required).
If the defective system can be determined, couple the functioning altimeter system to the altitude-keeping device.
If the defective system cannot be determined, follow the guidance in Scenario 3 for failure or unreliable altimeter indications of all primary altimeters.

***Scenario 5: Turbulence (greater than moderate) which the pilot believes will impact the aircraft's capability to maintain flight level.**

The Pilot should	**ATC can be expected to**
Watch for conflicting traffic both visually and by reference to ACAS, if equipped.	
1) If considered necessary, alert nearby aircraft by: making maximum use of exterior lights; 2) broadcasting position, FL, and intentions on 121.5 MHz (as a back-up, the VHF inter-pilot air-to-air frequency, 123.45MHz, may be used).	
Notify ATC of intended course of action as soon as possible. Possible courses of action include:	
1) maintaining CFL and route provided ATC can provide lateral, longitudinal or conventional vertical separation.	1) Assess traffic situation to determine if the aircraft can be accommodated through the provision of lateral, longitudinal, or conventional vertical separation, and if so, apply the appropriate minimum.
2) requesting flight level change, if necessary.	2) If unable to provide adequate separation, advise the pilot of essential traffic information and request pilot's intentions.
	3) Notify adjoining ATC facilities/ sectors of the situation.

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Tel.: +1 (514) 954-8219 ext. 6711

Ref.: AN 13/2.1-05/51

29 April 2005

Subject: Approval of Amendment 4 to the PANS-ATM

Action required: a) Implementation of the amendment on 24 November 2005; b) Publication of any differences as of 24 November 2005

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission, acting under delegated authority, at the sixth meeting of its 168th Session, on 15 February 2005, approved Amendment 4 to the *Procedures for Air Navigation Services — Air Traffic Management*, Fourteenth Edition (PANS-ATM, Doc 4444) for applicability on 24 November 2005. The amendment was approved on 31 March 2005 by the President of the Council on behalf of the Council in accordance with established procedure.

2. Amendment 4 stems from studies by the Secretariat with a view to updating current provisions to reflect technical advancements and evolving practices in States. The subjects are given in the amendment to the Foreword of the PANS-ATM, a copy of which is in the Attachment.

3. The nature and scope of the amendment to PANS-ATM are as follows:

a) an amendment has been made that allows for the use of vertical speed control between aircraft entering or established in the same holding pattern. This change was made to resolve an ambiguity between two paragraphs in the PANS-ATM;

b) flight crews are required to use true Mach number in airspace where the Mach number technique (MNT) is applied in the provision of longitudinal separation between aircraft. In some older aircraft and business jets, a correction needs to be applied to the displayed (indicated) Mach number. A change has been made in Chapter 5 to ensure that the true Mach number is used;

c) an amendment has been made to ensure that adequate obstacle clearance will exist when clearance is given by a radar controller to aircraft for a direct routing;

999 University Street
Montréal, Quebec
Canada H3C 5H7

Tel.: +1 (514) 954-8219
Fax: +1 (514) 954-6077

E-mail: icaohq@icao.int
Sitatex: YULCAYA

d) the provisions regarding distress and urgency messages have been aligned with Annex 10 — *Aeronautical Telecommunications*, Volume II — *Communication Procedures including those with PANS status*;

e) in order to avoid duplication in Annex 3 — *Meteorological Service for International Air Navigation* and the PANS-ATM, as well as any future risk of misalignment of provisions in these documents, provisions were deleted from the PANS-ATM. Only the basic requirements for meteorological information that air traffic services should provide to aircraft are now retained;

f) as part of a comprehensive effort to improve runway safety, the phraseology "TAXI TO HOLDING POSITION" has been changed to "TAXI TO HOLDING POINT" in the PANS-ATM, in order to avoid confusion with the non-ICAO phraseology "TAXI INTO POSITION AND HOLD" which continues to be used by some States and many pilots worldwide. As the "holding point" referred to in the revised phraseology is synonymous with "runway holding position" as used in Annex 14 — *Aerodromes*, a note has been added to the definition of "runway holding position" in Annex 2 — *Rules of the Air*, Annex 14 and the PANS-ATM to highlight the fact that, when used in radiotelephony phraseology, "runway holding point" refers to "runway holding position";

g) provisions for read-back of clearances and other safety-related information have been harmonized with those in Annex 11 — *Air Traffic Services*;

h) to be consistent with the provisions concerning the use of conditional clearances, applicable phraseologies have been aligned and additional editorial amendments have been made for clarity and consistency in Chapter 12;

i) editorial and/or consequential changes have been made throughout the document to harmonize the meteorological terminology to that used in Annex 3;

j) an amendment has been made to unify global and regional communications failure and in-flight contingency procedures, taking advantage of new technologies and current knowledge in the application of these procedures. Simplifying the procedures and securing the highest practical degree of harmonization will facilitate operations and improve the safety of air navigation;

k) in order to enhance the efficiency and safety of runway operations, an amendment has been made which specifies specific procedures for implementation of reduced runway separation minima and the circumstances under which such minima can be applied for global applicability;

l) an amendment has been made to include procedures for the use of strategic lateral offsets in oceanic and remote continental airspace, as a safety measure to reduce the risk of collision in the event of loss of vertical separation. These procedures were designed to include offsets to mitigate the effects of wake turbulence of preceding aircraft. Strategic lateral offset procedures should be implemented on a regional basis after coordination among all States involved; and

m) the opportunity was also taken to clarify precisely when the pilot of an arriving or taxiing aircraft shall report that the runway has been vacated.

4. Copies of the interim edition of the amendment are being sent to you under separate cover. The interim edition contains the text as it was approved by the Council and is being sent to you pending the issue of the replacement pages for the PANS-ATM in which the amendment will be incorporated. The replacement pages are expected to be forwarded to you in August 2005.

5. In accordance with the decision of the 26th Session of the Assembly, I would like to bring to your attention the Organization's long-standing practice of providing documentation to States upon request. Accordingly, the relevant working papers on Amendment 4 to the PANS-ATM and corresponding minutes of the Air Navigation Commission proceedings can be made available. In light of the costs involved, however, only one copy of such documents will normally be provided.

6. Your Government is invited by the Council to implement the provisions of PANS-ATM as amended. In this connection, I draw your attention to the decision taken by the Council, on 1 October 1973, to discontinue the publication of differences in Supplements to the PANS documents and, instead, to request States to publish up-to-date lists of significant differences from PANS documents in their Aeronautical Information Publications.

7. May I, therefore, invite your Government to publish in your Aeronautical Information Publication a list of any significant differences which will exist on 24 November 2005 between the amended provisions of PANS-ATM and your national regulations and practices.

Accept, Sir/Madam, the assurances of my highest consideration.

Taïeb Chérif
Secretary General

Enclosure:
Amendment to the Foreword of the PANS-ATM

Under separate cover:
Interim edition of Amendment 4 to the PANS-ATM

AMENDMENT TO THE FOREWORD OF THE PANS-ATM, FOURTEENTH EDITION

Add the following at the end of Table A:

Amendment	***Source(s)***	***Subject***	***Approved Applicable***
4	Secretariat	Definitions; meteorological information; special procedures for in-flight contingencies in oceanic airspace; reduced runway separation minima; air-ground communications failure procedures; phraseologies for use on and in the vicinity of the aerodrome.	31 March 2005 24 November 2005

—END —

AMENDMENT No. 4

TO THE

PROCEDURES FOR AIR NAVIGATION SERVICES

AIR TRAFFIC MANAGEMENT

(Doc 4444)

INTERIM EDITION

The text of Amendment No. 4 to the PANS-ATM (Doc 4444) was approved by the President of the Council of ICAO on behalf of the Council on **31 March 2005** for applicability on **24 November 2005**. This interim edition is distributed to facilitate implementation of the amendment by States. Replacement pages incorporating Amendment No. 4 are expected to be distributed in August 2005.

MARCH 2005

INTERNATIONAL CIVIL AVIATION ORGANIZATION

NOTES ON THE PRESENTATION OF AMENDMENT 4 TO THE PANS-ATM

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

1. ~~Text to be deleted is shown with a line through it.~~	text to be deleted
2. New text to be inserted is highlighted with grey shading.	new text to be inserted
3. ~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	new text to replace existing text

TEXT OF AMENDMENT 4 TO THE *PROCEDURES FOR AIR NAVIGATION SERVICES — AIR TRAFFIC MANAGEMENT* (PANS-ATM, Doc 4444)

FOREWORD

. . .

2. Scope and purpose

. . .

Note 2.— The objectives of the air traffic control service as prescribed in Annex 11 do not include prevention of collision with terrain. The procedures prescribed in this document do not ~~therefore~~ relieve pilots of their responsibility to ensure that any clearances issued by air traffic control units are safe in this respect;. ~~except when~~ When an IFR flight is vectored by radar or is given a direct routing which takes the aircraft off an ATS route, the procedures in ~~. See~~ Chapter 8, 8.6.5.2 apply.

CHAPTER 1. DEFINITIONS

. . .

~~***Aerodrome taxi circuit.*** The specified path of aircraft on the manoeuvring area during specific wind conditions.~~

. . .

~~***Aeronautical telecommunication service.*** A telecommunication service provided for any aeronautical purpose.~~

. . .

~~***Air-ground control radio station.*** An aeronautical telecommunication station having primary responsibility for handling communications pertaining to the operation and control of aircraft in a given area.~~

. . .

~~***Approach funnel.*** A specified airspace around a nominal approach path within which an aircraft approaching to land is considered to be making a normal approach.~~

. . .

~~***D-value.*** The amount (positive or negative) by which the altitude (Z) of a point on an isobaric surface differs from the altitude (Zp) of the same isobaric surface in the ICAO Standard Atmosphere (i.e. D-value = Z - Zp).~~

. . .

Expected approach time. The time at which ATC expects that an arriving aircraft, following a delay, will leave the holding ~~point~~ fix to complete its approach for a landing.

Note.— The actual time of leaving the holding ~~point~~fix will depend upon the approach clearance.

. . .

~~***Flight status.*** An indication of whether a given aircraft requires special handling by air traffic services units or not.~~

. . .

~~***Ground-to-air communication.*** One-way communication from stations or locations on the surface of the earth to aircraft.~~

. . .

Holding point fix. ~~A specified location, identified by visual or other means, in the vicinity of which the position of an aircraft in flight is maintained in accordance with air traffic control clearances.~~ A geographical location that serves as a reference for a holding procedure.

. . .

Instrument meteorological conditions (IMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minima specified for visual meteorological conditions.

Note 1.— The specified minima for visual meteorological conditions are contained in ~~Chapter 4~~ Chapter 3 of Annex 2.

. . .

Runway-holding position. A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/MLS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorized by the aerodrome control tower.

Note.— In radiotelephony phraseologies, the expression "holding point" is used to designate the runway-holding position.

~~***Signal area.*** An area on an aerodrome used for the display of ground signals.~~

. . .

CHAPTER 4. GENERAL PROVISIONS FOR AIR TRAFFIC SERVICES

. . .

4.5 AIR TRAFFIC CONTROL CLEARANCES

. . .

4.5.7 Description of air traffic control clearances

. . .

4.5.7.5.1 The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. The following items shall always be read back:

. . .

b) clearances and instructions to enter, land on, take off ~~on~~ from, hold short of, cross, taxi and backtrack on any runway; and

. . .

4.7.1.1 In order to facilitate a safe and orderly flow of traffic, aircraft may be instructed to adjust rate of climb or rate of descent. Vertical speed control may be applied between two climbing aircraft or two descending aircraft in order to establish or maintain a specific vertical separation minimum.

~~4.7.1.2 Vertical speed control shall not be applied between aircraft entering or established in a holding pattern.~~

Editorial Note.— Subsequent paragraphs will be renumbered accordingly.

. . .

4.10.3.2 ATC units shall, when circumstances warrant it, determine the lowest usable flight level or levels for the whole or parts of the control area for which they are responsible, and use it when assigning flight levels and pass it to pilots on request.

. . .

Note 3.— The objectives of the air traffic control service as prescribed in Annex 11 do not include prevention of collision with terrain. The procedures prescribed in this document do not ~~therefore~~ relieve pilots of their responsibility to ensure that any clearances issued by air traffic control units are safe in this respect;. ~~except when~~ When an IFR flight is vectored by radar or is given a direct routing which takes the aircraft off an ATS route, the procedures in . ~~See~~ Chapter 8, 8.6.5.2 apply.

. . .

CHAPTER 5. SEPARATION METHODS AND MINIMA

. . .

5.3.3 Assignment of cruising levels for controlled flights

. . .

5.3.3.5 An aircraft may be cleared to change cruising level at a specified time, place or rate.

Note.— See Chapter ~~4, Section 4.7~~,5, 5.3.4.1.1 concerning procedures for vertical speed control.

5.3.4 Vertical separation during climb or descent

. . .

5.3.4.1.1 When the aircraft concerned are entering or established in the same holding pattern, consideration shall be given to aircraft descending at markedly different rates and, if necessary, additional measures such as specifying a maximum descent rate for the higher aircraft and a minimum descent rate for the lower aircraft, should be applied to ensure that the required separation is maintained.

5.4.2 Longitudinal separation

5.4.2.1 LONGITUDINAL SEPARATION APPLICATION

5.4.2.1.1 Longitudinal separation shall be applied so that the spacing between the estimated positions of the aircraft being separated is never less than a prescribed minimum. Longitudinal separation between aircraft following the same or diverging tracks may be maintained by application of speed control, including the Mach number technique. When applicable, use of the Mach number technique shall be prescribed on the basis of a regional air navigation agreement.

Note 1.— Attention is drawn to the guidance material contained in the Air Traffic Services Planning Manual *(Doc 9426) regarding the application of the Mach number technique to separation of subsonic aircraft.*

Note 2.— The Mach number technique is applied using true Mach number.

. . .

5.4.2.4.1 Turbojet aircraft shall adhere to the true Mach number approved by ATC and shall request ATC approval before making any changes thereto. If it is essential to make an immediate temporary change in the Mach number (e.g. due to turbulence), ATC shall be notified as soon as possible that such a change has been made.

. . .

5.4.2.4.3 When the Mach number technique is applied and provided that:

a) the aircraft concerned have reported over the same reporting point and follow the same track or continuously diverging tracks until some other form of separation is provided; or

b) if the aircraft have not reported over the same reporting point and it is possible to ensure, by radar or other means, that the appropriate time interval will exist at the common point from which they either follow the same track or continuously diverging tracks;

minimum longitudinal separation between turbojet aircraft on the same track, whether in level, climbing or descending flight shall be:

1) 10 minutes; or

2) between 9 and 5 minutes inclusive, provided that:
the preceding aircraft is maintaining a true Mach number greater than the following aircraft in accordance with the following table:

. . .

5.4.2.4.4 When the 10-minute longitudinal separation minimum with Mach number technique is applied, the preceding aircraft shall maintain a true Mach number equal to or greater than that maintained by the following aircraft.

. . .

5.4.2.5.1 Turbojet aircraft shall adhere to the true Mach number approved by ATC and shall request ATC approval before making any changes thereto. If it is essential to make an immediate temporary change in the Mach number (e.g. due to turbulence), ATC shall be notified as soon as possible that such a change has been made.

. . .

5.4.2.5.6 When the 150 km (80 NM) longitudinal separation minimum with Mach number technique is applied, the preceding aircraft shall maintain a true Mach number equal to or greater than that maintained by the following aircraft.

. . .

5.9 CLEARANCES TO FLY MAINTAINING OWN SEPARATION WHILE IN VISUAL METEOROLOGICAL CONDITIONS

. . .

Note 3. — The objectives of the air traffic control service as prescribed in Annex 11 do not include prevention of collision with terrain. The procedures prescribed in this document do not ~~therefore~~ relieve pilots of their responsibility to ensure that any clearances issued by air traffic control units are safe in this respect;. ~~except when~~ When an IFR flight is vectored by radar or is given a direct routing which takes the aircraft off an ATS route, the procedures in ~~. See~~ Chapter 8, 8.6.5.2 apply.

CHAPTER 6. SEPARATION IN THE VICINITY OF AERODROMES

. . .

6.5.1.5 After coordination with the approach control unit, the ACC may clear the first arriving aircraft for approach rather than to a holding ~~point~~ fix.

. . .

6.5.3.2 Controllers shall exercise caution in initiating a visual approach when there is reason to believe that the flight crew concerned is not familiar with the aerodrome and its surrounding terrain. Controllers should also take into consideration the prevailing traffic and ~~weather~~ meteorological conditions when initiating visual approaches.

. . .

6.5.5.2 When delay is expected, the ACC shall normally be responsible for clearing aircraft to the holding ~~point~~ fix, and for including holding instructions, and expected approach time or onward clearance time, as applicable, in such clearances. (See Section 6.5.8.)

6.5.5.3 After coordination with the approach control unit, the ACC may clear an arriving aircraft to a visual holding ~~points~~ location to hold until further advised by the approach control unit.

6.5.5.4 After coordination with the aerodrome control tower, the approach control unit may clear an arriving aircraft to a visual holding ~~points~~ location to hold until further advised by the aerodrome control tower.

. . .

6.5.5.6 Aircraft should normally be held at a designated holding ~~point~~ fix. The required minimum vertical, lateral or longitudinal separation from other aircraft shall be provided. Criteria and procedures for the simultaneous use of adjacent holding patterns shall be prescribed in local instructions.

Note.— See Chapter 5, Section 5.5, concerning separation of aircraft holding in flight.

6.5.5.7 Levels at a holding ~~points~~ fix or visual holding location shall as far as practicable be assigned in a manner that will facilitate clearing each aircraft to approach in its proper priority. Normally, the first aircraft to arrive over a holding ~~point~~ fix or visual holding location should be at the lowest level, with following aircraft at successively higher levels.

. . .

6.5.6.2.2 INTERVAL BETWEEN SUCCESSIVE APPROACHES

In determining the time interval or longitudinal distance to be applied between successive approaching aircraft, the relative speeds between succeeding aircraft, the distance from the specified point to the runway, the need to apply wake turbulence separation, runway occupancy times, the prevailing ~~weather~~ meteorological conditions as well as any condition which may affect runway occupancy times shall be considered. When radar is used to establish an approach sequence, the minimum distance to be established between succeeding aircraft shall be specified in local instructions. Local instructions shall additionally specify the circumstances under which any increased longitudinal distance between approaches may be required as well as the minima to be used under such circumstances.

. . .

6.5.7.3 The holding ~~point~~ fix to which an expected approach time relates shall be identified together with the expected approach time whenever circumstances are such that this would not otherwise be evident to the pilot.

. . .

6.5.8 Onward clearance time

In the event an aircraft is held en route or at a location or aid other than the initial approach fix, the aircraft concerned shall, as soon as practicable, be given an expected onward clearance time from the holding ~~point~~ fix. The aircraft shall also be advised if further holding at a subsequent holding ~~points~~ fix is expected.

Note.— "Onward clearance time" is the time at which an aircraft can expect to leave the ~~point~~ fix at which it is being held.

. . .

6.6 INFORMATION FOR ARRIVING AIRCRAFT

. . .

6.6.4 At the commencement of final approach, the following information shall be transmitted to aircraft:

. . .

c) the current visibility representative of the direction of approach and landing or, when provided, the current runway visual range value(s) and the trend~~, if practicable, supplemented by slant visual range value(s), if possible~~.

. . .

6.7.3.2.7 All approaches regardless of ~~weather~~ meteorological conditions shall be radar-monitored. Control instructions and information necessary to ensure separation between aircraft and to ensure aircraft do not enter the NTZ shall be issued.

. . .

6.7.3.3 SUSPENSION OF INDEPENDENT PARALLEL APPROACHES TO CLOSELY-SPACED PARALLEL RUNWAYS

Independent parallel approaches to parallel runways spaced by less than 1 525 m between their centre lines shall be suspended under certain ~~weather~~ meteorological conditions, as prescribed by the appropriate ATS authority, including windshear, turbulence, downdrafts, crosswind and ~~severe weather~~ significant meteorological conditions such as thunderstorms, which might otherwise increase ILS localizer course and/or MLS final approach track deviations to the extent that safety may be impaired.

Note 1.— The increase in final approach track deviations would additionally result in an unacceptable level of deviation alerts being generated.

Note 2.— Guidance material relating to ~~weather~~ meteorological conditions is contained in the Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways *(Doc 9643).**

. . .

CHAPTER 7. PROCEDURES FOR AERODROME CONTROL SERVICE

. . .

7.2.2 Normally, an aircraft will land and take off into wind unless safety, the runway configuration, ~~weather~~ meteorological conditions and available instrument approach procedures or air traffic conditions determine that a different direction is preferable. In selecting the runway-in-use, however, the unit providing aerodrome control service shall take into consideration, besides surface wind speed and direction, other relevant factors such as the aerodrome traffic circuits, the length of runways, and the approach and landing aids available.

. . .

7.3.1.2.1 Prior to taxiing for take-off, aircraft shall be advised of the following elements of information, in the order listed, with the exception of such elements which it is known the aircraft has already received:

a) the runway to be used;

b) the surface wind direction and speed, including significant variations therefrom;

c) the QNH altimeter setting and, either on a regular basis in accordance with local arrangements or if so requested by the aircraft, the QFE altimeter setting;

. . .

7.5.3.1.2.2 If the control tower is unable to determine, either visually or by radar, that a vacating or crossing aircraft has cleared the runway, the aircraft shall be requested to report when it has vacated the runway. The report shall be made when the entire aircraft is ~~well clear of~~ beyond the relevant runway-holding position.

. . .

7.8 CONTROL OF DEPARTING AIRCRAFT

. . .

7.8.2 Separation of departing aircraft

Except as provided in ~~7.8.3~~ 7.10 and Chapter 5, Section 5.8, a departing aircraft will not normally be permitted to commence take-off until the preceding departing aircraft has crossed the end of the runway-in-use or has started a turn or until all preceding landing aircraft are clear of the runway in use.

. . .

Note 3.— See 7.5.3.1.2.2.

. . .

~~7.8.4~~7.8.3 Take-off clearance

~~7.8.4.1~~ 7.8.3.1 Take-off clearance may be issued to an aircraft when there is reasonable assurance that the separation in 7.8.2, or prescribed in accordance with ~~7.8.3,~~ 7.10, will exist when the aircraft commences take-off.

~~7.8.4.2~~ 7.8.3.2 When an ATC clearance is required prior to take-off, the take-off clearance shall not be issued until the ATC clearance has been transmitted to and acknowledged by the aircraft concerned. The ATC clearance shall be forwarded to the aerodrome control tower with the least possible delay after receipt of a request made by the tower or prior to such request if practicable.

~~7.8.4.3~~ 7.8.3.3 Subject to ~~7.8.4.2~~, 7.8.3.2, the take-off clearance shall be issued when the aircraft is ready for take-off and at or approaching the departure runway, and the traffic situation permits. To reduce the potential for misunderstanding, the take-off clearance shall include the designator of the departure runway.

~~7.8.4.4~~ 7.8.3.4 In the interest of expediting traffic, a clearance for immediate take-off may be issued to an aircraft before it enters the runway. On acceptance of such clearance the aircraft shall taxi out to the runway and take off in one continuous movement.

7.9 CONTROL OF ARRIVING AIRCRAFT

7.9.1 Separation of landing aircraft and preceding landing and departing aircraft using the same runway

Except as provided in ~~7.9.2~~ 7.10 and Chapter 5, Section 5.8, a landing aircraft will not normally be permitted to cross the runway threshold on its final approach until the preceding departing aircraft has crossed the end of the runway-in-use, or has started a turn, or until all preceding landing aircraft are clear of the runway-in-use.

Note 1.— See Figure 7-3.

Note 2.— Wake turbulence categories of aircraft and longitudinal separation minima are contained in Chapter 4, Section 4.9 and Chapter 5, Section 5.8, respectively.

Note 3.— See 7.5.3.1.2.2.

~~7.9.2 Reduction of separation minima~~

~~Provided an appropriate safety assessment has shown that an acceptable level of safety will be met, lower minima than those in 7.9.1 may be prescribed by the appropriate ATS authority, after consultation with users, and taking into consideration such factors as:~~

~~a) runway length;~~

~~b) aerodrome lay-out; and~~

~~c) types of aircraft involved.~~

~~Such lower minima shall not apply:~~

~~1) between sunset and sunrise, or such other period between sunset and sunrise as may be prescribed;~~

~~2) when braking action may be adversely affected by runway contaminants (e.g. slush, water, etc.);~~

~~3) in weather conditions preventing the pilot from making an early assessment of traffic conditions on the runway.~~

~~*Note.— See the* Air Traffic Services Planning Manual *(Doc 9426) for details of such lower minima developed by one State.*~~

~~7.9.3~~ 7.9.2 Clearance to land

An aircraft may be cleared to land when there is reasonable assurance that the separation in 7.9.1, or prescribed in accordance with ~~7.9.2,~~ 7.10 will exist when the aircraft crosses the runway threshold, provided that a clearance to land shall not be issued until a preceding landing aircraft has crossed the runway threshold. To reduce the potential for misunderstanding, the landing clearance shall include the designator of the landing runway.

~~7.9.4~~ 7.9.3 Landing and roll-out manoeuvres

~~7.9.4.1~~ 7.9.3.1 When necessary or desirable in order to expedite traffic, a landing aircraft may be requested to:

a) hold short of an intersecting runway after landing;

. . .

~~7.9.4.2~~ 7.9.3.2 In requesting a landing aircraft to perform a specific landing and/or roll-out manoeuvre, the type of aircraft, runway length, location of exit taxiways, reported braking action on runway and taxiway, and prevailing ~~weather~~ meteorological conditions shall be considered. A HEAVY aircraft shall not be requested to land beyond the touchdown zone of a runway.

~~7.9.4.3~~ 7.9.3.3 If the pilot-in-command considers that he or she is unable to comply with the requested operation, the controller shall be advised without delay.

~~7.9.4.4~~ 7.9.3.4 When necessary or desirable, e.g. due to low visibility conditions, a landing or a taxiing aircraft may be instructed to report when a runway has been vacated. The report shall be made when the entire aircraft is ~~well clear of~~ beyond the relevant runway-holding position.

~~7.8.3 Reduction of separation minima~~
7.10 REDUCED RUNWAY SEPARATION MINIMA BETWEEN AIRCRAFT USING THE SAME RUNWAY

7.10.1 Provided that an appropriate, documented safety assessment has shown that an acceptable level of safety ~~will~~can be met, lower minima than those in 7.8.2 and 7.9.1 may be prescribed by the appropriate

ATS authority, after consultation with the operators.~~, and~~ The safety assessment shall be carried out for each runway for which the reduced minima are intended, taking into account ~~such~~ factors such as:

a) runway length;

b) aerodrome layout; and

c) types/categories of aircraft involved.

~~Such lower minima shall not apply:~~

~~1) between a departing aircraft and a preceding landing aircraft;~~

~~2) between sunset and sunrise, or such other period between sunset and sunrise as may be prescribed;~~

~~3) when braking action may be adversely affected by runway contaminants (e.g. slush, water, etc.); and~~

~~4) in weather conditions preventing the pilot from making an early assessment of traffic conditions on the runway.~~

~~*Note.— See the* Air Traffic Services Planning Manual *(Doc 9426) for details of such lower minima developed by one State.*~~

Insert new text as follows:

7.10.2 All applicable procedures related to the application of reduced runway separation minima shall be published in the Aeronautical Information Publication as well as in local air traffic control instructions. Controllers shall be provided with appropriate and adequate training in the use of the procedures.

7.10.3 Reduced runway separation minima shall only be applied during the hours of daylight from 30 minutes after local sunrise to 30 minutes before local sunset.

7.10.4 For the purpose of reduced runway separation, aircraft shall be classified as follows:

a) *Category 1 aircraft:* single-engine propeller aircraft with a maximum certificated take-off mass of 2 000 kg or less;

b) *Category 2 aircraft:* single-engine propeller aircraft with a maximum certificated take-off mass of more than 2 000 kg but less than 7 000 kg; and twin-engine propeller aircraft with a maximum certificated take-off mass of less than 7 000 kg;

c) *Category 3 aircraft:* all other aircraft.

7.10.5 Reduced runway separation minima shall not apply between a departing aircraft and a preceding landing aircraft.

7.10.6 Reduced runway separation minima shall be subject to the following conditions:

a) wake turbulence separation minima shall be applied;

b) visibility shall be at least 5 km and ceiling shall not be lower than 300 m (1 000 ft);

c) tail wind component shall not exceed 5 kt;

d) there shall be available means, such as suitable landmarks, to assist the controller in assessing the distances between aircraft. A surface surveillance system that provides the air traffic controller with position information on aircraft may be utilized, provided that approval for operational use of such equipment includes a safety assessment to ensure that all requisite operational and performance requirements are met;

e) minimum separation continues to exist between two departing aircraft immediately after take-off of the second aircraft;

f) traffic information shall be provided to the flight crew of the succeeding aircraft concerned; and

g) the braking action shall not be adversely affected by runway contaminants such as ice, slush, snow, water, etc.

7.10.7 Reduced runway separation minima which may be applied at an aerodrome shall be determined for each separate runway. The separation to be applied shall in no case be less than the following minima:

a) landing aircraft:

1) a succeeding landing Category 1 aircraft may cross the runway threshold when the preceding aircraft is a Category 1 or 2 aircraft which either:

i) has landed and passed a point at least 600 m from the threshold of the runway, is in motion and will vacate the runway without backtracking; or

ii) is airborne and has passed a point at least 600 m from the threshold of the runway:

2) a succeeding landing Category 2 aircraft may cross the runway threshold when the preceding aircraft is a Category 1 or 2 aircraft which either:

i) has landed and has passed a point at least 1 500 m from the threshold of the runway, is in motion and will vacate the runway without backtracking; or

ii) is airborne and has passed a point at least 1 500 m from the threshold of the runway:

3) a succeeding landing aircraft may cross the runway threshold when a preceding Category 3 aircraft:

i) has landed and has passed a point at least 2 400 m from the threshold of the runway, is in motion and will vacate the runway without backtracking; or

ii) is airborne and has passed a point at least 2 400 m from the threshold of the runway.

b) departing aircraft:

1) a Category 1 aircraft may be cleared for take-off when the preceding departing aircraft is a Category 1 or 2 aircraft which is airborne and has passed a point at least 600 m from the position of the succeeding aircraft;

2) a Category 2 aircraft may be cleared for take-off when the preceding departing aircraft is a Category 1 or 2 aircraft which is airborne and has passed a point at least 1 500 m from the position of the succeeding aircraft; and

3) an aircraft may be cleared for take-off when a preceding departing Category 3 aircraft is airborne and has passed a point at least 2 400 m from the position of the succeeding aircraft.

7.10.7.1 Consideration should be given to increased separation between high performance single-engine aircraft and preceding Category 1 or 2 aircraft.

End of new text.

~~7.10~~ 7.11 PROCEDURES FOR LOW VISIBILITY OPERATIONS

~~7.10.1~~ 7.11.1 Control of aerodrome surface traffic in conditions of low visibility

Editorial Note.— Subsequent paragraphs will be renumbered accordingly.

. . .

~~7.13.2.1~~ 7.14.2.1 All aeronautical ground lights shall be operated, except as provided in ~~7.13.2.2~~ 7.14.2.2 and ~~7.13.3~~ 7.14.3:

a) continuously during the hours of darkness or during the time the centre of the sun's disc is more than 6 degrees below the horizon, whichever requires the longer period of operation, unless otherwise provided hereafter or otherwise required for the control of air traffic;

b) at any other time when their use, based on ~~weather~~ meteorological conditions, is considered desirable for the safety of air traffic.

Editorial Note.— Subsequent paragraphs will be renumbered accordingly.

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CHAPTER 8. RADAR SERVICES

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8.6 GENERAL RADAR PROCEDURES

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8.6.5 Radar vectoring

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8.6.5.1 Radar vectoring shall be achieved by issuing to the pilot specific headings which will enable the aircraft to maintain the desired track. When vectoring an aircraft, a radar controller should comply with the following:

. . .

d) controlled flights should not be vectored into uncontrolled airspace except in the case of emergency or in order to circumnavigate ~~severe~~ adverse ~~weather~~ meteorological conditions (in which case the pilot should be so informed), or at the specific request of the pilot; and

. . .

8.6.5.2 When vectoring an IFR flight and when giving an IFR flight a direct routing which takes the aircraft off an ATS route, the radar controller shall issue clearances such that the prescribed obstacle clearance will exist at all times until the aircraft reaches the point where the pilot will resume own navigation. When necessary, the minimum radar vectoring altitude shall include a correction for low temperature effect.

Note 1.— When an IFR flight is being vectored, the pilot ~~is often~~ may be unable to determine the aircraft's exact position in respect to obstacles in this area and consequently the altitude which provides the required obstacle clearance. Detailed obstacle clearance criteria are contained in PANS-OPS (Doc 8168), Volume I, Part VI, Chapter 3 (Altimeter Corrections) and Volume II, Part II, Departure Procedures, Part III, 24.2.2.3 (Procedures based on tactical vectoring), and Part VI (Obstacle Clearance Criteria for En-route).

. . .

8.6.10 Reporting of significant meteorological information to meteorological offices

Although a radar controller is not required to keep a special watch for ~~storm detection~~ heavy precipitation, etc., information on the position, intensity, extent and movement of significant ~~weather~~ meteorological conditions (i.e. ~~storms~~ heavy showers or well-defined frontal surfaces) as observed on radar displays, should, when practicable, be reported to the associated meteorological office.

. . .

8.7.3.9 Radar separation shall not be applied between aircraft holding over the same holding ~~point~~ fix. Application of radar separation between holding aircraft and other flights shall be subject to requirements and procedures prescribed by the appropriate ATS authority.

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CHAPTER 9. FLIGHT INFORMATION SERVICE AND ALERTING SERVICE

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9.1.3.5 TRANSMISSION OF ~~SPECIAL REPORTS IN THE~~ SPECI ~~CODE FORM AND AMENDED AERODROME FORECASTS~~ SPECI AND AMENDED TAF

9.1.3.5.1 Special reports in the SPECI code form and amended ~~aerodrome forecasts~~ TAF shall be transmitted on request and supplemented by:

a) directed transmission from the appropriate air traffic services unit of selected special reports and amended ~~aerodrome forecasts~~ TAF for the departure, destination and its alternate aerodromes, as listed in the flight plan; or

b) a general call on appropriate frequencies for the unacknowledged transmission to affected aircraft of selected special reports and amended ~~aerodrome forecasts~~ TAF; or

c) continuous or frequent broadcast or the use of data link to make available current ~~aerodrome reports and forecasts~~ METAR and TAF in areas determined on the basis of regional air navigation agreements where traffic congestion dictates. VOLMET broadcasts and/ or D-VOLMET should be used to serve this purpose (see Annex 11, 4.4).

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CHAPTER 10. COORDINATION

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10.4.1.3 Such agreements and instructions shall cover the following as relevant:

a) definition of areas of responsibility and common interest, airspace structure and airspace classification(s);

. . .

k) designated holding ~~points~~ fixes and procedures for arriving traffic;

. . .

10.4.2.2.4 When boundary estimate data are to be transmitted for approval by the accepting unit, the time in respect of an aircraft not yet departed shall be based upon the estimated time of departure as determined by the ATC unit in whose area of responsibility the departure aerodrome is located. In respect of an aircraft in flight requiring an initial clearance, the time shall be based on the estimated elapsed time from the holding ~~point~~ fix to the boundary plus the time expected to be needed for coordination.

. . .

10.4.3.3.1 The unit providing approach control service shall keep the ACC promptly advised of pertinent data on controlled traffic such as:

a) runway(s)-in-use and expected type of instrument approach procedure;

b) lowest vacant level at the holding ~~point~~ fix available for use by the ACC;

. . .

e) arrival times over the holding ~~point~~ fix when these vary by three minutes, or such other time as has been agreed between the two ATC units concerned, from those previously estimated;

f) cancellations by aircraft of IFR flight, if these will affect levels at the holding ~~point~~ fix or expected approach times of other aircraft;

. . .

10.4.3.3.2 The ACC shall keep the unit providing approach control service promptly advised of pertinent data on controlled traffic such as:

a) identification, type and point of departure of arriving aircraft;

b) estimated time and proposed level of arriving aircraft over holding ~~point~~ fix or actual time if aircraft is released to the unit providing approach control service after arrival over the holding ~~point~~ fix;

. . .

CHAPTER 11. AIR TRAFFIC SERVICES MESSAGES

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11.1.2 Emergency messages

This category comprises:

a) distress messages and distress traffic, including ~~alerting~~ messages relating to a distress phase (SS);

b) urgency messages, including ~~alerting~~ messages relating to an alert phase or to an uncertainty phase (~~SS~~DD);

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11.4 MESSAGE TYPES AND THEIR APPLICATION

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11.4.3 Flight information messages

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11.4.3.2 MESSAGES CONTAINING METEOROLOGICAL INFORMATION

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11.4.3.2.2 Meteorological information concerning the meteorological conditions at aerodromes, to be transmitted to aircraft by the ATS unit concerned, in accordance with Annex 11, Chapter 4 and this

document, Chapter 6, Sections 6.4 and 6.6 and Chapter 7, Section 7.3.1, shall be extracted by the ATS unit concerned from the following meteorological messages, provided by the appropriate meteorological office, supplemented for arriving and departing aircraft, as appropriate, by information from ~~indicators~~ displays relating to meteorological sensors (in particular, those related to the surface wind and runway visual range) located in the ATS units:

. . .

b) ~~meteorological reports in the~~ METAR/SPECI ~~code forms~~, for dissemination to other aerodromes beyond the aerodrome of origin (mainly intended for flight planning, VOLMET broadcasts and D-VOLMET).

11.4.3.2.3 The meteorological information referred to in 11.4.3.2.2 shall be extracted, as appropriate, from meteorological reports providing information ~~in accordance with the following~~ on the following elements:

~~11.4.3.2.3.1~~ a) ~~M~~ mean surface wind direction and speed and significant variations therefrom;

~~11.4.3.2.3.1.1 In meteorological reports, the direction shall be given in degrees true and the speed in km/h (kt). All directional and speed variations shall refer to the preceding 10-minute period. Directional variation shall be given when the total variation is 60 degrees or more; when the mean speed is above 6 km/h (3 kt) and the wind varies less than 180 degrees, it shall be expressed as the two extreme directions between which the wind has varied; otherwise, it shall be indicated as VRB, followed by the mean speed, with no indication of the mean wind direction. Speed variations (gusts) shall be reported only when the variation from the mean speed is 20 km/h (10 kt) or more.~~

Note.— Information on surface wind direction provided to ATS units by the associated meteorological office is referenced to degrees true North. Information on surface wind direction obtained from the ATS surface wind indicator and passed to pilots by ATS units is given in degrees magnetic.

~~11.4.3.2.3.1.2 In local meteorological routine and special reports:~~

~~a) the averaging period for mean surface wind direction and speed shall be 2 minutes;~~

~~b) speed variations shall be expressed as the maximum and minimum values attained;~~

~~c) light and variable surface winds of 6 km/h (3 kt) or less shall include a range of wind directions, whenever possible.~~

~~11.4.3.2.3.1.3 In meteorological reports disseminated beyond the aerodrome:~~

~~a) the averaging period for mean surface wind direction and speed shall be 10 minutes;~~

~~b) speed variations shall be expressed as the maximum value attained. Minimum wind speed shall not be included~~.

~~11.4.3.2.3.2~~ b) ~~V~~visibility, including significant directional variations;

~~11.4.3.2.3.2.1 When the visibility is less than 500 m, it shall be expressed in steps of 50 m; when it is 500 m or more but less than 5 000 m, in steps of 100 m; 5 000 m or more but less than 10 km, in kilometre steps;~~

and when it is 10 km or more, only 10 km shall be given, except when the conditions for the use of CAVOK apply.

11.4.3.2.3.2.2 In local meteorological routine and special reports, the visibility shall be representative of:

a) the take-off/climb-out area for departing aircraft;

b) the approach and landing area for arriving aircraft.

11.4.3.2.3.2.3 In meteorological reports disseminated beyond the aerodrome, the visibility shall be representative of the aerodrome and its immediate vicinity. In case of significant directional variations in visibility:

a) the lowest visibility shall be reported;

b) additional values shall be given with indications of the direction of observation.

11.4.3.2.3.3 c) R runway visual range (RVR);

11.4.3.2.3.3.1 Runway visual range values up to 400 m shall be given in increments of 25 m, values between 400 and 800 m in increments of 50 m, and values above 800 m shall be given in increments of 100 m. Runway visual range values which do not fit the reporting scale shall be rounded down to the nearest lower step in the reporting scale.

11.4.3.2.3.3.2 In local meteorological routine and special reports, the averaging period for RVR shall be 1 minute and:

a) when the runway visual range is above the maximum value which can be determined by the system in use, it shall be reported as more than the specified distance, e.g. RVR RWY 14 AB. 1 200M where the figure 1 200 is the maximum value that can be determined by the system;

or

when the runway visual range is below the minimum value which can be measured with the system in use, it shall be reported as less than the specified distance, e.g. RVR RWY 10 BLW 150M.

b) when the runway visual range is observed from one location along the runway about 300 m from the threshold, it shall be included without any indication of location, e.g. RVR RWY 20 600M;

or

when the runway visual range is observed from more than one location along the runway, the value for the touchdown zone shall be given first and shall be followed by the values representative of the mid-point and stop-end. The locations for which these values are representative shall be given in meteorological reports as TDZ, MID and END, e.g. RVR RWY 16 TDZ 600M MID 400M END 400M;

Note.— Where reports for three locations are given, the indication of these locations may be omitted, provided that the reports are passed in the order specified above, e.g. RVR RWY 16 600M 400M 400M.

c) when there is more than one runway in use, the available runway visual range values for each runway shall be given and the runways to which the values refer shall be indicated, e.g. RVR RWY 26 800M RVR RWY 20 700M; if the runway visual range is available only for one runway, that runway shall be indicated, e.g. RVR RWY 20 600M.

11.4.3.2.3.3.3 In meteorological reports disseminated beyond the aerodrome, the averaging period for RVR shall be 10 minutes and:

a) only the value representative of the touchdown zone shall be given, and no indication of location on the runway shall be included;

b) when there is more than one runway available for landing, touchdown zone runway visual range values shall be included for all such runways, up to a maximum of four, and the runways to which the values refer shall be indicated, e.g. RVR RWY 26 500M RVR RWY 20 800M;

c) when the runway visual range values during the 10-minute period immediately preceding the observation have shown a distinct tendency, such that the mean during the first 5 minutes varies by 100 m or more from the mean during the second 5 minutes of the period, this shall be indicated by the abbreviation "U" for an upward tendency and by the abbreviation "D" for the downward tendency, e.g. RVR RWY 12 300M/D;

d) when the fluctuations of the runway visual range during the 10-minute period immediately preceding the observation have shown no distinct tendency, this shall be indicated by the abbreviation "N";

e) when the one-minute runway visual range values during the 10-minute period immediately preceding the observation vary from the mean value by more than 50 m or more than 20 per cent of the mean value, whichever is the greater, the one-minute mean minimum and the one-minute mean maximum values shall be included instead of the 10-minute mean value, e.g. RVR RWY 18 MNM700M MAX1100M.

Note.— See the Manual on Runway Visual Range Observing and Reporting Practices (Doc 9328) regarding RVR.

11.4.3.2.3.4 d) P present weathermeteorological conditions;

11.4.3.2.3.4.1 The types of the present weather phenomena shall be given in meteorological reports in terms of drizzle, rain, snow, snow grains, ice pellets, ice crystals (diamond dust), hail, small hail and/or snow pellets, fog, mist, sand, dust (widespread), haze, smoke, volcanic ash, dust/sand whirls (dust devils), squall, funnel cloud (tornado or waterspout), dust storm and sand storm.

11.4.3.2.3.4.2 The following characteristics of the present weather phenomena shall be given, as appropriate, in connection with the types listed in 11.4.3.2.3.4.1: thunderstorm, shower, freezing, blowing, low drifting, shallow, patches and partial.

11.4.3.2.3.4.3 The relevant intensity (light, moderate, heavy) or, as appropriate, the proximity to the aerodrome (vicinity) of the reported present weather phenomena shall be given.

~~11.4.3.2.3.5~~ e) ~~A~~ amount and height of base of low cloud;

~~Cloud amount using FEW (1-2 oktas), SCT (3-4 oktas), BKN (5-7 oktas) or OVC (8 oktas), type (only if cumulonimbus (CB) or towering cumulus (TCU)) and height of base in metres (feet) shall be given in that order. If the base of the lowest cloud is diffuse or ragged or fluctuating rapidly, the minimum height of the cloud or cloud fragments shall be given together with an appropriate description of the characteristics thereof. If there are no clouds and no restriction on vertical visibility, and the abbreviation CAVOK is not appropriate, SKC shall be used. If there are no clouds below 1 500 m (5 000 ft) or below the highest minimum sector altitude, whichever is greater, no cumulonimbus and no restriction on vertical visibility and the abbreviations "CAVOK" and "SKC" are not appropriate, the abbreviation "NSC" shall be used. When the sky is obscured, the vertical visibility shall be given, if available.~~

~~11.4.3.2.3.6~~ f) ~~A~~air temperature and dew-point temperature;

~~Air temperature and dew point temperature shall be given rounded to the nearest whole degree Celsius, with observed values involving 0.5°C rounded to the next higher whole degree Celsius.~~

~~11.4.3.2.3.7~~ g) ~~A~~altimeter setting(s); and

~~The QNH altimeter setting shall be given. The QFE altimeter setting shall also be available and passed either on a regular basis in accordance with local arrangements or if requested by the pilot. Altimeter settings shall be given in hectopascals in four digits together with the unit of measurement used and shall be rounded down to the nearest lower whole hectopascal.~~

~~11.4.3.2.3.8~~ h) ~~Other significant~~ supplementary information.

~~11.4.3.2.3.8.1 This shall include any available information on meteorological conditions in the area of the aerodrome, and in the approach, missed approach or climb-out areas relating to the location of cumulonimbus or thunderstorm, moderate or severe turbulence, wind shear, hail, severe squall line, moderate or severe icing, freezing precipitation, severe mountain waves, sand storm, dust storm, blowing snow, tornado or waterspout, as well as any information on recent weather of operational significance (i.e. freezing precipitation; moderate or heavy precipitation; moderate or heavy blowing snow; duststorm or sandstorm; thunderstorm; tornado or waterspout; volcanic ash) observed during the period since the last issued routine report or last hour, whichever is shorter, but not at the time of observation.~~

~~11.4.3.2.3.8.2 In meteorological reports disseminated beyond the aerodrome, only information on wind shear and on recent weather of operational significance as given in 11.4.3.2.3.8.1 shall be included.~~

~~11.4.3.2.3.9 When the visibility is 10 km or more, there is no cloud below 1 500 m (5 000 ft), or below the highest minimum sector altitude, whichever is greater, and no cumulonimbus, and there is no weather of significance as given in 11.4.3.2.3.4.1 and 11.4.3.2.3.4.2, information on visibility, runway visual range, present weather and cloud amount, type and height shall be replaced by the term "CAVOK".~~

Note. — Provisions relating to meteorological information to be provided in accordance with 11.4.3.2.3 are contained in Annex 3 — Meteorological Service for International Air Navigation, *Chapter 4 and Appendix 3.*

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CHAPTER 12. PHRASEOLOGIES

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12.2 GENERAL

Note.— Requirements for read-back of clearances and safety-related information are provided in Chapter 4, 4.5.7.5.

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12.2.7 Conditional phrases, such as “behind landing aircraft” or “after departing aircraft”, shall not be used for movements affecting the active runway(s), except when the aircraft or vehicles concerned are seen by the appropriate controller and pilot. The aircraft or vehicle causing the condition in the clearance issued shall be the first aircraft/vehicle to pass in front of the other aircraft concerned. In all cases a conditional clearance shall be given in the following order and consist of:

a) identification;
b) the condition;
c) the clearance; and
d) brief reiteration of the condition,

for example:

“SAS 941, BEHIND DC9 ON SHORT FINAL, LINE UP BEHIND”.

Note.— This implies the need for the aircraft receiving the conditional clearance to identify the aircraft or vehicle causing the conditional clearance.

~~12.2.8 Runway-in-use, altimeter settings, SSR Codes, level instructions, heading and speed instructions and, where so required by the appropriate ATS authority, transition levels, shall always be read back, e.g.:~~

~~Air traffic services: (aircraft call sign) “SQUAWK THREE FOUR TWO FIVE”;~~
~~Aircraft reply: “SQUAWK THREE FOUR TWO FIVE, (aircraft call sign)”.~~

~~*Note.— If the level of an aircraft is reported in relation to standard pressure 1 013.2 hPa, the words “FLIGHT LEVEL” should precede the level figures. If the level of the aircraft is reported in relation to QNH/QFE, the figure should be followed by the word “METRES” or “FEET” as appropriate.*~~

Editorial Note.— Subsequent paragraphs will be renumbered accordingly.

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12.3.1 **General**

	Circumstances	*Phraseologies*
12.3.1.2	LEVEL CHANGES, REPORTS AND RATES	. . .
. . .		
	... after returning to clearance after responding to an ACAS resolution advisory (Pilot and controller interchange)	*x) TCAS CLIMB (*or* DESCENT)~~,~~ COMPLETED, (*assigned clearance*) RESUMED; . . .
12.3.1.3	TRANSFER OF CONTROL AND/OR FREQUENCY CHANGE	. . . d) STAND BY ~~(*frequency*) FOR *(unit call sign)*~~; FOR (*unit call sign*) (*frequency*);

. . .

12.3.2 Area control service

. . .

12.3.2.7	WHEN CLEARANCE FOR DEVIATION CANNOT BE ISSUED	UNABLE, TRAFFIC *(direction)* BOUND *(type of aircraft) (level)* ESTIMATED (*or* OVER) *(significant point)* AT *(time)* CALL SIGN *(call sign)* ADVISE INTENTIONS

. . .

Editorial Note.— Subsequent paragraphs will be renumbered accordingly.

12.3.4 Phraseologies for use on and in the vicinity of the aerodrome

12.3.4.7	TAXI PROCEDURES	
	... for departure	*a) [*aircraft type*] [*wake turbulence category if "heavy"*] [*aircraft location*] REQUEST TAXI [*intentions*]; *b) [*aircraft type*] [*wake turbulence category if "heavy"*] [*aircraft location*] *(flight rules)* TO *(aerodrome of destination)* REQUEST TAXI [*intentions*];

Circumstances	*Phraseologies*
	c) TAXI TO HOLDING ~~POSITION~~ POINT [*number*] [RUNWAY *(number)*] [HOLD SHORT OF RUNWAY *(number)* (*or* CROSS RUNWAY *(number)*)] [TIME *(time)*];
... where detailed taxi instructions are required	*d) [*aircraft type*] [*wake turbulence category if "heavy"*] REQUEST DETAILED TAXI INSTRUCTIONS;
	e) TAXI TO HOLDING ~~POSITION~~ POINT [*(number)*] [RUNWAY *(number)*] VIA *(specific route to be followed)* [TIME *(time)*] [HOLD SHORT OF RUNWAY (*number*) (*or* CROSS RUNWAY *(number)*];
... where aerodrome information is not available from an alternative source such as ATIS	f) TAXI TO HOLDING ~~POSITION~~ POINT [*(number)*] *(followed by aerodrome information as applicable)* [TIME *(time)*];
	g) TAKE (*or* TURN) FIRST (*or* SECOND) LEFT (*or* RIGHT);
	. . .

. . .

12.3.4.9 TO CROSS A RUNWAY . . .

*a) REQUEST CROSS RUNWAY *(number)*; *Note.— If the control tower is unable to see the crossing aircraft(e.g. night, low visibility, etc.), the instruction should always be accompanied by a request to report when the aircraft has vacated ~~and is clear of~~ the runway.*
b) CROSS RUNWAY *(number)* [REPORT VACATED];
c) EXPEDITE CROSSING RUNWAY *(number)* TRAFFIC *(aircraft type) (distance)* KILOMETRES (*or* MILES) FINAL;
d) TAXI TO HOLDING ~~POSITION~~ POINT [*number*] [RUNWAY *(number)*] VIA *(specific route to be followed)*, [HOLD SHORT OF RUNWAY *(number)*] or [CROSS RUNWAY *(number*)];

Circumstances	*Phraseologies*
Note.— The pilot will, when requested, report "RUNWAY VACATED" when the entire aircraft is ~~well clear of the runway.~~ beyond the relevant runway-holding position.	*e) RUNWAY VACATED. *Denotes pilot transmission.

12.3.4.10 PREPARATION FOR TAKE-OFF

... conditional clearances	. . . ‡j) *(condition)* LINE UP (*brief reiteration of the condition*);
... acknowledgement of a conditional clearance	*k) *(condition)* LINING UP (*brief reiteration of the condition*);
... confirmation or otherwise of the ~~readback~~ read-back of conditional clearance	l) [THAT IS] CORRECT (*or* NEGATIVE) [I SAY AGAIN] ... *(as appropriate)*). *Denotes pilot transmission. † When there is the possibility of confusion during multiple runway operations. ‡ Provisions concerning the use of conditional clearances are contained in 12.2.4.

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12.3.4.11 TAKE-OFF CLEARANCE

	~~a) CLEARED FOR TAKE-OFF [REPORT AIRBORNE];~~
~~... when more than one runway in use~~	~~b)~~ a)RUNWAY *(number)* CLEARED FOR TAKE-OFF [REPORT AIRBORNE];
... when reduced runway separation is used	b) *(traffic information)* RUNWAY *(number)* CLEARED FOR TAKE-OFF; c) TAKE OFF IMMEDIATELY OR VACATE RUNWAY [*(instructions)*]; . . .

	Circumstances	*Phraseologies*
. . .		
12.3.4.13	ENTERING AN AERODROME TRAFFIC CIRCUIT	*a) [*aircraft type*] *(position) (level)* FOR LANDING; b) JOIN [*(direction of circuit)*] *(position in circuit) ~~(direction of circuit)~~(runway number)* [SURFACE] WIND *(direction and speed) (units)*' [TEMPERATURE [MINUS] *(number)*] QNH (*or* QFE) *(number)* [*(units)*] [TRAFFIC *(detail)*]; . . .
	~~... when right hand traffic circuit in use~~	~~d) JOIN RIGHT HAND *(position in circuit) (runway number)* [SURFACE] WIND *(direction and speed) (units)* [TEMPERATURE [MINUS] *(number)*] QNH (*or* QFE) *(number)* [*(units)*] [TRAFFIC *(detail)*];~~ . . .
. . .		
12.3.4.16	LANDING CLEARANCE	~~a) CLEARED TO LAND;~~
	~~... multiple runway operations~~	~~b)~~ a)RUNWAY *(number)* CLEARED TO LAND;
	... when reduced runway separation is used	b) *(traffic information)* RUNWAY *(number)* CLEARED TO LAND;
	... special operations	c) CLEARED TOUCH AND GO; . . .
. . .		

CHAPTER 13. AUTOMATIC DEPENDENT SURVEILLANCE (ADS) SERVICES

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13.5.3.3.2 ADS-based separation shall not be applied between aircraft holding over the same holding ~~point~~ fix. Application of horizontal separation between holding aircraft and other flights shall be subject to requirements and procedures prescribed by the appropriate ATS authority.

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CHAPTER 15. PROCEDURES RELATED TO EMERGENCIES, COMMUNICATION FAILURE AND CONTINGENCIES

Insert new text as follows:

15.2 SPECIAL PROCEDURES FOR IN-FLIGHT CONTINGENCIES IN OCEANIC AIRSPACE

15.2.1 Introduction

15.2.1.1 Although all possible contingencies cannot be covered, the procedures in 15.2.2 and 15.2.3 provide for the more frequent cases such as:

a) inability to maintain assigned flight level due to meteorological conditions, aircraft performance or pressurization failure;

b) en route diversion across the prevailing traffic flow; and

c) loss of, or significant reduction in, the required navigation capability when operating in an airspace where the navigation performance accuracy is a prerequisite to the safe conduct of flight operations.

15.2.1.2 With regard to 15.2.1.1 a) and b), the procedures are applicable primarily when rapid descent and/or turn-back or diversion is required. The pilot's judgement shall determine the sequence of actions to be taken, having regard to the prevailing circumstances. Air traffic control shall render all possible assistance.

15.2.2 General procedures

15.2.2.1 If an aircraft is unable to continue the flight in accordance with its ATC clearance, and/or an aircraft is unable to maintain the navigation performance accuracy specified for the airspace, a revised clearance shall be obtained, whenever possible, prior to initiating any action.

15.2.2.2 The radiotelephony distress signal (MAYDAY) or urgency signal (PAN PAN) preferably spoken three times shall be used as appropriate. Subsequent ATC action with respect to that aircraft shall be based on the intentions of the pilot and the overall air traffic situation.

15.2.2.3 If prior clearance cannot be obtained, an ATC clearance shall be obtained at the earliest possible time and, until a revised clearance is received, the pilot shall:

a) leave the assigned route or track by initially turning 90 degrees to the right or to the left. When possible, the direction of the turn should be determined by the position of the aircraft relative to any organized route or track system. Other factors which may affect the direction of the turn are:

   1) the direction to an alternate airport, terrain clearance;

   2) any lateral offset being flown, and

   3) the flight levels allocated on adjacent routes or tracks.

b) following the turn, the pilot should:

1) if unable to maintain the assigned flight level, initially minimize the rate of descent to the extent that is operationally feasible;

2) take account of other aircraft being laterally offset from its track;

3) acquire and maintain in either direction a track laterally separated by 28 km (15 NM) from the assigned route; and

4) once established on the offset track, climb or descend to select a flight level which differs from those normally used by 150 m (500 ft);

c) establish communications with and alert nearby aircraft by broadcasting, at suitable intervals: aircraft identification, flight level, position (including the ATS route designator or the track code, as appropriate) and intentions on the frequency in use and on 121.5 MHz (or, as a back-up, on the inter-pilot air-to-air frequency 123.45 MHz);

d) maintain a watch for conflicting traffic both visually and by reference to ACAS (if equipped);

e) turn on all aircraft exterior lights (commensurate with appropriate operating limitations);

f) keep the SSR transponder on at all times; and

g) take action as necessary to ensure the safety of the aircraft.

15.2.2.3.1 When leaving the assigned track to acquire and maintain the track laterally separated by 28 km (15 NM), the flight crew, should, where practicable, avoid bank angles that would result in overshooting the track to be acquired, particularly in airspace where a 55.5 km (30 NM) lateral separation minimum is applied.

15.2.2.4 *Extended range operations by aeroplanes with two-turbine power-units (ETOPS)*

15.2.2.4.1 If the contingency procedures are employed by a twin-engine aircraft as a result of an engine shutdown or failure of an ETOPS critical system, the pilot should advise ATC as soon as practicable of the situation, reminding ATC of the type of aircraft involved, and request expeditious handling.

15.2.3 Weather deviation procedures

15.2.3.1 *General*

Note.— The following procedures are intended for deviations around adverse meteorological conditions.

15.2.3.1.1 When the pilot initiates communications with ATC, a rapid response may be obtained by stating “WEATHER DEVIATION REQUIRED” to indicate that priority is desired on the frequency and for ATC response. When necessary, the pilot should initiate the communications using the urgency call “PAN PAN” (preferably spoken three times).

15.2.3.1.2 The pilot shall inform ATC when weather deviation is no longer required, or when a weather deviation has been completed and the aircraft has returned to its cleared route.

15.2.3.2 *Actions to be taken when controller-pilot communications are established*

15.2.3.2.1 The pilot should notify ATC and request clearance to deviate from track, advising, when possible, the extent of the deviation expected.

15.2.3.2.2 ATC should take one of the following actions:

a) when appropriate separation can be applied, issue clearance to deviate from track; or

b) if there is conflicting traffic and ATC is unable to establish appropriate separation, ATC shall:

1) advise the pilot of inability to issue clearance for the requested deviation;

2) advise the pilot of conflicting traffic; and

3) request the pilot's intentions.

15.2.3.2.3 The pilot should take the following actions:

a) comply with the ATC clearance issued; or

b) advise ATC of intentions and execute the procedures detailed in 15.2.3.3 below.

15.2.3.3 *Actions to be taken if a revised ATC clearance cannot be obtained*

Note.— The provisions of this section apply to situations where a pilot needs to exercise the authority of a pilot-in-command under the provisions of Annex 2, 2.3.1.

15.2.3.3.1 If the aircraft is required to deviate from track to avoid adverse meteorological conditions and prior clearance cannot be obtained, an ATC clearance shall be obtained at the earliest possible time. Until an ATC clearance is received the pilot shall take the following actions:

a) if possible, deviate away from an organized track or route system;

b) establish communications with and alert nearby aircraft by broadcasting, at suitable intervals: aircraft identification, flight level, position (including ATS route designator or the track code) and intentions, on the frequency in use and on 121.5 MHz (or, as a back-up, on the inter-pilot air-to-air frequency 123.45 MHz);

c) watch for conflicting traffic both visually and by reference to ACAS (if equipped);

Note.— If, as a result of actions taken under the provisions of 15.2.3.3.1 b) and c) above, the pilot determines that there is another aircraft at or near the same flight level with which a conflict may occur, then the pilot is expected to adjust the path of the aircraft, as necessary, to avoid conflict.

d) turn on all aircraft exterior lights (commensurate with appropriate operating limitations);

e) for deviations of less than 19 km (10 NM) remain at a level assigned by ATC;

f) for deviations greater than 19 km (10 NM), when the aircraft is approximately 19 km (10 NM) from track, initiate a level change in accordance with Table 1;

Table 1

Route centre line track	*Deviations > 19 km (10 NM)*	*Level change*
EAST 000° - 179° magnetic	LEFT RIGHT	DESCEND 90 m (300 ft) CLIMB 90 m (300 ft)
WEST 180° - 359° magnetic	LEFT RIGHT	CLIMB 90 m (300 ft) DESCEND 90 m (300 ft)

g) when returning to track, be at its assigned flight level when the aircraft is within approximately 19 km (10 NM) of the centre line; and

h) if contact was not established prior to deviating, continue to attempt to contact ATC to obtain a clearance. If contact was established, continue to keep ATC advised of intentions and obtain essential traffic information.

15.2.4 Procedures for strategic lateral offsets in oceanic and remote continental airspace

Note 1.— Annex 2, 3.6.2.1.1 requires authorization for the application of strategic lateral offsets from the appropriate ATS authority responsible for the airspace concerned.

Note 2.— The following incorporates lateral offset procedures for both the mitigation of the increasing lateral overlap probability due to increased navigation accuracy, and wake turbulence encounters.

Note 3.— The use of highly accurate navigation systems (such as the global navigation satellite system (GNSS)) by an increasing proportion of the aircraft population has had the effect of reducing the magnitude of lateral deviations from the route centre line and, consequently, increasing the probability of a collision, should a loss of vertical separation between aircraft on the same route occur.

15.2.4.1 The following shall be taken into account by the appropriate ATS authority when authorizing the use of strategic lateral offsets in a particular airspace:

a) strategic lateral offsets shall only be authorized in en route oceanic or remote continental airspace. Where part of the airspace in question is within radar coverage, transiting aircraft should normally be allowed to initiate or continue offset tracking;

b) strategic lateral offsets may be authorized for the following types of routes (including where routes or route systems intersect):

1) uni-directional and bi-directional routes; and

2) parallel route systems where the spacing between route centre lines is not less than 55.5 km (30 NM);

c) in some instances it may be necessary to impose restrictions on the use of strategic lateral offsets, e.g. where their application may be inappropriate for reasons related to obstacle clearance;

d) strategic lateral offset procedures should be implemented on a regional basis after coordination between all States involved;

e) the routes or airspace where application of strategic lateral offsets is authorized, and the procedures to be followed by pilots, shall be promulgated in aeronautical information publications (AIPs); and

f) air traffic controllers shall be made aware of the airspace within which strategic lateral offsets are authorized.

15.2.4.1.1 The decision to apply a strategic lateral offset shall be the responsibility of the flight crew. The flight crew shall only apply strategic lateral offsets in airspace where such offsets have been authorized by the appropriate ATS authority and when the aircraft is equipped with automatic offset tracking capability.

15.2.4.1.2 The strategic lateral offset shall be established at a distance of 1.85 km (1 NM) or 3.7 km (2 NM) to the right of the centre line relative to the direction of flight.

Note 1.— Pilots may contact other aircraft on the inter-pilot air-to-air frequency 123.45 MHz to coordinate offsets.

Note 2.— The strategic lateral offset procedure has been designed to include offsets to mitigate the effects of wake turbulence of preceding aircraft. If wake turbulence needs to be avoided, one of the three available options (centre line, 1.85 km (1 NM) or 3.7 km (2 NM) right offset) may be used.

Note 3.— Pilots are not required to inform ATC that a strategic lateral offset is being applied.

End of new text.

15.~~2~~3 AIR-GROUND COMMUNICATIONS FAILURE

Note 1.— Radar procedures to be applied in relation to an aircraft experiencing air-ground communication failure are contained in Chapter 8, Section 8.8.3.

Note 2.— An aircraft equipped with an SSR transponder is expected to operate the transponder on Mode A Code 7600 to indicate that it has experienced air-ground communication failure.

Note 3.— See also Chapter 6, 6.3.2.4 concerning departure clearances containing no geographical or time limit for an initial level and procedures to be applied in relation to an aircraft experiencing air-ground communication failure under such circumstances.

Note 4. — See also Chapter 5, 5.4.2.6.3.~~1~~2, for additional requirements applying to communication failure during the application of the 50 NM longitudinal RNAV/RNP 10 separation minimum.

~~15.2.1~~ 15.3.1 Action by air traffic control units when unable to maintain two-way communication with an aircraft operating in a control area or control zone shall be as outlined in the paragraphs which follow.

~~15.2.2~~ 15.3.2 As soon as it is known that two-way communication has failed, action shall be taken to ascertain whether the aircraft is able to receive transmissions from the air traffic control unit by requesting it to execute a specified manoeuvre which can be observed by radar or to transmit, if possible, a specified signal in order to indicate acknowledgement.

~~15.2.3~~ 15.3.3 If the aircraft fails to indicate that it is able to receive and acknowledge transmissions, separation shall be maintained between the aircraft having the communication failure and other aircraft, based on the assumption that the aircraft will:

a) if in visual meteorological conditions:

1) continue to fly in visual meteorological conditions;

2) land at the nearest suitable aerodrome; and

3) report its arrival by the most expeditious means to the appropriate air traffic control unit; or

b) if in instrument meteorological conditions or when conditions are such that it does not appear ~~feasible to~~ likely that the pilot will complete the flight in accordance with a):

1) unless otherwise prescribed on the basis of a regional air navigation agreement, in airspace where radar is not used in the provision of air traffic control, maintain the last assigned speed and level, or minimum flight altitude if higher, for a period of 20 minutes following the aircraft's failure to report its position over a compulsory reporting point and thereafter adjust level and speed in accordance with the filed flight plan; or,

2) in airspace where radar is used in the provision of air traffic control, maintain the last assigned speed and level, or minimum flight altitude if higher, for a period of 7 minutes following:

i) the time the last assigned level or minimum flight altitude is reached; or

ii) the time the transponder is set to Code 7600; or

iii) the aircraft's failure to report its position over a compulsory reporting point;

whichever is later and thereafter adjust level and speed in accordance with the filed flight plan;

3) when being radar vectored or having been directed by ATC to proceed offset using RNAV without a specified limit, proceed in the most direct manner possible to rejoin the current flight plan route no later than the next significant point, taking into consideration the applicable minimum flight altitude;

~~2~~4) proceed according to the current flight plan route to the appropriate designated navigation aid or fix serving the destination aerodrome and, when required to ensure compliance with ~~3~~ 5) below, hold over this aid or fix until commencement of descent;

~~3~~5) commence descent from the navigation aid or fix specified in ~~2~~ 4) at, or as close as possible to, the expected approach time last received and acknowledged; or, if no expected approach time has been received and acknowledged, at, or as close as possible to, the estimated time of arrival resulting from the current flight plan;

~~4~~6) complete a normal instrument approach procedure as specified for the designated navigation aid or fix; and

~~5~~7) land, if possible, within 30 minutes after the estimated time of arrival specified in ~~b)~~ 5) or the last acknowledged expected approach time, whichever is later.

Note 1.— Provisions related to minimum levels are contained in Annex 2, 5.1.2.

Note 2.— As evidenced by the meteorological conditions prescribed therein, ~~15.2.3 a)~~ 15.3.3. a) relates to all controlled flights, whereas ~~15.2.3 b)~~ 15.3.3. b) relates only to IFR flights.

~~15.2.4~~ 15.3.4 Action taken to ensure suitable separation shall cease to be based on the assumption stated in ~~15.2.3~~ 15.3.3 when:

a) it is determined that the aircraft is following a procedure differing from that in ~~15.2.3~~ 15.3.3; or

b) through the use of electronic or other aids, air traffic control units determine that action differing from that required by ~~15.2.3~~ 15.3.3 may be taken without impairing safety; or

c) positive information is received that the aircraft has landed.

~~15.2.5~~ 15.3.5 As soon as it is known that two-way communication has failed, appropriate information describing the action taken by the air traffic control unit, or instructions justified by any emergency situation, shall be transmitted blind for the attention of the aircraft concerned, on the frequencies available on which the aircraft is believed to be listening, including the voice frequencies of available radio navigation or approach aids. Information shall also be given concerning:

a) ~~weather~~ meteorological conditions favourable to a cloud-breaking procedure in areas where congested traffic may be avoided; and

b) ~~weather~~ meteorological conditions at suitable aerodromes.

. . .

~~15.2.8~~ 15.3.8 If circumstances indicate that a controlled flight experiencing a communication failure might proceed to (one of) the alternate aerodrome(s) specified in the filed flight plan, the air traffic control unit(s) serving the alternate aerodrome(s) and any other air traffic control units that might be affected by a possible diversion shall be informed of the circumstances of the failure and requested to attempt to establish communication with the aircraft at a time when the aircraft could possibly be within communication range. This shall apply particularly when, by agreement with the operator or a designated representative, a clearance has been transmitted blind to the aircraft concerned to proceed to an alternate aerodrome, or when ~~weather~~ meteorological conditions at the aerodrome of intended landing are such that a diversion to an alternate is considered likely.

Editorial Note.— Subsequent paragraphs will be renumbered accordingly.

. . .

~~15.3.1~~ 15.4.1 Strayed VFR flights and VFR flights encountering adverse ~~weather~~ meteorological conditions

Note.— A strayed aircraft is an aircraft which has deviated significantly from its intended track or which reports that it is lost.

~~15.3.1.1~~ 15.4.1.1 A VFR flight reporting that it is uncertain of its position or lost, or encountering adverse ~~weather~~ meteorological conditions, should be considered to be in a state of emergency and handled as such. The controller shall, under such circumstances, communicate in a clear, concise and calm manner and care shall be taken, at this stage, not to question any fault or negligence that the pilot may have committed in the preparation or conduct of the flight. Depending on the circumstances, the pilot should be requested to provide any of the following information considered pertinent so as to better provide assistance:

. . .

~~15.3.1.2~~ 15.4.1.2 If communications with the aircraft are weak or distorted, it should be suggested that the aircraft climb to a higher level, provided ~~weather~~ meteorological conditions and other circumstances permit.

~~15.3.1.3~~ 15.4.1.3 Navigation assistance to help the pilot determine the aircraft position may be provided by use of radar, direction-finder, navigation aids or sighting by another aircraft. Care must be taken when providing navigation assistance to ensure that the aircraft does not enter cloud.

Note.— The possibility of a VFR flight becoming strayed as a result of encountering adverse ~~weather~~ meteorological conditions must be recognized.

. . .

~~15.3.1.7~~ 15.4.1.7 When providing radar assistance in adverse ~~weather~~ meteorological conditions, the primary objective should be to bring the aircraft into VMC as soon as possible. Caution must be exercised to prevent the aircraft from entering cloud.

Editorial Note.— Subsequent paragraphs will be renumbered accordingly.

. . .

APPENDIX 2. FLIGHT PLAN

. . .

ITEM 15:ROUTE

INSERT the *first cruising speed* as in (a) and the *first cruising level* as in (b), without a space between them.

THEN, following the arrow, *INSERT* the route description as in (c).

(a) Cruising speed (maximum 5 characters)

INSERT the *True Air Speed* for the first or the whole cruising portion of the flight, in terms of:

Kilometres per hour, expressed as K followed by 4 figures (e.g. K0830), *or*

Knots, expressed as N followed by 4 figures (e.g. N0485), *or*

True Mach number, when so prescribed by the appropriate ATS authority, to the nearest hundredth of unit Mach, expressed as M followed by 3 figures (e.g. M082).

. . .

ITEM 18: OTHER INFORMATION

INSERT 0 (zero) if no other information,

OR, any other necessary information in the preferred sequence shown hereunder, in the form of the appropriate indicator followed by an oblique stroke and the information to be recorded:

EET/ Significant points or FIR boundary designators and accumulated estimated elapsed times to such points or FIR boundaries, when so prescribed on the basis of regional air navigation agreements, or by the appropriate ATS authority.

Examples: EET/CAP0745 XYZ0830
EET/EINN0204

RIF/ The route details to the revised destination aerodrome, followed by the ICAO four-letter location indicator of the aerodrome. The revised route is subject to reclearance in flight.

Examples: RIF/DTA HEC KLAX
RIF/ESP G94 CLA ~~APPH~~YPPH
RIF/LEMD

. . .

APPENDIX 3. AIR TRAFFIC SERVICES MESSAGES

. . .

Field type 15 — Route

SINGLE HYPHEN

(a)	*Cruising Speed or Mach Number* The True Airspeed for the first or the whole cruising portion of the flight, in terms of: K followed by 4 NUMERICS giving the True Airspeed in kilometres per hour, or N followed by 4 NUMERICS giving the True Airspeed in knots, or when so prescribed by the appropriate ATS authority, M followed by 3 NUMERICS giving the true Mach Number to the nearest hundredth of unit Mach.

. . .

APPENDIX 4. AIR TRAFFIC INCIDENT REPORT

1. ICAO model air traffic incident report form

Amend Item 5 as follows: Flight ~~weather~~ meteorological conditions

— END —

International Civil Aviation Organization | Organisation de l'aviation civile internationale | Organización de Aviación Civil Internacional | Международная организация гражданской авиации | منظمة الطيران المدني الدولي | 国际民用航空组织

Tel.: +1 (514) 954-8219 ext. 6711

Ref.: AN 13/13.1-05/37

24 March 2005

Subject: Adoption of Amendment 43 to Annex 11

Action required: a) Notify any disapproval before 11 July 2005; b) Notify any differences and compliance before 24 October 2005

Sir/Madam,

1. I have the honour to inform you that Amendment 43 to the *International Standards and Recommended Practices, Air Traffic Services* (Annex 11 to the Convention on International Civil Aviation) was adopted by the Council at the eighth meeting of its 174th Session on 2 March 2005. Copies of the Amendment, the Resolution of Adoption and Note on the Notification of Differences are being sent to you under separate cover.

2. When adopting the amendment, the Council prescribed 11 July 2005 as the date on which it will become effective, except for any part concerning which a majority of Contracting States have registered their disapproval before that date. In addition, the Council resolved that Amendment 43, to the extent it becomes effective, will be applicable on 24 November 2005.

3. Amendment 43 arises from studies by the Secretariat with a view to updating current provisions to reflect technical advancements and evolving practices in States, and also from the Aeronautical Information Services/Aeronautical Charts (AIS/MAP) Divisional Meeting (1998). The subjects are given in the amendment to the Foreword of Annex 11, Thirteenth Edition, a copy of which is in Attachment A.

4. The nature and scope of the amendment are as follows:

a) as part of a comprehensive effort to improve runway safety, a review of related provisions was carried out and, as a result, the Note under Section 3.10 (Use of surface movement radar (SMR) was revised and upgraded to a Recommended Practice in light of the specifications in Annex 14 — *Aerodromes* which are aimed at improving visual observation on the manoeuvring area so that air traffic controllers can provide a better service;

399 University Street
Montréal, Quebec
Canada H3C 5H7
Tel.: +1 (514) 954-8219
Fax: +1 (514) 954-6077
E-mail: icaohq@icao.int
Sitatex: YULCAYA

b) the ability to record all air traffic control (ATC) communications is already provided for by most types of communications equipment. As these data have proven to be critical in many accident and incident investigations, thus leading to numerous safety benefits, a requirement to have them recorded wherever possible has been made. A provision that recorded data be retained for a period of at least thirty days is included in four separate paragraphs for consistency with Annex 10 — *Aeronautical Telecommunications*. Also, as many radar facilities are now capable of recording surveillance data, provisions have been upgraded to Standards;

c) extensive amendments to Annex 1 — *Personnel Licensing*, Annex 6 — *Operation of Aircraft*, Annex 10, Annex 11 and the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) related to language proficiency requirements were adopted in 2003 which are expected to result in significant safety benefits in a range of aeronautical activity. An additional related paragraph in Annex 11 has been identified and amended;

d) amendments to provisions regarding meteorological data have been updated to align them with Annex 3 — *Meteorological Service for International Air Navigation*;

e) monitoring of aircraft height-keeping performance is one of the underlying assumptions of the safety studies on which reduced vertical separation minimum (RVSM) is based. In all regions where RVSM has been implemented, Regional Monitoring Agencies (RMAs) have been established by the appropriate Planning and Implementation Regional Groups (PIRGs) to undertake this function. An amendment to Annex 11 adds a requirement to establish such a monitoring programme. As a complement to this, it also adds to Annex 6 provisions specifying the responsibility of the relevant State authority to take prompt and appropriate action if the monitoring results indicate that the height-keeping performance of a particular aircraft or an aircraft type group exceeds the prescribed limits;

f) when the provisions related to ATS safety management in Annex 11 were adopted in 2001, the date of 27 November 2003 was specified in paragraph 2.26.2 as the time from which the Standard would become applicable. Simultaneously, in order to introduce a requirement for safety management in Annex 11 applicable on 1 November 2001, a Recommended Practice was included as paragraph 2.26.3. Since the date of 27 November 2003 has passed, an editorial amendment to Standard 2.26.2 has been made and Recommended Practice 2.26.3 has been deleted; and

g) consequential to the introduction in Annex 15 — *Aeronautical Information Services* of the common reference systems for air navigation, new definitions regarding calendar, datum and Gregorian Calendar have been included in Annex 11. Additionally, due to the introduction of electronic terrain and obstacle data specifications into Annex 15, the existing provisions in Annex 11 for obstacle data contained in Appendix 5 titled "Aeronautical data quality requirements" have been updated in order to align them with the new Annex 15 specifications. Accuracy and integrity requirements for obstacles in the terminal control area are included in Tables 1 and 2 of this Appendix.

5. In accordance with the decision of the 26th Session of the Assembly, I would like to bring to your attention the Organization's long-standing practice of providing documentation to States upon request. Accordingly, the relevant working papers on Amendment 43 to Annex 11 and corresponding minutes of the Council and the Air Navigation Commission proceedings can be made available. In light of the costs involved, however, only one copy of such documents will normally be provided.

6. In conformity with the Resolution of Adoption, may I request:

a) that before 11 July 2005 you inform me if there is any part of Amendment 43, concerning which your Government wishes to register disapproval, using the form in Attachment B for this purpose. Please note that only statements of disapproval need be registered and if you do not reply it will be assumed that you do not disapprove of the amendment;

b) that before 24 October 2005 you inform me of the following, using the form in Attachment C for this purpose:

1) any differences that will exist on 24 November 2005 between the national regulations or practices of your Government and the provisions of the whole of Annex 11, as amended by all amendments up to and including Amendment 43, and thereafter of any further differences that may arise;

2) the date or dates by which your Government will have complied with the provisions of the whole of Annex 11, as amended by all amendments up to and including Amendment 43.

7. With reference to the request in paragraph 6 a) above, it should be noted that a registration of disapproval of Amendment 43 or any part of it in accordance with Article 90 of the Convention does not constitute a notification of differences under Article 38 of the Convention. To comply with the latter provision, a separate statement is necessary if any differences do exist, as requested in paragraph 6 b) 1). It is recalled in this respect that international Standards in Annexes have a conditional binding force, to the extent that the State or States concerned have not notified any difference thereto under Article 38 of the Convention.

8. Guidance on the determination and reporting of differences is given in the Note on the Notification of Differences which, as mentioned above, is being sent to you under separate cover.

9. Please note that a detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.

10. I would appreciate it if you would also send a copy of your notifications, referred to in paragraph 6 b) above, to the ICAO Regional Director accredited to your Government.

11. As soon as practicable after the amendment becomes effective, on 11 July 2005, replacement pages incorporating Amendment 43 will be forwarded to you.

Accept, Sir/Madam, the assurances of my highest consideration.

Taïeb Chérif
Secretary General

Enclosures:

A — Amendment to the Foreword of Annex 11
B — Form on notification of disapproval of all or part of Amendment 43 to Annex 11
C — Form on notification of compliance with or differences from Annex 11

Under separate cover:

Copy of Amendment 43 to Annex 11 with the associated Resolution of Adoption and Note on the Notification of Differences (to be dispatched on or about 25 March 2005)

ATTACHMENT A to State letter AN 13/13.1-05/37

AMENDMENT TO THE FOREWORD OF ANNEX 11, THIRTEENTH EDITION

Add the following at the end of Table A:

Amendment	***Source(s)***	***Subject***	***Adopted/Approved Effective Applicable***
43	Secretariat; Aeronautical Information Services/ Aeronautical Charts (AIS/MAP) Divisional Meeting (1998)	Definitions; use of surface movement radar; ATS requirements for communications; meteorology information; height-keeping performance by aircraft; ATS safety management; electronic terrain and obstacle data.	2 March 2005 11 July 2005 24 November 2005

— — — — — — — —

ATTACHMENT B to State letter AN 13/13.1-05/37

NOTIFICATION OF DISAPPROVAL OF ALL OR PART OF AMENDMENT 43 TO ANNEX 11

To: The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

(State) _____ hereby wishes to disapprove the following parts of Amendment 43 to Annex 11:

Signature _____ Date _____

NOTES

1) If you wish to disapprove all or part of Amendment 43 to Annex 11, please dispatch this notification of disapproval to reach Montreal by 11 July 2004. If it has not been received by that date it will be assumed that you do not disapprove of the amendment. **If you approve of all parts of Amendment 43, it is not necessary to return this notification of disapproval.**

2) This notification should not be considered a notification of compliance with or differences from Annex 11. Separate notifications on this are necessary. (See Attachment C.)

3) Please use extra sheets as required.

— — — — — — — —

ATTACHMENT C to State letter AN 13/13.1-05/37

NOTIFICATION OF COMPLIANCE WITH OR DIFFERENCES FROM ANNEX 11
(including all amendments up to and including Amendment 43)

To: The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

1. No differences will exist on _____ between the national regulations and/or practices of **(State)** _____ and the provisions of Annex 11, including all amendments up to and including Amendment 43.

2. The following differences will exist on _____ between the regulations and/or practices of **(State)** _____ and the provisions of Annex 11, including Amendment 43: (Please see Note 3) below.)

a) **Annex Provision** (Please give exact paragraph reference)	**b)** **Details of Difference** (Please describe the difference precisely)	**c)** **Remarks** (Please indicate reasons for the difference)

(Please use extra sheets as required)

3. By the dates indicated below, **(State)** _____ will have complied with the provisions of Annex 11, including all amendments up to and including Amendment 43 for which differences have been notified in 2 above.

a) **Annex Provision** (Please give exact paragraph reference)	**b)** **Date**	**c)** **Comments**

(Please use extra sheets as required)

Signature _____ Date _____

NOTES

1) If paragraph 1 above is applicable to you, please complete paragraph 1 and return this form to Montreal. If paragraph 2 is applicable to you, please complete paragraphs 2 and 3 and return the form to Montreal.

2) Please dispatch the form to reach Montreal by 24 October 2005.

3) A detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.

4) Guidance on the notification of differences from Annex 11 is provided in the Note on the Notification of Differences that is being forwarded with a copy of Amendment 43 to Annex 11 under separate cover.

5) Please send a copy of this notification to the ICAO Regional Director accredited to your Government.

— END —

AMENDMENT No. 43

TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AIR TRAFFIC SERVICES

AIR TRAFFIC CONTROL SERVICE
FLIGHT INFORMATION SERVICE
ALERTING SERVICE

ANNEX 11

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

The amendment to Annex 11 contained in this document was adopted by the Council of ICAO on **2 March 2005**. Such parts of this amendment as have not been disapproved by more than half of the total number of Contracting States on or before **11 July 2005** will become effective on that date and will become applicable on **24 November 2005** as specified in the Resolution of Adoption.

MARCH 2005

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AMENDMENT 43 TO THE INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AIR TRAFFIC SERVICES

RESOLUTION OF ADOPTION

The Council

Acting in accordance with the Convention on International Civil Aviation, and particularly with the provisions of Articles 37, 54 and 90 thereof,

1. *Hereby adopts* on 2 March 2005 Amendment 43 to the International Standards and Recommended Practices contained in the document entitled *International Standards and Recommended Practices, Air Traffic Services* which for convenience is designated Annex 11 to the Convention;

2. *Prescribes* 11 July 2005 as the date upon which the said amendment shall become effective, except for any part thereof in respect of which a majority of the Contracting States have registered their disapproval with the Council before that date;

3. *Resolves* that the said amendment or such parts thereof as have become effective shall become applicable on 24 November 2005;

4. *Requests the Secretary General*:

a) to notify each Contracting State immediately of the above action and immediately after 11 July 2005 of those parts of the amendment which have become effective;

b) to request each Contracting State:

1) to notify the Organization (in accordance with the obligation imposed by Article 38 of the Convention) of the differences that will exist on 24 November 2005 between its national regulations or practices and the provisions of the Standards in the Annex as hereby amended, such notification to be made before 24 October 2005, and thereafter to notify the Organization of any further differences that arise; and

2) to notify the Organization before 24 October 2005 of the date or dates by which it will have complied with the provisions of the Standards in the Annex as hereby amended.

c) to invite each Contracting State to notify additionally any differences between its own practices and those established by the Recommended Practices, when the notification of such differences is important for the safety of air navigation, following the procedure specified in subparagraph b) above with respect to differences from Standards.

— — — — — — — —

NOTES ON THE PRESENTATION OF AMENDMENT 43 TO ANNEX 11

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

1. ~~Text to be deleted is shown with a line through it.~~	text to be deleted
2. New text to be inserted is highlighted with grey shading.	new text to be inserted
3. ~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	new text to replace existing text

TEXT OF AMENDMENT TO INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES
AIR TRAFFIC SERVICES

ANNEX 11
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

CHAPTER 1. DEFINITIONS

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~~***Aeronautical station (RR S1.81).*** A land station in the aeronautical mobile service. In certain instances, an aeronautical station may belocated, for example, on board ship or on a platform at sea.~~

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Editorial Note.— Insert new definitions in alphabetical order.

Calendar. Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).

Datum. Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104*).

Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108*).

Note.— In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

* ISO Standard 19104, *Geographic information — Terminology*
* ISO Standard 19108, *Geographic information — Temporal schema*

Editorial Note.— End of new definitions.

CHAPTER 2. GENERAL

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2.26.2 ~~As of 27 November 2003, t~~The acceptable level of safety and safety objectives applicable to the provision of ATS within airspaces and at aerodromes shall be established by the State or States concerned. When applicable, safety levels and safety objectives shall be established on the basis of regional air navigation agreements.

Note.— The acceptable level of safety may be specified in qualitative or quantitative terms. The following are examples of measures which could be used to express the acceptable level of safety:

a) a maximum probability of an undesirable event, such as collision, loss of separation or runway incursion;

b) a maximum number of accidents per flight hour;

c) a maximum number of incidents per aircraft movement;

d) a maximum number of valid short-term conflict alerts (STCA) per aircraft movement.

~~2.26.3 **Recommendation.—** *The acceptable level of safety and safety objectives applicable to the provision of ATS within airspaces and at aerodromes should be established by the State or States concerned. When applicable, safety levels and safety objectives should be established on the basis of regional air navigation agreements.*~~

~~2.26.4~~ 2.26.3 An ATS safety management programme shall, *inter alia*:

a) identify actual and potential hazards and determine the need for remedial action;

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Renumber subsequent paragraphs accordingly.

2.27 Common reference systems

2.27.1 Horizontal reference system

2.27.1.1 World Geodetic System —1984 (WGS-84) shall be used as the horizontal (geodetic) reference system for air navigation. Reported aeronautical geographical coordinates (indicating latitude and longitude) shall be expressed in terms of the WGS-84 geodetic reference datum.

Note.— Comprehensive guidance material concerning WGS-84 is contained in the World Geodetic System —1984 (WGS-84) Manual *(Doc 9674).*

2.27.2 Vertical reference system

2.27.2.1 Mean sea level (MSL) datum, which gives the relationship of gravity-related height (elevation) to a surface known as the geoid, shall be used as the vertical reference system for air navigation.

Note.—The geoid globally most closely approximates MSL. It is defined as the equipotential surface in the gravity field of the Earth which coincides with the undisturbed MSL extended continuously through the continents.

2.27.3 Temporal reference system

2.27.3.1 The Gregorian calendar and Coordinated Universal Time (UTC) shall be used as the temporal reference system for air navigation.

2.27.3.2 When a different temporal reference system is used, this shall be indicated in GEN 2.1.2 of Aeronautical Information Publication (AIP).

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CHAPTER 3. AIR TRAFFIC CONTROL SERVICE

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3.3.4 Separation by an air traffic control unit shall be obtained by at least one of the following:

a) vertical separation, obtained by assigning different levels selected from:

1) the appropriate table~~s~~ of cruising levels in Appendix 3 of Annex 2, or

2) a modified table of cruising levels, when so prescribed in accordance with Appendix 3 of Annex 2 for flight above FL 410,

except that the correlation of levels to track as prescribed therein shall not apply whenever otherwise indicated in appropriate aeronautical information publications or air traffic control clearances;

~~*Note.- Guidance material relating to vertical separation is contained in the* Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574).~~

b) horizontal separation, obtained by providing:

1) longitudinal separation, by maintaining an interval between aircraft operating along the same, converging or reciprocal tracks, expressed in time or distance; or

2) lateral separation, by maintaining aircraft on different routes or in different geographical areas;

c) composite separation, consisting of a combination of vertical separation and one of the other forms of separation contained in b) above, using minima for each which may be lower than, but not less than half of, those used for each of the combined elements when applied individually. Composite separation shall only be applied on the basis of regional air navigation agreements.

Note.— Guidance material relating to the implementation of composite lateral/vertical separation is contained in the Air Traffic Services Planning Manual (Doc 9426).

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

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

3.3.4.2 Arrangements shall be put in place, through inter-regional agreement, for the sharing between regions of data from monitoring programmes.

Note.— Guidance material relating to vertical separation and monitoring of height-keeping performance is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574).

3.7 Air traffic control clearances

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3.7.3 Read-back of clearances and safety-related information

3.7.3.1 The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. The following items shall always be read back:

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b) clearances and instructions to enter, land on, take off ~~on~~ from, hold short of, cross and backtrack on any runway; and

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3.10 Use of surface movement radar (SMR)

~~*Note.— Surface movement radar (SMR) has proven to be useful in assisting with the monitoring of aircraft and vehicles on the manoeuvring area. See Annex 14, Volume I, Chapter 8 for the requirements concerning the provision of SMR and the* Air Traffic Services Planning Manual *(Doc 9426) for guidance on the use of SMR.*~~

3.10.1 **Recommendation.—** *In the absence of visual observation of all or part of the manoeuvring area or to supplement visual observation, surface movement radar (SMR) provided in accordance with the provisions of Annex 14, Volume I, or other suitable surveillance equipment, should be utilized to:*

a) monitor the movements of aircraft and vehicles on the manoeuvring area;

b) provide directional information to pilots and vehicle drivers as necessary; and

c) provide advice and assistance for the safe and efficient movement of aircraft and vehicles on the manoeuvring area.

Note.— See the Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476), *the* Manual on Advanced-Surface Movement Guidance and Control Systems (A-SMCGS) (Doc 9830) *and the* Air Traffic Services Planning Manual (Doc 9426) *for guidance on the use of SMR.*

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CHAPTER 4. FLIGHT INFORMATION SERVICE

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~~4.3.10~~4.3.1.4 Use of the OFIS messages in directed request/reply transmissions

When requested by the pilot, the applicable OFIS message(s) shall be transmitted by the appropriate ATS unit.

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4.3.4 Voice-automatic terminal information service (Voice-ATIS) broadcasts

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4.3.4.6 **Recommendation.—** ~~*Pending the development and adoption of a more suitable form of speech for universal use in aeronautical radiotelephony communications,*~~ Voice-ATIS broadcasts provided at designated aerodromes ~~designated~~ for use by international air services ~~should~~ shall be available in the English language as a minimum.

4.3.4.7 **Recommendation.—** *Where Voice-ATIS broadcasts are available in more than one language, a discrete channel should be used for each language.*

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CHAPTER 6. AIR TRAFFIC SERVICES REQUIREMENTS FOR COMMUNICATIONS

6.1 Aeronautical mobile service (air-ground communications)

6.1.1 General

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6.1.1.2 When direct pilot-controller two-way radiotelephony or data link communications are used for the provision of air traffic control service, recording facilities shall be provided on all such air-ground communication channels.

Note.— Requirements for retention of all automatic recordings of communications in ATC are specified in Annex 10, Volume II, 3.5.1.5.

6.1.1.3 Recordings of communications channels as required in paragraph 6.1.1.2 shall be retained for a period of at least thirty days.

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6.2 Aeronautical fixed service (ground-ground communications)

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6.2.1 General

6.2.1.1 Direct-speech and/or data link communications shall be used in ground-ground communications for air traffic services purposes.

Note 1.— Indication by time of the speed with which the communication should be established is provided as a guide to communication services, particularly to determine the types of communication channels required, e.g. that "instantaneous" is intended to refer to communications which effectively provide for immediate access between controllers; "fifteen seconds" to accept switchboard operation and "five minutes" to mean methods involving retransmission.

Note 2.—Requirements for retention of all automatic recordings of communications in ATC are specified in Annex 10, Volume II, 3.5.1.5.

6.2.2 Communications within a flight information region

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6.2.2.3 *Description of communication facilities*

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6.2.2.3.3 **~~Recommendation.—~~** In all cases where automatic transfer of data to and/or from air traffic services computers is required, suitable facilities for automatic recording ~~should~~ shall be provided.

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6.2.2.3.7 All facilities for direct-speech or data link communications between air traffic services units and between air traffic services units and other units described under 6.2.2.2.1 and 6.2.2.2.2 ~~appropriate military units~~ shall be provided with automatic recording.

6.2.2.3.8 Recordings of data and communications as required in 6.2.2.3.3 and 6.2.2.3.7 shall be retained for a period of at least thirty days.

~~6.2.2.3.8 **Recommendation.—** *All facilities for direct-speech or data link communications required under 6.2.2.2.1 and 6.2.2.2.2 and not otherwise covered by 6.2.2.3.7 should be provided with automatic recording.*~~

6.2.3 Communications between flight information regions

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6.2.3.5 **~~Recommendation.—~~** In all cases where automatic exchange of data between air traffic services computers is required, suitable facilities for automatic recording ~~should~~ shall be provided.

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6.2.3.6 Recordings of data and communications as required in 6.2.3.5 shall be retained for a period of at least thirty days.

6.3 Surface movement control service

6.3.1 Communications for the control of vehicles other than aircraft on manoeuvring areas at controlled aerodromes

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6.3.1.2 **~~Recommendation.—~~** Where conditions warrant, separate communication channels ~~should~~ shall be provided for the control of vehicles on the manoeuvring area. Automatic recording facilities ~~should~~ shall be provided on all such channels.

6.3.1.3 Recordings of communications as required in 6.3.1.2 shall be retained for a period of at least thirty days.

Note.—See also Annex 10, Volume II, 3.5.1.5.

6.4 Aeronautical radio navigation service

6.4.1 Automatic recording of surveillance data

6.4.1.1 **~~Recommendation.—~~** Surveillance data from primary and secondary radar equipment or obtained through ADS or other surveillance systems, used as an aid to air traffic services, ~~should~~ shall be automatically recorded for use in accident and incident investigations, search and rescue, air traffic control and surveillance systems evaluation and training.

6.4.1.2 **~~Recommendation.—~~** Automatic recordings ~~should~~ shall be retained for a period of at least ~~fourteen~~ thirty days. When the recordings are pertinent to accident and incident investigations, they ~~should~~ shall be retained for longer periods until it is evident that they will no longer be required.

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CHAPTER 7. AIR TRAFFIC SERVICES REQUIREMENTS FOR INFORMATION

7.1 Meteorological information

7.1.1 General

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7.1.2 Flight information centres and area control centres

7.1.2.1 Flight information centres and area control centres shall be supplied with SIGMET and AIRMET information, special air-reports, current meteorological reports and forecasts, particular emphasis being given to the occurrence or expected occurrence of ~~weather~~ deterioration in a weather element as soon as this can be determined. These reports and forecasts shall cover the flight information region or control area and such other areas as may be determined on the basis of regional air navigation agreements.

Note.— For the purpose of this provision, certain changes in ~~weather~~ meteorological conditions are construed as ~~weather~~ deterioration in a weather element, although they are not ordinarily considered as such. An increase in temperature may, for example, adversely affect the operation of certain types of aircraft.

7.1.2.2 Flight information centres and area control centres shall be provided, at suitable intervals, with current pressure data for setting altimeters, for locations specified by the flight information centre or area control centre concerned.

7.1.3 Units providing approach control service

7.1.3.1 Units providing approach control service shall be supplied with current meteorological reports and forecasts for the airspace and the aerodromes with which they are concerned. Special reports and amendments to forecasts shall be communicated to the units providing approach control service as soon as they are necessary in accordance with established criteria, without waiting for the next routine report or forecast. Where multiple ~~anemometers~~ sensors are used, the ~~indicators~~ displays to which they are related shall be clearly marked to identify the runway and section of the runway monitored by each ~~anemometer~~ sensor.

Note.—See Note following 7.1.2.1.

7.1.3.2 Units providing approach control service shall be provided with current pressure data for setting altimeters, for locations specified by the unit providing approach control service.

7.1.3.3 Units providing approach control service for final approach, landing and take-off shall be equipped with surface wind ~~indicator(s)~~ display(s). The ~~indicator(s)~~ display(s) shall be related to the same location(s) of observation and be fed from the same ~~anemometer(s)~~ sensor(s) as the corresponding ~~indicator(s)~~ display(s) in the aerodrome control tower and in the meteorological station, where such a station exists.

7.1.3.4 Units providing approach control service for final approach, landing and take-off at aerodromes where runway visual range values are assessed by instrumental means shall be equipped with ~~indicator(s)~~ display(s) permitting read-out of the current runway visual range value(s). The ~~indicator(s)~~ display(s) shall be related to the same location(s) of observation and be fed from the same ~~runway visual range measuring device(s)~~ sensor(s) as the corresponding ~~indicator(s)~~ displays in the aerodrome control tower and in the meteorological station, where such a station exists.

7.1.3.5 **Recommendation**.— *Units providing approach control service for final approach, landing and take-off at aerodromes where the height of cloud base is assessed by instrumental means should be equipped with display(s) permitting read-out of the current value(s) of the height of cloud base. The displays should be related to the same location(s) of observations and be fed from the same sensor(s) as the corresponding display(s) in the aerodrome control tower and in the meteorological station, where such a station exists.*

~~7.1.3.5~~ 7.1.3.6 ~~**Recommendation**.—~~ Units providing approach control service for final approach, landing and take-off ~~should~~ shall be supplied with information on wind shear which could adversely affect aircraft on the approach or take-off paths or during circling approach.

Note.— Provisions concerning the issuance of wind shear warnings and ATS requirements for meteorological information are given in Annex 3, Chapters 7, ~~and~~ 10 and Appendix 6, ~~respectively~~.

7.1.4 Aerodrome control towers

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7.1.4.3 Aerodrome control towers shall be equipped with surface wind ~~indicator(s)~~ display(s). The ~~indicator(s)~~ display(s) shall be related to the same location(s) of observation and be fed from the same ~~anemometer(s)~~ sensor(s) as the corresponding ~~indicator(s)~~ display(s) in the meteorological station, where such a station exists. Where multiple ~~anemometers~~ sensor(s) are used, the ~~indicators~~ displays to which they are related shall be clearly marked to identify the runway and section of the runway monitored by each ~~anemometer~~ sensor.

7.1.4.4 Aerodrome control towers at aerodromes where runway visual range values are measured by instrumental means shall be equipped with ~~indicator(s)~~ display(s) permitting read-out of the current runway visual range value(s). The ~~indicator(s)~~ display(s) shall be related to the same location(s) of observation and be fed from the same ~~runway visual range measuring device(s)~~ sensor(s) as the corresponding ~~indicator(s)~~ display(s) in the meteorological station, where such a station exists.

7.1.4.5 **Recommendation**.— *Aerodrome control towers at aerodromes where the height of cloud base is assessed by instrumental means should be equipped with display(s) permitting read-out of the current value(s) of the height of cloud base. The displays should be related to the same location(s) of observations and be fed from the same sensor(s) as the corresponding display(s) in the meteorological station, where such a station exists.*

~~7.1.4.5~~ ~~**Recommendation.—**~~ 7.1.4.6 Aerodrome control towers ~~should~~ shall be supplied with information on wind shear which could adversely affect aircraft on the approach or take-off paths or during circling approach and aircraft on the runway during the landing roll or take-off run.

~~7.1.4.6~~ 7.1.4.7 **Recommendation.—** *Aerodrome control towers and/or other appropriate units should be supplied with ~~information concerning meteorological conditions which could adversely affect aircraft on the ground, including parked aircraft, and the aerodrome facilities and services.~~ aerodrome warnings.*

Note.— The meteorological conditions ~~are listed in Annex 3, Chapter 7, 7.5.2.~~ for which aerodrome warnings are issued are listed in Annex 3, Appendix 6, 5.1.2.

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APPENDIX 5. AERONAUTICAL DATA QUALITY REQUIREMENTS

Table 1. Latitude and longitude

Latitude and longitude	Accuracy Data type	Integrity Classification
Flight information region boundary points	2 km ~~(1 NM)~~ declared	1×10^{-3} routine
P, R, D ~~areas~~ area boundary points (outside CTA/CTZ boundaries)	2 km ~~(1 NM)~~ declared	1×10^{-3} routine
P, R, D ~~areas~~ area boundary points (inside CTA/CTZ boundar~~y~~ies)	100 m calculated	1×10^{-5} essential
CTA/CTZ boundary points	100 m calculated	1×10^{-5} essential
En-route navaids and fixes, holding, STAR/SID points	100 m surveyed/calculated	1×10^{-5} essential
Obstacles ~~en route~~ in Area 1 (the entire State territory)	~~100~~ 50 m surveyed	1×10^{-3} routine
Obstacles in Area 2 (the part outside the aerodrome/heliport boundary)	5 m surveyed	1×10^{-5} essential
Final approach fixes/points and other essential fixes/points comprising the instrument approach procedure	3 m surveyed/calculated	1×10^{-5} essential

Note 1.—See Annex 15, Appendix 8 for graphical illustrations of obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Note 2.— In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, obstacles are to be collected in accordance with the Area 1 numerical requirements specified in Annex 15, Appendix 8, Table A8-2.

Note 3.C Implementation of Annex 15 provisions 10.6.1.1 and 10.6.1.2 concerning the availability, as of 20 November 2008 and 18 November 2010, of obstacle data according to Area 1 and Area 2 specifications respectively, would be facilitated by appropriate advanced planning for the collection and processing of such data.

Table 2. Elevation/altitude/height

Elevation/altitude/height	Accuracy Data type	Integrity Classification
Threshold crossing height, precision approaches	0.5 m ~~or 1 ft~~ calculated	1×10^{-8} critical
Obstacle clearance altitude/height (OCA/H)	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Obstacles ~~en route~~ in Area 1 (the entire State territory), elevations	~~3~~ 30 m ~~(10 ft)~~ surveyed	1×10^{-3} routine
Obstacles in Area 2 (the part outside the aerodrome/heliport boundary)	3 m surveyed	1×10^{-5} essential
Distance measuring equipment (DME), elevation	30 m (100 ft) surveyed	1×10^{-5} essential
Instrument approach procedures altitude	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Minimum altitudes	50 m ~~or 100 ft~~ calculated	1×10^{-3} routine

Note 1.— See Annex 15, Appendix 8 for graphical illustrations of the obstacle data collection surfaces and criteria used to identify obstacles in the defined areas.

Note 2.— In those portions of Area 2 where flight operations are prohibited due to very high terrain or other local restrictions and/or regulations, obstacles are to be collected in accordance with the Area 1 numerical requirements specified in Annex 15, Appendix 8, Table A8-2.

Note 3.C Implementation of Annex 15 provisions 10.6.1.1 and 10.6.1.2 concerning the availability, as of 20 November 2008 and 18 November 2010, of obstacle data according to Area 1 and Area 2 specifications respectively, would be facilitated by appropriate advanced planning for the collection and processing of such data.

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Table 5. Length/distance/dimension

Length/distance/dimension	Accuracy Data type	Integrity Classification
Airway segments length	1/10 km ~~or 1/10 NM~~ calculated	1×10^{-3} routine
En-route fix formations distance	1/10 km ~~or 1/10 NM~~ calculated	1×10^{-3} routine
Terminal arrival/departure route segments length	1/100 km ~~or 1/100 NM~~ calculated	1×10^{-5} essential
Terminal and instrument approach procedure fix formations distance	1/100 km ~~or 1/100 NM~~ calculated	1×10^{-5} essential

NOTE ON THE NOTIFICATION OF DIFFERENCES TO ANNEX 11 AND FORM OF NOTIFICATION

(Prepared and issued in accordance with instructions of the Council)

1. *Introduction*

1.1 The Assembly and the Council, when reviewing the notification of differences received in compliance with Article 38 of the Convention, have repeatedly noted that the state of such reporting is not entirely satisfactory.

1.2 With a view to achieving a more comprehensive coverage, this note is issued to facilitate the determination and reporting of such differences and to state the primary purpose of such reporting.

1.3 The primary purpose of reporting of differences is to promote safety and efficiency in air navigation by ensuring that governmental and other agencies, including operators, concerned with international civil aviation are made aware of all national rules and practices in so far as they differ from those prescribed in the ICAO Standards.

1.4 Contracting States are, therefore, requested to give particular attention to the notification before 24 October 2005 of differences with respect to the Standards in Annex 11. The Council has also invited Contracting States to extend the above considerations to Recommended Practices.

1.5 Contracting States are asked to note further that it is necessary to make an explicit statement of intent to comply where such intent exists, or where such is not the intent, of the difference or differences that will exist. This statement should be made with respect to the whole of the Annex, i.e. not only to the latest amendment but to the whole Annex, including the amendment.

1.6 If previous notifications have been made in respect of this Annex, detailed repetition may be avoided, if appropriate, by stating the current validity of the earlier notification.

2. *Notification of differences to Annex 11, including Amendment 43*

2.1 Past experience has indicated that the reporting of differences to Annex 11 has in some instances been too extensive since some appear merely to be a different manner of expressing the same intent.

2.2 Guidance to Contracting States in the reporting of differences to Annex 11 can only be given in very general terms. Where the national regulations of States call for compliance with procedures that are not identical but essentially the same as those contained in the Annex, no difference should be reported since the details of the procedures existing are the subject of notification through the medium of aeronautical information publications. The provisions contained in Amendment 43 affect several Recommended Practices contained in Annex 11. Although differences to Recommended Practices are not notifiable under Article 38 of the Convention, Contracting States are invited to notify the Organization of the differences between their national regulations and practices and any corresponding Recommended Practices contained in an Annex when the knowledge of such differences is important for the safety of air navigation. Broadly, the determination should be based on the following criteria in so far as they are applicable:

a) When the national regulations of a Contracting State affect the operation of aircraft of other Contracting States in and above its territory:

   1) by imposing an obligation within the scope of an Annex which is not covered by an ICAO Standard;

   2) by imposing an obligation different in character* from that of the corresponding ICAO Standard;

3) by being more exacting than the corresponding ICAO Standard;

4) by being less protective than the corresponding ICAO Standard.

b) When the national regulations of a Contracting State applicable to its aircraft and their maintenance, as well as to aircrew personnel, engaged in international air operations over the territory of another Contracting State:

1) are different in character[*] from the corresponding ICAO Standard;

2) are less protective than the corresponding ICAO Standard.

c) When the facilities or services provided by a Contracting State for international air navigation:

1) impose an obligation or requirement for safety additional to any that may be imposed by the corresponding ICAO Standard;

2) while not imposing an additional obligation, differ in principle, type or system from the corresponding ICAO Standard;

3) are less protective than the corresponding ICAO Standard.

2.3 For States that have already fully reported differences to Annex 11, or have reported that no differences exist, the reporting of any further differences occasioned by the amendment should be relatively straightforward; however, attention is called to paragraph 1.5 wherein it is indicated that this statement should be made with respect to the whole of the Annex, i.e. not only to the amendment itself but to the Annex as amended.

3. *Form of notification of differences*

3.1 Differences should be notified in the following form:

a) *Reference*: The number of the paragraphs or sub-paragraph in Annex 11 as amended which contains the Standard or Recommended Practice to which the difference relates;

b) *Description of the difference*: Describe the difference precisely and include any additional information necessary to make its effect clear;

c) *Remarks*: Under "Remarks" indicate any reasons for the "Difference".

3.2 The differences notified will be recorded in a supplement to the Annex, normally in the terms used by the Contracting State when making the notification. In the interest of making the supplement as useful as possible, please make statements as clear and concise as possible and confine remarks to essential points. Comments on implementation, in accordance with paragraph 4 b) 2) of the Resolution of Adoption, should not be combined with those concerning differences.

3.3 A *pro forma* to facilitate the notification of differences is given in Attachment C of State letter AN 13/13.1-05/37.

[*] The expression "different in character" in a) 2) and b) 1) would be applied to a national regulation which achieves, by other means, the same objective as that of the corresponding ICAO Standard and so cannot be classified under a) 3) or 4) and b) 2).

—END —

International Civil Aviation Organization | Organisation de l'aviation civile internationale | Organización de Aviación Civil Internacional | Международная организация гражданской авиации | منظمة الطيران المدني الدولي | 国际民用航空组织

Tel.: +1 (514) 954-8219 ext. 8077

Ref.: AN 11/1.3.18-05/28

24 March 2005

Subject: Adoption of Amendment 29 to Annex 6, Part I

Action required: a) Notify any disapproval before 11 July 2005; b) Notify any differences and compliance before 24 October 2005

Sir/Madam,

1. I have the honour to inform you that Amendment 29 to the *International Standards and Recommended Practices, Operation of Aircraft — International Commercial Air Transport — Aeroplanes* (Annex 6, Part I to the Convention on International Civil Aviation) was adopted by the Council at the eleventh meeting of its 174th Session on 9 March 2005. Copies of the Amendment, the Resolution of Adoption and Note on the Notification of Differences are being sent to you under separate cover.

2. When adopting the amendment, the Council prescribed 11 July 2005 as the date on which it will become effective, except for any part concerning which a majority of Contracting States have registered their disapproval before that date. In addition, the Council resolved that Amendment 29, to the extent it becomes effective, will be applicable on 24 November 2005.

3. Amendment 29 arises from:

a) the Separation and Airspace Safety Panel (SASP), and in part from a Secretariat review of the *Regional Supplementary Procedures* (SUPPs, Doc 7030); and

b) the recommendations of the sixth meeting of the Operations Panel, and the Separation and Airspace Safety Panel.

The subjects are given in the amendment to the Foreword of Annex 6, Part I, Eighth Edition, a copy of which is in Attachment A.

999 University Street
Montréal, Quebec
Canada H3C 5H7

Tel.: +1 (514) 954-8219
Fax: +1 (514) 954-6077

E-mail: icaohq@icao.int
Sitatex: YULCAYA

4. The requirement for all aircraft to hold an approval for operations in reduced vertical separation minimum (RVSM) airspace, and the responsibility of States with regard to the issuance of these approvals, are specified in Annex 6, Parts I and II — *International General Aviation — Aeroplanes*. However, the height-keeping performance criteria on which the approvals should be based have, until now, been specified only in the SUPPs of the regions which have implemented RVSM. For the approvals to be valid globally, it is necessary that all States apply the same criteria when issuing approvals. To ensure standardization, the proposed amendment adds new appendices to Parts I and II of Annex 6, containing the height-keeping performance criteria. Additionally, because monitoring of height-keeping performance was the underlying assumption on which RVSM was based, the amendment introduces new provisions in Annex 6, Parts I and II specifying the responsibility of the relevant State authority to take prompt and appropriate action if the monitoring results indicate that the height-keeping performance of a particular aircraft or an aircraft type group exceeds the prescribed limits. A complementary amendment to Annex 11 — *Air Traffic Services* requires, for airspace where RVSM is applied between FL 290 and FL 410 inclusive, the establishment of a Regional Monitoring Agency (RMA) and the sharing of data obtained through the monitoring process.

5. The amendment concerning the operation of aircraft includes the following five distinct issues that involve both safety and efficiency improvements for the operation of aircraft:

a) under some conditions, particularly in busy terminal airspace, flight crew workload associated with single pilot operations under instrument flight rules (IFR) or at night may exceed the capability of single pilots. To address this issue, new Standards and Recommended Practices are introduced for these operations that specify additional operating requirements and equipment carriage requirements;

b) safety and efficiency improvements afforded by the reliability of modern turbine engines enable single-engine turbine-powered aeroplanes to replace multi-engine aeroplanes for commercial operations under instrument meteorological conditions or at night. This amendment introduces new provisions relating to the operational approval of these operations which provide for safety and economic benefits to operators;

c) the suitability and integrity of electronic navigation data products used in air navigation is vital to ensure the safety of operations. This amendment introduces new provisions for appropriate controls to be put in place by States and operators accordingly;

d) crosswind and tailwind values specified in aeroplane flight manuals are maximum values demonstrated during certification, and are not necessarily suitable for operational purposes because they are neither operating limitations (unless stipulated in the limitations section of the flight manual) nor manufacturer guidelines. To provide an appropriate margin of safety under all operating conditions, the amendment requires operators to specify crosswind and tailwind limits in their operations manuals; and

e) the safety and efficiency of modern flight simulators enables pilot-in-command recent experience requirements to be met in a simulator, instead of in the aeroplane. Applicable since 25 November 2004, Annex 1 — *Personnel Licensing* provides for a type rating limiting the privileges to act as a pilot only during the cruise phase of flight (cruise relief pilot). This amendment updates the recent experience requirements for

pilot-in-command and co-pilot, and introduces such requirements for cruise relief pilot accordingly.

6. In accordance with the decision of the 26th Session of the Assembly, I would like to bring to your attention the Organization's long-standing practice of providing documentation to States upon request. Accordingly, the relevant working papers on Amendment 29 to Annex 6, Part I and corresponding minutes of the Council and the Air Navigation Commission proceedings can be made available. In light of the costs involved, however, only one copy of such documents will normally be provided.

7. In conformity with the Resolution of Adoption, may I request:

a) that before 11 July 2005 you inform me if there is any part of Amendment 29, concerning which your Government wishes to register disapproval, using the form in Attachment B for this purpose. Please note that only statements of disapproval need be registered and if you do not reply it will be assumed that you do not disapprove of the amendment;

b) that before 24 October 2005 you inform me of the following, using the form in Attachment C for this purpose:

1) any differences that will exist on 24 November 2005 between the national regulations or practices of your Government and the provisions of the whole of Annex 6, Part I, as amended by all amendments up to and including Amendment 29, and thereafter of any further differences that may arise; and

2) the date or dates by which your Government will have complied with the provisions of the whole of Annex 6, Part I, as amended by all amendments up to and including Amendment 29.

8. With reference to the request in paragraph 7 a) above, it should be noted that a registration of disapproval of Amendment 29 or any part of it in accordance with Article 90 of the Convention does not constitute a notification of differences under Article 38 of the Convention. To comply with the latter provision, a separate statement is necessary if any differences do exist, as requested in paragraph 7 b) 1). It is recalled in this respect that international Standards in Annexes have a conditional binding force, to the extent that the State or States concerned have not notified any difference thereto under Article 38 of the Convention.

9. Guidance on the determination and reporting of differences is given in the Note on the Notification of Differences which, as mentioned above, is being sent to you under separate cover.

10. Please note that a detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.

11. I would appreciate it if you would also send a copy of your notifications, referred to in paragraph 7 b) above, to the ICAO Regional Director accredited to your Government.

12. As soon as practicable after the amendment becomes effective, on 11 July 2005, replacement pages incorporating Amendment 29 will be forwarded to you.

Accept, Sir/Madam, the assurances of my highest consideration.

Taïeb Chérif
Secretary General

Enclosures:

A — Amendment to the Foreword of Annex 6, Part I
B — Form on notification of disapproval of all or part of Amendment 29 to Annex 6, Part I
C — Form on notification of compliance with or differences from Annex 6, Part I

Under separate cover:

Copy of Amendment 29 to Annex 6, Part I with the associated Resolution of Adoption and Note on the Notification of Differences (to be dispatched on or about 24 March 2005)

ATTACHMENT A to State letter AN 11/1.3.18-05/28

AMENDMENT TO THE FOREWORD OF ANNEX 6, PART I, EIGHTH EDITION

Add the following at the end of Table A (page xx):

Amendment	*Source(s)*	*Subject*	*Adopted/Approved Effective Applicable*
29	Sixth meeting of the Operations Panel and the Separation and Airspace Safety Panel	a) new definitions related to reduced vertical separation minimum (RVSM) operations and cruise relief pilots; b) new Standards 4.9.1 and 4.9.2 concerning single pilot operations under instrument flight rules (IFR) or at night; c) an exception to the operating limitations in 5.1.2 for approved single-engined turbine-powered aeroplanes; d) new Standards 5.4.1 and 5.4.2 specifying requirements for approval of commercial operations by single-engine turbine-powered aeroplanes in instrument meteorological conditions (IMC) or at night; e) new Standard 6.22 specifying aeroplane equipment requirements for single pilot operations under instrument flight rules (IFR) or at night; f) amendments to 7.2.4 regarding flight levels for reduced vertical separation minimum (RVSM) operations, and new Standards 7.2.5, 7.2.6 and 7.2.7 specifying the responsibility of the relevant State authority to take prompt and appropriate action if the monitoring results indicate that the height-keeping performance of a particular aircraft or an aircraft type group exceeds the prescribed limits; g) new Standards 7.4.1 and 7.4.2 concerning operator management of electronic navigation data products; h) amendments to Standards 9.4.1 and 9.4.2 concerning recent experience of the pilot-in-command, co-pilot and cruise relief pilot;	9 March 2005 11 July 2005 24 November 2005

Amendment	*Source(s)*	*Subject*	*Adopted/Approved Effective Applicable*
		i) amendments to Standards 9.4.3.5 and 9.4.3.6, concerning area, route and aerodrome qualifications of the pilot-in-command; j) new Standard 9.4.5.1 requiring States to specify requirements applicable to single pilot operations under the instrument flight rules or at night; k) a new Recommended Practice 9.4.5.2, specifying pilot-in-command experience and training requirements for single pilot operations under the instrument flight rules or at night; l) amendments to Appendix 2, regarding the contents of operations manuals in relation to area, route and aerodrome qualifications of the pilot-in-command, and maximum crosswind and tailwind operating limits; and m) a new Appendix 3 regarding the height-keeping performance criteria for operations in RVSM airspace.	

— — — — — — — —

ATTACHMENT B to State letter AN 11/1.3.18-05/28

NOTIFICATION OF DISAPPROVAL OF ALL OR PART OF AMENDMENT 29 TO ANNEX 6, PART I

To: The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

(State) _____ hereby wishes to disapprove the following parts of Amendment 29 to Annex 6, Part I:

Signature _____ Date _____

NOTES

1) If you wish to disapprove all or part of Amendment 29 to Annex 6, Part I, please dispatch this notification of disapproval to reach Montreal by 11 July 2005. If it has not been received by that date it will be assumed that you do not disapprove of the amendment. **If you approve of all parts of Amendment 29, it is not necessary to return this notification of disapproval.**

2) This notification should not be considered a notification of compliance with or differences from Annex 6, Part I. Separate notifications on this are necessary. (See Attachment C.)

3) Please use extra sheets as required.

— — — — — — — —

ATTACHMENT C to State letter AN 11/1.3.18-05/28

NOTIFICATION OF COMPLIANCE WITH OR DIFFERENCES FROM ANNEX 6, PART I (including all amendments up to and including Amendment 29)

To: The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

1. No differences will exist on _____ between the national regulations and/or practices of **(State)** _____ and the provisions of Annex 6, Part I including all amendments up to and including Amendment 29.

2. The following differences will exist on _____ between the regulations and/or practices of **(State)** _____ and the provisions of Annex 6, Part I, including Amendment 29: (Please see Note 3) below.)

a) **Annex Provision** (Please give exact paragraph reference)	**b)** **Details of Difference** (Please describe the difference precisely)	**c)** **Remarks** (Please indicate reasons for the difference)

(Please use extra sheets as required)

3. By the dates indicated below, **(State)** _____ will have complied with the provisions of Annex 6, Part I, including all amendments up to and including Amendment 29 for which differences have been notified in 2 above.

a) **Annex Provision** (Please give exact paragraph reference)	**b)** **Date**	**c)** **Comments**

(Please use extra sheets as required)

Signature _____ Date _____

NOTES

1) If paragraph 1 above is applicable to you, please complete paragraph 1 and return this form to Montreal. If paragraph 2 is applicable to you, please complete paragraphs 2 and 3 and return the form to Montreal.

2) Please dispatch the form to reach Montreal by 24 October 2005.

3) A detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.

4) Guidance on the notification of differences from Annex 6, Part I is provided in the Note on the Notification of Differences that is being forwarded with a copy of Amendment 29 to Annex 6, Part I under separate cover.

5) Please send a copy of this notification to the ICAO Regional Director accredited to your Government.

— END —

AMENDMENT No. 29

TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

OPERATION OF AIRCRAFT

ANNEX 6

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART I
INTERNATIONAL COMMERCIAL AIR TRANSPORT — AEROPLANES

The amendment to Annex 6, Part I, contained in this document was adopted by the Council of ICAO on **9 March 2005**. Such parts of this amendment as have not been disapproved by more than half of the total number of Contracting States on or before **11 July 2005** will become effective on that date and will become applicable on **24 November 2005** as specified in the Resolution of Adoption.

MARCH 2005

INTERNATIONAL CIVIL AVIATION ORGANIZATION

AMENDMENT 29 TO THE INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

OPERATION OF AIRCRAFT — INTERNATIONAL COMMERCIAL AIR TRANSPORT — AEROPLANES

RESOLUTION OF ADOPTION

The Council

Acting in accordance with the Convention on International Civil Aviation, and particularly with the provisions of Articles 37, 54 and 90 thereof,

1. *Hereby adopts* on 9 March 2005 Amendment 29 to the International Standards and Recommended Practices contained in the document entitled *International Standards and Recommended Practices, Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes* which for convenience is designated Annex 6, Part I to the Convention;

2. *Prescribes* 11 July 2005 as the date upon which the said Amendment shall become effective, except for any part thereof in respect of which a majority of the Contracting States have registered their disapproval with the Council before that date;

3. *Resolves* that the said Amendment or such parts thereof as have become effective shall become applicable on 24 November 2005;

4. *Requests the Secretary General:*

a) to notify each Contracting State immediately of the above action and immediately after 11 July 2005 of those parts of the amendment which have become effective;

b) to request each Contracting State:

1) to notify the Organization (in accordance with the obligation imposed by Article 38 of the Convention) of the differences that will exist on 24 November 2005 between its national regulations or practices and the provisions of the Standards in the Annex as hereby amended, such notification to be made before 24 October 2005, and thereafter to notify the Organization of any further differences that arise;

2) to notify the Organization before 24 October 2005 of the date or dates by which it will have complied with the provisions of the Standards in the Annex as hereby amended.

c) to invite each Contracting State to notify additionally any differences between its own practices and those established by the Recommended Practices, when the notification of such differences is important for the safety of air navigation, following the procedure specified in subparagraph b) above with respect to differences from Standards.

— — — — — — — —

NOTES ON THE PRESENTATION OF THE AMENDMENT TO ANNEX 6, PART I

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

1.	~~Text to be deleted is shown with a line through it.~~	text to be deleted
2.	New text to be inserted is highlighted with grey shading.	new text to be inserted
3.	~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	new text to replace existing text

TEXT OF AMENDMENT 29 TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

OPERATION OF AIRCRAFT

ANNEX 6
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART I
INTERNATIONAL COMMERCIAL AIR TRANSPORT — AEROPLANES

. . .

CHAPTER 1. DEFINITIONS

. . .

Altimetry system error (ASE). The difference between the altitude indicated by the altimeter display, assuming a correct altimeter barometric setting, and the pressure altitude corresponding to the undisturbed ambient pressure.

. . .

Cruise relief pilot. A flight crew member who is assigned to perform pilot tasks during cruise flight, to allow the pilot-in-command or a co-pilot to obtain planned rest.

. . .

Target level of safety (TLS). A generic term representing the level of risk which is considered acceptable in particular circumstances.

. . .

Total vertical error (TVE). The vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

. . .

CHAPTER 4. FLIGHT OPERATIONS

. . .

Insert new 4.9 as follows:

4.9 Additional requirements for single pilot operations under the Instrument Flight Rules (IFR) or at night

4.9.1 An aeroplane shall not be operated under the IFR or at night by a single pilot unless approved by the State of the Operator.

4.9.2 An aeroplane shall not be operated under the IFR or at night by a single pilot unless:

a) the flight manual does not require a flight crew of more than one;

b) the aeroplane is propeller-driven;

c) the maximum approved passenger seating configuration is not more than nine;

d) the maximum certificated take-off mass does not exceed 5 700 kg;

e) the aeroplane is equipped as described in 6.22; and

f) the pilot-in-command has satisfied requirements of experience, training, checking and recency described in 9.4.5.

. . .

CHAPTER 5. AEROPLANE PERFORMANCE OPERATING LIMITATIONS

5.1 General

. . .

5.1.2 Except as provided in 5.4, Ssingle-engine aeroplanes shall only be operated in conditions of weather and light, and over such routes and diversions therefrom, that permit a safe forced landing to be executed in the event of engine failure.

. . .

5.4 Additional requirements for operations of single-engine turbine-powered aeroplanes at night and/or in instrument meteorological conditions (IMC)

5.4.1 In approving operations by single-engine turbine-powered aeroplanes at night and/or in IMC the State of the Operator shall ensure that the airworthiness certification of the aeroplane is appropriate and that the overall level of safety intended by the provisions of Annexes 6 and 8 is provided by:

a) the reliability of the turbine engine;

b) the operator's maintenance procedures, operating practices, flight dispatch procedures and crew training programmes; and

c) equipment and other requirements provided in accordance with Appendix 3.

5.4.2 All single-engine turbine-powered aeroplanes operated at night and/or in IMC shall have an engine trend monitoring system, and those aeroplanes for which the individual Certificate of Airworthiness is first issued on or after 1 January 2005 shall have an automatic trend monitoring system.

. . .

CHAPTER 6. AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

. . .

Insert new 6.22 as follows:

6.22 All aeroplanes operated by a single pilot under the Instrument Flight Rules (IFR) or at night

For approval in accordance with 4.9.1, all aeroplanes operated by a single pilot under the IFR or at night shall be equipped with:

a) a serviceable autopilot that has at least altitude hold and heading select modes;

b) a headset with a boom microphone or equivalent; and

c) means of displaying charts that enables them to be readable in all ambient light conditions.

. . .

CHAPTER 7. AEROPLANE COMMUNICATION AND NAVIGATION EQUIPMENT

. . .

7.2 Navigation equipment

. . .

7.2.4 For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, a reduced vertical separation minimum (RVSM) of 300 m (1 000 ft) is applied ~~above~~ between FL 290 and FL 410 inclusive, an aeroplane:

a) shall be provided with equipment which is capable of:

1) indicating to the flight crew the flight level being flown;

2) automatically maintaining a selected flight level;

3) providing an alert to the flight crew when a deviation occurs from the selected flight level. The threshold for the alert shall not exceed ± 90 m (300 ft); and

4) automatically reporting pressure-altitude; and

b) shall be authorized by the State of the Operator for operation in the airspace concerned.

Insert new text as follows:

7.2.5 Prior to granting the RVSM approval required in accordance with 7.2.4 b), the State shall be satisfied that:

a) the vertical navigation performance capability of the aeroplane satisfies the requirements specified in Appendix 4;

b) the operator has instituted appropriate procedures in respect of continued airworthiness (maintenance and repair) practices and programmes; and

c) the operator has instituted appropriate flight crew procedures for operations in RVSM airspace.

Note.— An RVSM approval is valid globally on the understanding that any operating procedures specific to a given region will be stated in the operations manual or appropriate crew guidance.

7.2.6 The State of the Operator, in consultation with the State of Registry if appropriate, shall ensure that, in respect of those aeroplanes mentioned in 7.2.4 , adequate provisions exist for:

a) receiving the reports of height-keeping performance issued by the monitoring agencies established in accordance with Annex 11, 3.3.4.1; and

b) taking immediate corrective action for individual aircraft, or aircraft type groups, identified in such reports as not complying with the height-keeping requirements for operation in airspace where RVSM is applied.

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

Note.— These provisions and procedures need to address both the situation where the aircraft in question was operating without approval in the airspace of the State, and the situation where an operator for which the State has regulatory oversight responsibility is found to be operating without the required approval in the airspace of another State.

End of new text.

7.2.~~5~~8 The aeroplane shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the aeroplane to navigate in accordance with 7.2.1 and where applicable 7.2.2, 7.2.3 and 7.2.4.

Note.— Guidance material relating to aircraft equipment necessary for flight in airspace where ~~a 300 m (1 000 ft)~~ RVSM is applied ~~above FL 290~~ is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574).

. . .

Insert new 7.4 as follows:

7.4 Electronic navigation data management

7.4.1 An operator shall not employ electronic navigation data products that have been processed for application in the air and on the ground unless the State of the Operator has approved the operator's procedures for ensuring that the process applied and the products delivered have met acceptable standards of integrity, and that the products are compatible with the intended function of the equipment that will use them. The State of the Operator shall ensure that the operator continues to monitor both process and products.

Note.— Guidance relating to the processes that data suppliers may follow is contained in RTCA DO-200A/EUROCAE ED-76 *and* RTCA DO-201A/EUROCAE ED-77.

7.4.2 An operator shall implement procedures that ensure the timely distribution and insertion of current and unaltered electronic navigation data to all aircraft that require it.

. . .

CHAPTER 9. AEROPLANE FLIGHT CREW

Amend Chapter 9 as follows:

9.4 Qualifications

9.4.1 Recent experience — pilot-in-command and co-pilot

An operator shall not assign a ~~pilot to act as pilot-in-command of an aeroplane unless, on that same type of aeroplane within the preceding 90 days, that pilot has made at least three take-offs and landings~~. pilot-in-command or a co-pilot to operate at the flight controls of an aeroplane during take-off and landing unless that pilot has operated the flight controls during at least three take-offs and landings within the preceding 90 days on the same type of aeroplane or in a flight simulator approved for the purpose.

9.4.2 Recent experience — ~~co-~~cruise relief pilot

~~An operator shall not assign a co-pilot to operate at the flight controls during take-off and landing unless, on the same type of aeroplane within the preceding 90 days, that co-pilot has operated the flight controls, as pilot-in-command or as co-pilot, during three take-offs and landings or has otherwise demonstrated competence to act as co-pilot on a flight simulator approved for the purpose.~~

An operator shall not assign a pilot to act in the capacity of cruise relief pilot unless, within the preceding 90 days that pilot has either:

a) operated as a pilot-in-command, co-pilot or cruise relief pilot on the same type of aeroplane; or

b) carried out flying skill refresher training including normal, abnormal and emergency procedures specific to cruise flight on the same type of aeroplane or in a flight simulator approved for the purpose, and has practised approach and landing procedures, where the approach and landing procedure practice may be performed as the pilot who is not flying the aeroplane.

9.4.3 Pilot-in-command area, route and ~~airport~~ aerodrome qualification

. . .

9.4.3.5 An operator shall not continue to utilize a pilot as a pilot-in-command on a route or within an area specified by the operator and approved by the State of the Operator unless, within the preceding 12 months, ~~the~~ that pilot has made at least one trip ~~between the terminal points of that route~~ as a pilot member of the flight crew, or as a check pilot, or as an observer ~~on~~ in the flight ~~deck~~ crew compartment:

a) within that specified area; and

b) if appropriate, on any route where procedures associated with that route or with any aerodromes intended to be used for take-off or landing require the application of special skills or knowledge.

9.4.3.6 In the event that more than 12 months elapse in which a pilot-in-command has not made such a trip on a route in close proximity and over similar terrain, within such a specified area, route or aerodrome, and has not practised such procedures in a training device which is adequate for this purpose, prior to again serving as a pilot-in-command within that area or on that route, that pilot must requalify in accordance with 9.4.3.2 and 9.4.3.3.

. . .

Insert new 9.4.5 as follows:

9.4.5 Single pilot operations under the Instrument Flight Rules (IFR) or at night

9.4.5.1 The State of the Operator shall prescribe requirements of experience, recency and training applicable to single pilot operations intended to be carried out under the IFR or at night.

9.4.5.2 **Recommendation.**— *The pilot-in-command should:*

a) for operations under the IFR or at night, have accumulated at least 50 hours flight time on the class of aeroplane, of which at least 10 hours shall be as pilot in command;

b) for operations under the IFR, have accumulated at least 25 hours flight time under the IFR on the class of aeroplane, which may form part of the 50 hours flight time in sub-paragraph a);

c) for operations at night, have accumulated at least 15 hours flight time at night, which may form part of the 50 hours flight time in sub-paragraph a);

d) for operations under the IFR, have acquired recent experience as a pilot engaged in a single pilot operation under the IFR of:

i) at least five IFR flights, including three instrument approaches carried out during the preceding 90 days on the class of aeroplane in the single pilot role; or

ii) an IFR instrument approach check carried out on such an aeroplane during the preceding 90 days;

e) for operations at night, have made at least three take-offs and landings at night on the class of aeroplane in the single pilot role in the preceding 90 days; and

f) have successfully completed training programmes that include, in addition to the requirements of 9.3, passenger briefing with respect to emergency evacuation; autopilot management; and the use of simplified in-flight documentation.

9.4.5.3 The initial and recurrent flight training and proficiency checks indicated in 9.3.1 and 9.4.4 shall be performed by the pilot-in-command in the single pilot role on the class of aeroplane in an environment representative of the operation.

. . .

APPENDIX 2. ORGANIZATION AND CONTENTS OF AN OPERATIONS MANUAL

(See Chapter 4, 4.2.2.1)

Amend Appendix 2 as follows:

1. Organization

1.1 **Recommendation.**— *An operations manual, which may be issued in separate parts corresponding to specific aspects of operations, provided in accordance with Chapter 4, 4.2.2.1 should be organized with the following structure:*

. . .

c) Areas, ~~R~~routes and aerodromes; and

. . .

1.2 From 1 January 2006, an operations manual, which may be issued in separate parts corresponding to specific aspects of operations, provided in accordance with Chapter 4, 4.2.2.1 shall be organized with the following structure:

. . .

c) Areas, ~~R~~routes and aerodromes; and

. . .

2.1 General

. . .

2.1.24 ~~Route and destination~~ Procedures for familiarization with areas, routes and aerodromes.

. . .

2.2 Aircraft Operating Information

. . .

Insert new 2.2.5 as follows:

2.2.5 The maximum crosswind and tailwind components for each aeroplane type operated and the reductions to be applied to these values having regard to gusts, low visibility, runway surface conditions, crew experience, use of autopilot, abnormal or emergency circumstances, or any other relevant operational factors.

Renumber subsequent paragraphs accordingly.

. . .

Insert new Appendix 3 as follows:

APPENDIX 3. ADDITIONAL REQUIREMENTS FOR APPROVED OPERATIONS BY SINGLE-ENGINE TURBINE-POWERED AEROPLANES AT NIGHT AND/OR IN INSTRUMENT METEOROLOGICAL CONDITIONS (IMC)

(*See Chapter 5, 5.4.1*)

Airworthiness and operational requirements provided in accordance with Chapter 5, 5.4.1, shall satisfy the following:

1. Turbine engine reliability

1.1 Turbine engine reliability shall be shown to have a power loss rate of less than 1 per 100 000 engine hours.

Note.— Power loss in this context is defined as any loss of power, the cause of which may be traced to faulty engine or engine component design or installation, including design or installation of the fuel ancillary or engine control systems. (See Attachment I).

1.2 The operator shall be responsible for engine trend monitoring.

1.3 To minimize the probability of in-flight engine failure, the engine shall be equipped with:

a) an ignition system that activates automatically, or is capable of being operated manually, for take-off and landing, and during flight, in visible moisture;

b) a magnetic particle detection, or equivalent, system that monitors the engine, accessories gearbox, and reduction gearbox, and which includes a flight deck caution indication; and

c) an emergency engine power control device that permits continuing operation of the engine through a sufficient power range to safely complete the flight in the event of any reasonably probable failure of the fuel control unit.

2. Systems and equipment

Single-engine turbine-powered aeroplanes approved to operate at night and/or in IMC shall be equipped with the following systems and equipment intended to ensure continued safe flight and to assist in achieving a safe forced landing after an engine failure, under all allowable operating conditions:

a) two separate electrical generating systems, each one capable of supplying all probable combinations of continuous in-flight electrical loads for instruments, equipment and systems required at night and/or in IMC;

b) a radio altimeter;

c) an emergency electrical supply system of sufficient capacity and endurance, following loss of all generated power to, as a minimum:

1) maintain the operation of all essential flight instruments, communication and navigation systems during a descent from the maximum certificated altitude in a glide configuration to the completion of a landing;

2) lower the flaps and landing gear, if applicable;

3) provide power to one pitot heater, which must serve an air speed indicator clearly visible to the pilot;

4) provide for operation of the landing light specified in 2 j);

5) provide for one engine restart, if applicable; and

6) provide for the operation of the radio altimeter;

d) two attitude indicators, powered from independent sources;

e) a means to provide for at least one attempt at engine re-start;

f) airborne weather radar;

g) a certified area navigation system capable of being programmed with the positions of aerodromes and safe forced landing areas, and providing instantly available track and distance information to those locations;

h) for passenger operations, passenger seats and mounts which meet dynamically-tested performance standards and which are fitted with a shoulder harness or a safety belt with a diagonal shoulder strap for each passenger seat;

i) in pressurized aeroplanes, sufficient supplemental oxygen for all occupants for descent following engine failure at the maximum glide performance from the maximum certificated altitude to an altitude at which supplemental oxygen is no longer required;

j) a landing light that is independent of the landing gear and is capable of adequately illuminating the touchdown area in a night forced landing; and

k) an engine fire warning system.

3. Minimum equipment list

The State of the Operator shall require the minimum equipment list of an operator approved in accordance with Chapter 5, 5.4 to specify the operating equipment required for night and/or IMC operations, and for day/VMC operations.

4. Flight manual information

The flight manual shall include limitations, procedures, approval status and other information relevant to operations by single-engine turbine-powered aeroplanes at night and/or in IMC.

5. Event reporting

5.1 An operator approved for operations by single-engine turbine-powered aeroplanes at night and/or in IMC shall report all significant failures, malfunctions or defects to the State of the Operator who in turn will notify the State of Design.

5.2 The State of the Operator shall review the safety data and monitor the reliability information so as to be able to take any actions necessary to ensure that the intended safety level is achieved. The State of the Operator will notify major events or trends of particular concern to the appropriate Type Certificate Holder and the State of Design.

6. Operator planning

6.1 Operator route planning shall take account of all relevant information in the assessment of intended routes or areas of operations, including the following:

a) the nature of the terrain to be overflown, including the potential for carrying out a safe forced landing in the event of an engine failure or major malfunction;

b) weather information, including seasonal and other adverse meteorological influences that may affect the flight; and

c) other criteria and limitations as specified by the State of the Operator.

6.2 An operator shall identify aerodromes or safe forced landing areas available for use in the event of engine failure, and the position of these shall be programmed into the area navigation system.

Note 1.— A 'safe' forced landing in this context means a landing in an area at which it can reasonably be expected that it will not lead to serious injury or loss of life, even though the aeroplane may incur extensive damage.

Note 2.— Operation over routes and in weather conditions that permit a safe forced landing in the event of an engine failure, as specified in Chapter 5, 5.1.2, is not required by Appendix 3, 6.1 and 6.2 for aeroplanes approved in accordance with Chapter 5, 5.4. The availability of forced landing areas at all points along a route is not specified for these aeroplanes because of the very high engine reliability, additional systems and operational equipment, procedures and training requirements specified in this Appendix.

7. Flight crew experience, training and checking

7.1 The State of the Operator shall prescribe the minimum flight crew experience required for night/IMC operations by single-engine turbine-powered aeroplanes.

7.2 An operator's flight crew training and checking shall be appropriate to night and/or IMC operations by single-engine turbine-powered aeroplanes, covering normal, abnormal and emergency procedures and, in particular, engine failure, including descent to a forced landing in night and/or in IMC conditions.

8. Route limitations over water

The State of the Operator shall apply route limitation criteria for single engine turbine-powered aeroplanes operating at night and/or in IMC on over water operations if beyond gliding distance from an area suitable for a safe forced landing/ditching having regard to the characteristics of the aeroplane, seasonal weather influences, including likely sea state and temperature, and the availability of search and rescue services.

9. Operator certification or validation

The operator shall demonstrate the ability to conduct operations by single-engine turbine-powered aeroplanes at night and/or in IMC through a certification and approval process specified by the State of the Operator.

Note.— Guidance on the airworthiness and operational requirements is contained in Attachment I.

Insert new Appendix 4 as follows:

APPENDIX 4. ALTIMETRY SYSTEM PERFORMANCE REQUIREMENTS FOR OPERATIONS IN RVSM AIRSPACE

(Note.— See Chapter 7, 7.2.5)

1. In respect of groups of aeroplanes that are nominally of identical design and build with respect to all details that could influence the accuracy of height-keeping performance, the height-keeping performance capability shall be such that the total vertical error (TVE) for the group of aeroplanes shall have a mean no greater than 25 m (80 ft) in magnitude and shall have a standard deviation no greater than $28 - 0.013z^2$ for $0 \leq z \leq 25$ when z is the magnitude of the mean TVE in metres, or $92 - 0.004z^2$ for $0 \leq z \leq 80$ where z is in feet. In addition, the components of TVE shall have the following characteristics:

a) the mean altimetry system error (ASE) of the group shall not exceed 25 m (80 ft) in magnitude;

b) the sum of the absolute value of the mean ASE and of three standard deviations of ASE shall not exceed 75 m (245 ft); and

c) the differences between cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

2. In respect of aeroplanes for which the characteristics of the airframe and altimetry system fit are unique and so cannot be classified as belonging to a group of aeroplanes encompassed by paragraph 1, the height-keeping performance capability shall be such that the components of the TVE of the aeroplane have the following characteristics:

a) the ASE of the aeroplane shall not exceed 60 m (200 ft) in magnitude under all flight conditions; and

b) the differences between the cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

End of new text.

. . .

Insert new Attachment I as follows:

ATTACHMENT I. ADDITIONAL GUIDANCE FOR APPROVED OPERATIONS BY SINGLE-ENGINE TURBINE-POWERED AEROPLANES AT NIGHT AND/OR IN INSTRUMENT METEOROLOGICAL CONDITIONS (IMC)

Supplementary to Chapter 5, 5.4 and Appendix 3

1. Purpose and scope

The purpose of this attachment is to give additional guidance on the airworthiness and operational requirements described in Chapter 5, 5.4 and Appendix 3, which have been designed to meet the overall level of safety intended for approved operations by single-engine turbine-powered aeroplanes at night and/or in IMC.

2. Turbine engine reliability

2.1 The power loss rate required in Chapter 5, 5.4.1 and Appendix 3 should be established as likely to be met based on data from commercial operations supplemented by available data from private operations in similar theatres of operation. A minimum amount of service experience is needed on which to base the judgment, and this should include at least 20 000 hours on the actual aeroplane/engine combination unless additional testing has been carried out or experience on sufficiently similar variants of the engine is available.

2.2 In assessing turbine engine reliability, evidence should be derived from a world fleet database covering as large a sample as possible of operations considered to be representative, compiled by the manufacturers and reviewed with the States of Design and the Operator. Since flight hour reporting is not mandatory for many types of operators, appropriate statistical estimates may be used to develop the engine reliability data. Data for individual operators approved for these operations including trend monitoring and event reports should also be monitored and reviewed by the State of the Operator to ensure that there is no indication that the operator's experience is unsatisfactory.

2.2.1 Engine trend monitoring should include the following:

a) an oil consumption monitoring programme based on manufacturers' recommendations; and

b) an engine condition monitoring programme describing the parameters to be monitored, the method of data collection and the corrective action process; this should be based on the manufacturer's recommendations. The monitoring is intended to detect turbine engine deterioration at an early stage to allow for corrective action before safe operation is affected.

2.2.2 A reliability programme should be established covering the engine and associated systems. The engine programme should include engine hours flown in the period and the in-flight shutdown rate for all causes and the unscheduled engine removal rate, both on a 12-month moving average basis. The event reporting process should cover all items relevant to the ability to operate safely at night and/or in IMC. The data should be available for use by the operator, the Type Certificate Holder and the State so as to establish that the intended reliability levels are being achieved. Any sustained adverse trend should result in an immediate evaluation by the operator in consultation with the State and manufacturer with a view to determining actions to restore the intended safety level.The operator should develop a parts control programme with

support from the manufacturer that ensures that the proper parts and configuration are maintained for single engine turbine-powered aeroplanes approved to conduct these operations. The programme includes verification that parts placed on an approved single engine turbine-powered aeroplane during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the necessary configuration of that aeroplane for operations approved in accordance with Chapter 5, 5.4.

2.3 Power loss rate should be determined as a moving average over a specified period (e.g. a 12-month moving average if the sample is large). Power loss rate, rather than in-flight shut-down rate, has been used as it is considered to be more appropriate for a single-engine aeroplane. If a failure occurs on a multi-engined aeroplane that causes a major, but not total, loss of power on one engine, it is likely that the engine will be shut down as positive engine-out performance is still available, whereas on a single-engine aeroplane it may well be decided to make use of the residual power to stretch the glide distance.

2.4 The actual period selected should reflect the global utilization and the relevance of the experience included (e.g. early data may not be relevant due to subsequent mandatory modifications which affected the power loss rate). After the introduction of a new engine variant and whilst global utilization is relatively low, the total available experience may have to be used to try to achieve a statistically meaningful average.

3. Operations manual

The operations manual should include all necessary information relevant to operations by single-engine turbine-powered aeroplanes at night and/or in IMC. This should include all of the additional equipment, procedures and training required for such operations, route and/or area of operation and aerodrome information (including planning and operating minima).

4. Operator certification or validation

The certification or validation process specified by the State of the Operator should ensure the adequacy of the operator's procedures for normal, abnormal and emergency operations, including actions following engine, systems or equipment failures. In addition to the normal requirements for operator certification or validation, the following items should be addressed in relation to operations by single-engine turbine-powered aeroplanes:

a) proof of the achieved engine reliability of the aeroplane engine combination (see Appendix 3, paragraph 1);
b) specific and appropriate training and checking procedures including those to cover engine failure/malfunction on the ground, after take-off and en-route and descend to a forced landing from the normal cruising altitude;

c) a maintenance programme which is extended to address the equipment and systems referred to in Appendix 3, paragraph 2;

d) an MEL modified to address the equipment and systems necessary for operations at night and/or in IMC;

e) planning and operating minima appropriate to the operations at night and/or in IMC;

f) departure and arrival procedures and any route limitations;

g) pilot qualifications and experience; and

h) the operations manual, including limitations, emergency procedures, approved routes or areas of operation, the MEL and normal procedures related to the equipment referred to in Appendix 3, paragraph 2.

5. Operational and maintenance programme requirements

5.1 Approval to undertake operations by single-engine turbine-powered aeroplanes at night and/or in IMC specified in an air operator certificate or equivalent document should include the particular airframe/engine combinations, including the current type design standard for such operations, the specific aeroplanes approved, and the areas or routes of such operations.

5.2 The operator's maintenance control manual should include a statement of certification of the additional equipment required, and of the maintenance and reliability programme for such equipment, including the engine.

6. Route limitations over water

6.1 Operators of single-engine turbine-powered aeroplanes carrying out operations at night and/or in IMC should make an assessment of route limitations over water. The distance from a land mass suitable for a safe forced landing that the aeroplane may be operated should be determined, which equates to the glide distance from the cruise altitude to the safe forced landing area, following engine failure, assuming still air conditions. States may add to this an additional distance taking into account the likely prevailing conditions and type of operation. This should take into account the likely sea conditions, the survival equipment carried, the achieved engine reliability and the search and rescue services available.

6.2 Any additional distance allowed beyond the glide distance should not exceed a distance equivalent to 15 minutes at the aeroplane's normal cruise speed.

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NOTE ON THE NOTIFICATION OF DIFFERENCES TO ANNEX 6, PART I AND FORM OF NOTIFICATION

(Prepared and issued in accordance with instructions of the Council)

1. *Introduction*

1.1 The Assembly and the Council, when reviewing the notification of differences received in compliance with Article 38 of the Convention, have repeatedly noted that the state of such reporting is not entirely satisfactory.

1.2 With a view to achieving a more comprehensive coverage, this note is issued to facilitate the determination and reporting of such differences and to state the primary purpose of such reporting.

1.3 The primary purpose of reporting of differences is to promote safety and efficiency in air navigation by ensuring that governmental and other agencies, including operators, concerned with international civil aviation are made aware of all national rules and practices in so far as they differ from those prescribed in the ICAO Standards.

1.4 Contracting States are, therefore, requested to give particular attention to the notification before 24 October 2005 of differences with respect to Standards in Annex 6, Part I. The Council has also invited Contracting States to extend the above considerations to Recommended Practices.

1.5 Contracting States are asked to note further that it is necessary to make an explicit statement of intent to comply where such intent exists, or where such is not the intent, of the difference or differences that will exist. This statement should be made with respect to the whole of the Annex, i.e. not only to the latest amendment but to the whole Annex, including the amendment.

1.6 If previous notifications have been made in respect of this Annex, detailed repetition may be avoided, if appropriate, by stating the current validity of the earlier notification.

2. *Notification of differences to Annex 6, Part I, including Amendment 29*

2.1 Past experience has indicated that the reporting of differences to Annex 6, Part I has in some instances been too extensive since some appear merely to be a different manner of expressing the same intent.

2.2 Guidance to Contracting States in the reporting of differences to Annex 6, Part I can only be given in very general terms. Where the national regulations of States call for compliance with procedures that are not identical but essentially the same as those contained in the Annex, no difference should be reported since the details of the procedures existing are the subject of notification through the medium of aeronautical information publications. Although differences to Recommended Practices are not notifiable under Article 38 of the Convention, Contracting States are invited to notify the Organization of the differences between their national regulations and practices and any corresponding Recommended Practices contained in an Annex when the knowledge of such differences is important for the safety of air navigation. Broadly, the determination should be based on the following criteria in so far as they are applicable:

a) When the national regulations of a Contracting State affect the operation of aircraft of other Contracting States in and above its territory:

1) by imposing an obligation within the scope of an Annex which is not covered by an ICAO Standard;

2) by imposing an obligation different in character* from that of the corresponding ICAO Standard;

3) by being more exacting than the corresponding ICAO Standard;

4) by being less protective than the corresponding ICAO Standard;

b) When the national regulations of a Contracting State applicable to its aircraft and their maintenance, as well as to aircrew personnel, engaged in international air operations over the territory of another Contracting State:

1) are different in character* from the corresponding ICAO Standard;

2) are less protective than the corresponding ICAO Standard.

c) When the facilities or services provided by a Contracting State for international air navigation:

1) impose an obligation or requirement for safety additional to any that may be imposed by the corresponding ICAO Standard;

2) while not imposing an additional obligation, differ in principle, type or system from the corresponding ICAO Standard;

3) are less protective than the corresponding ICAO Standard.

2.3 For States that have already fully reported differences from Annex 6, Part I, or have reported that no differences exist, the reporting of any further differences occasioned by the amendment should be relatively straightforward; however, attention is called to paragraph 1.5 wherein it is indicated that this statement should be made with respect to the whole of the Annex, i.e. not only to the amendment itself but to the Annex as amended.

3. *Form of notification of differences*

3.1 Differences should be notified in the following form:

a) *Reference:* The number of the paragraphs or subparagraphs in Annex 6, Part I as amended which contains the Standard or Recommended Practice to which the difference relates;

b) *Description of the difference*: Describe the difference precisely and include any additional information necessary to make its effect clear;

c) *Remarks*: Under "Remarks" indicate any reasons for the "Difference".

3.2 The differences notified will be recorded in a Supplement to the Annex, normally in the terms used by the Contracting State when making the notification. In the interest of making the supplement as useful as possible, please make statements as clear and concise as possible and confine remarks to

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* The expression "different in character" in a) 2) and b) 1) would be applied to a national regulation which achieves, by other means, the same objective as that of the corresponding ICAO Standard and so cannot be classified under a) 3) or 4) and b) 2).

essential points. Comments on implementation, in accordance with paragraph 4 b) 2) of the Resolution of Adoption, should not be combined with those concerning differences.

3.3 A *pro forma* to facilitate the notification of differences is given in Attachment C to State letter AN 11/1.3.18-05/28.

— END —

ASIA RVSM MINIMUM MONITORING REQUIREMENTS:

AS OF: 1 July 2005

1. UPDATE OF MONITORING REQUIREMENTS CHART AND WEBSITE. As significant data is obtained, monitoring requirements for specific aircraft types may change. When the chart is updated, a letter will be distributed to States and operators. The updated chart will be posted on the MAAR website being maintained by Aeronautical Radio of Thailand, Ltd. (AEROTHAI) on behalf of the International Civil Aviation Organization (ICAO) Asia-Pacific regional planning group. The website address is:

http://www.aerothai.co.th/maar

2. INITIAL MONITORING. All Asia operators that operate or intend to operate in airspace where RVSM is applied are required to participate in the RVSM monitoring program. The attached chart of monitoring requirements establishes requirements for initial monitoring associated with the RVSM approval process. In their application to the appropriate State authority for RVSM approval, operators must show a plan for meeting the applicable initial monitoring requirements.

3. AIRCRAFT STATUS FOR MONITORING. Aircraft engineering work that is required for the aircraft to receive RVSM airworthiness approval must be completed prior to the aircraft being monitored. Any exception to this rule will be coordinated with the State authority.

4. APPLICABILITY OF MONITORING FROM OTHER REGIONS. Monitoring data obtained in conjunction with RVSM monitoring programs from other regions can be used to meet Asia monitoring requirements. The Monitoring Agency for Asia Region (MAAR), which is responsible for administering the Asia monitoring program, has access to monitoring data from other regions and will coordinate with States and operators to inform them on the status of individual operator monitoring requirements.

5. MONITORING PRIOR TO THE ISSUE OF RVSM OPERATIONAL APPROVAL IS NOT A REQUIREMENT. Operators should submit monitoring plans to the responsible civil aviation authority that show how they intend to meet the requirements specified in the table below. Monitoring will be carried out in accordance with this table.

6. AIRCRAFT GROUPS NOT LISTED ON THE CHART. Contact the MAAR for clarification if an aircraft group is not listed on the Minimum Monitoring Requirements chart or for clarification of other monitoring related issues. An aircraft group not listed in the table below will probably be subject to Category 2 monitoring requirements.

7. TABLE OF MONITORING GROUPS. A table of monitoring groups is provided in the pages following the Minimum Monitoring Requirements Chart. The table shows the aircraft types and series that are grouped together for operator monitoring purposes.

8. TRAILING CONE DATA. Altimetry System Error estimations developed using Trailing Cone data collected during RVSM certification flights can be used to fulfill monitoring requirements. It must be documented, however, that aircraft RVSM systems were in the approved RVSM configuration for the flight.

9. MONITORING OF AIRFRAMES THAT ARE RVSM COMPLIANT ON DELIVERY. If an operator adds new RVSM compliant airframes of a type for which it already has RVSM operational approval and has completed monitoring requirements for the type in accordance with the attached chart, the new airframes are not required to be monitored. If an operator adds new RVSM compliant airframes of an aircraft type for which it has NOT previously received RVSM operational approval, then the operator should complete monitoring in accordance with the attached chart.

10. FOLLOW-ON MONITORING. Monitoring is an on-going program that will continue after the RVSM approval process. A follow-on sampling program for additional operator aircraft will be coordinated by the Asia-Pacific RVSM Implementation Task Force.

MONITORING AGENCY FOR ASIA REGION (MAAR)
EFFECTIVE AS OF: 1 July 2005

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

MONITORING GROUPS FOR AIRCRAFT CERTIFIED UNDER GROUP APPROVAL REQUIREMENTS

Monitoring Group	ICAO Desig-nator	A/C Type	A/C Series
A124	A124	AN-124 RUSLAN	ALL SERIES
A300	A306 A30B	A300 A300	600, 600F, 600R, 620, 620R, 620RF B2-100, B2-200, B4-100, B4-100F, B4-120, B4-200, B4-200F, B4-220, C4-200
A310-GE	A310	A310	200, 200F,300, 300F
A310-PW	A310	A310	220, 220F,320
A318	A318	A318	ALL SERIES
A320	A319 A320 A321	A319 A320 A321	CJ , 110, 130 110, 210, 230 110, 130, 210, 230
A330	A332, A333	A330	200, 220, 240, 300, 320, 340
A340	A342, A343,	A340	210, 310
A345	A345	A340	540
A346	A346	A340	640
A3ST	A3ST	A300	600R ST BELUGA
AN72	AN72	AN-74, AN-72	ALL SERIES
ASTR	ASTR	1125 ASTRA	ALL SERIES
ASTR-SPX	ASTR	ASTR SPX	ALL SERIES
AVRO	RJ1H, RJ70, RJ85	AVRO	RJ70, RJ85, RJ100
B712	B712	B717	200
B727	B721 B722	B727	100, 100C, 100F,100QF, 200, 200F
B732	B732	B737	200, 200C
B737 (Classic)	B733 B734 B735	B737	300, 400, 500
B737 New Generation (NG)	B736 B737 B738 B739	B737 B737 B737 B737	600 700, 700BBJ 800 900
B737 (Cargo)	B737	B737	700C
B747Classic (CL)	B741 B742 B743	B747	100, 100B, 100F, 200B, 200C, 200F, 200SF, 300
B74S	B74S	B747	SR, SP
B744-5	B744	B747	400, 400D, 400F (With 5 inch Probes)
B744-10	B744	B747	400, 400D, 400F (With 10 inch Probes)
B752	B752	B757	200, 200PF

Monitoring Group	ICAO Desig-nator	A/C Type	A/C Series
B753	B753	B757	300
B767	B762 B763	B767	200, 200EM, 200ER, 200ERM, 300, 300ER, 300ERF
B764	B764	B767	400ER
B772	B772	B777	200, 200ER, 300, 300ER
B773	B773	B777	300, 300ER
BE40	BE40	BEECHJET 400A	ALL SERIES
BE20	BE20	BEECH 200 -KINGAIR	ALL SERIES
C500	C500	500 CITATION, 500 CITATION I, 501 CITATION I SINGLE PILOT	ALL SERIES
C525	C525	525 CITATIONJET, 525 CITATIONJET I	ALL SERIES
C525-II	C25A	525A CITATIONJET II	ALL SERIES
C525 CJ3	C25B	CITATIONJET III	ALL SERIES
C550-552	C550	552 CITATION II	ALL SERIES
C550-B	C550	550 CITATION BRAVO	ALL SERIES
C550-II	C550	550 CITATION II, 551 CITATION II SINGLE PILOT	ALL SERIES
C550-SII	C550	S550 CITATION SUPER II	ALL SERIES
C560	C560	560 CITATION V, 560 CITATION V ULTRA, 560 CITATION V ULTRA ENCORE	ALL SERIES
C56X	C56X	560 CITATION EXCEL	ALL SERIES
C650	C650	650 CITATION III , 650 CITATION VI , 650 CITATION VII	ALL SERIES
C750	C750	750 CITATION X	ALL SERIES
CARJ	CRJ1, CRJ2	REGIONALJET	100, 200, 200ER, 200LR
CRJ-700	CRJ7	REGIONALJET	700
CRJ-900	CRJ9	REGIONALJET	900
CL600	CL60	CL-600 CL-601	CL-600-1A11 CL-600-2A12, CL-600-2B16
CL604	CL60	CL-604	CL-600-2B16
BD100	CL30	CHALLENGER 300	ALL SERIES
BD700	GL5T	GLOBAL 5000	ALL SERIES
CONC	CONC	CONCORDE	ALL SERIES
DC10	DC10	DC-10	10, 10F, 15, 30, 30F, 40, 40F
DC86-7	DC86, DC87	DC-8	62, 62F, 72, 72F
DC93	DC93	DC-9	30, 30F
DC95	DC95	DC-9	SERIES 51

Monitoring Group	ICAO Desig-nator	A/C Type	A/C Series
E135-145	E135, E145	EMB-135, EMB-145	ALL SERIES
F100	F100	FOKKER 100	ALL SERIES
F2TH	F2TH	FALCON 2000	ALL SERIES
F70	F70	FOKKER 70	ALL SERIES
F900	F900	FALCON 900, FALCON 900EX	ALL SERIES
FA10	FA10	FALCON 10	ALL SERIES
FA20	FA20	FALCON 20 FALCON 200	ALL SERIES
FA50	FA50	FALCON 50, FALCON 50EX	ALL SERIES
GALX	GALX	1126 GALAXY	ALL SERIES
GLEX	GLEX	BD-700 GLOBAL EXPRESS	ALL SERIES
GLF2	GLF2	GULFSTREAM II (G-1159),	ALL SERIES
GLF2B	GLF2	GULFSTREAM IIB (G-1159B)	ALL SERIES
GLF3	GLF3	GULFSTREAM III (G-1159A)	ALL SERIES
GLF4	GLF4	GULFSTREAM IV (G-1159C)	ALL SERIES
GLF5	GLF5	GULFSTREAM V (G-1159D)	ALL SERIES
H25B-700	H25B	BAE 125 / HS125	700B
H25B-800	H25B	BAE 125 / HAWKER 800XP, BAE 125 / HAWKER 800, BAE 125 / HS125	ALL SERIES/A, B/800
H25C	H25C	BAE 125 / HAWKER 1000	A , B
IL86	IL86	IL-86	NO SERIES
IL96	IL96	IL-96	M , T, 300
J328	J328	328JET	ALL SERIES
L101	L101	L-1011 TRISTAR	1 (385-1), 40 (385-1), 50 (385-1), 100, 150 (385-1-14), 200, 250 (385-1-15), 500 (385-3)
L29B-2	L29B	L-1329 JETSTAR 2	ALL SERIES
L29B-731	L29B	L-1329 JETSTAR 731	ALL SERIES
LJ31	LJ31	LEARJET 31	NO SERIES, A
LJ35/6	LJ35 LJ36	LEARJET 35 LEARJET 36	NO SERIES, A
LJ40	LJ40	LEARJET 40	ALL SERIES
LJ45	LJ45	LEARJET 45	ALL SERIES
LJ55	LJ55	LEARJET 55	NO SERIES B, C
LJ60	LJ60	LEARJET 60	ALL SERIES
MD10	MD10	MD-10	ALL SERIES
MD11	MD11	MD-11	COMBI, ER, FREIGHTER, PASSENGER

Monitoring Group	ICAO Desig-nator	A/C Type	A/C Series
MD80	MD81, MD82, MD83, MD87, MD88	MD-80	81, 82, 83, 87, 88
MD90	MD90	MD-90	30, 30ER
P180	P180	P-180 AVANTI	ALL SERIES
PRM1	PRM1	PREMIER 1	ALL SERIES
T134	T134	TU-134	A, B
T154	T154	TU-154	A , B, M, S
T204	T204, T224, T234	TU-204, TU-224, TU-234	100, 100C, 120RR, 200, C
YK42	YK42	YAK-42	ALL SERIES

Manual of Operating Procedures and Practices for Regional Monitoring Agencies in relation to the use of a 300 m (1 000 ft) Vertical Separation Minimum above FL 290

First Edition— 2004

FOREWORD

The requirements and procedures for the introduction of 300 m (1000 ft) vertical separation between FL290 and FL 410, generally referred to as the reduced vertical separation minimum (RVSM) were developed by the Review of the General Concept of Separation Panel (RGCSP), which has since been renamed the Separation and Airspace Safety Panel (SASP). The provisions necessary for the application of RVSM were incorporated in Annex 2 — *Rules of the Air*, Annex 6 — *Operation of Aircraft,* Annex 11 — *Air Traffic Services* and the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444). More detailed guidance material was provided in the *Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive* (Doc 9574)[1].

In order to ensure that the overall safety objectives for the air traffic services (ATS) system can be met, all aircraft operating in airspace where RVSM is implemented are required to hold an approval, issued by the State of the Operator or State of Registry as appropriate, indicating that they meet all the technical and operational requirements for such operations. This requirement, and the responsibility of States with regard to the issuance of these approvals, are specified in Annex 6, Part I — *International Commercial Air Transport — Aeroplanes*, 7.2.3 b) and Annex 6, Part II — *International General Aviation — Aeroplanes*, 7.2.3 b).

Doc 9574 indicates that there is a need for system performance monitoring during both implementation planning and the post-implementation operational use of RVSM. The principles and procedures for monitoring are described in Chapter 6 of Doc 9574. In all regions where RVSM has been implemented, Regional Monitoring Agencies (RMA) have been established, by the appropriate Planning and Implementation Regional Groups (PIRGs), to undertake these functions. The objectives of the RVSM monitoring programme include, inter alia:

a) verification that the RVSM approval process remains effective;

b) verification that the target level of safety will be met on implementation of RVSM, and will continue to be met thereafter;

[1] *This Note applies only to the unedited version being made available via ICAO-Net. State letter AN 13/13.1-04/71 of 30 June 2004 circulated a proposal for amendments to Annex 6, Parts I and II, and Annex 11, relating to aircraft height-keeping performance in RVSM airspace, the need for height monitoring, and the role of RMAs. The new provisions in this amendment proposal already exist as guidance material in Doc 9574, and are in addition to the existing provisions relating to RVSM in these Annexes. The purpose of the amendments is to raise this material to the status of Standards. Because it is expected that the new Standards will be applicable by the time this manual is published, and for completeness, any references to these provisions in the manual refer to the expected new Annex provisions. Readers should bear in mind that their expected applicability date as Standards is 24 November 2005.*

c) monitoring the effectiveness of the altimetry system modifications which have been implemented to enable aircraft to meet the required height-keeping performance criteria; and

d) evaluation of the stability of altimetry system error (ASE).

This manual was developed to provide guidance for RMAs in the performance of these functions.

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LIST OF ABBREVIATIONS AND ACRONYMS

AAD	assigned altitude deviation
ACAS	airborne collision avoidance system
ACC	area control centre
ASE	altimetry system error
ATC	air traffic control
ATS	air traffic services
CARSAMMA	Caribbean/South American Regional Monitoring Agency
CFL	cleared flight level
CMA	Central Monitoring Agency
CRM	collision risk model
FTE	flight technical error
GMS	GPS-based monitoring system
GMU	GPS-based monitoring unit
GPS	global positioning system
HF	high frequency
HMU	height monitoring unit
JAA	Joint Aviation Authorities
MAAR	Monitoring Agency for the Asia Region
MASPS	minimum aircraft system performance specification
MECMA	Middle East Central Monitoring Agency
NAARMO	North Atlantic Approvals Registry and Monitoring Agency
NAT	North Atlantic
NAT SPG	North Atlantic Systems Planning Group

NOTAM	notice to airmen
PARMO	Pacific Approvals Registry and Monitoring Organization
RGCSP	Review of the General Concept of Separation Panel
RMA	Regional Monitoring Agency
RVSM	reduced vertical separation minimum
SASP	Separation and Airspace Safety Panel
SATMA	South Atlantic Monitoring Agency
SD	standard deviation
SSR	secondary surveillance radar
TLS	target level of safety
TVE	total vertical error
VSM	vertical separation minimum

EXPLANATION OF TERMS

The following definitions are intended to clarify specialized terms used in this document.

Aberrant aircraft. Those aircraft which exhibit measured height-keeping performance that is significantly different from the core height-keeping performance measured for the whole population of aircraft operating in RVSM airspace.

Aircraft type group. Aircraft are considered to be members of the same group if they are designed and assembled by one manufacturer and are of nominally identical design and build with respect to all details that could influence the accuracy of height-keeping performance.

Airworthiness approval. The process by which the State authority ensures that aircraft meet the RVSM minimum aviation system performance specification (MASPS). Typically, this would involve an operator meeting the requirements of the aircraft manufacturer service bulletin for the aircraft and having the State authority verify the successful completion of this work.

Altimetry system error (ASE). The difference between the altitude indicated by the altimeter display assuming a correct altimeter barometric setting and the pressure altitude corresponding to the undisturbed ambient pressure.

Altimetry system error stability. Altimetry system error for an individual aircraft is considered to be stable if the statistical distribution of altimetry system error is within agreed limits over an agreed period of time.

Altitude. The vertical distance of a level, point or an object considered as a point, measured from mean sea level (MSL).

Assigned altitude deviation (AAD). The difference between the transponder Mode C altitude and the assigned altitude/flight level.

Automatic altitude-control system. A system that is designed to automatically control the aircraft to a referenced pressure altitude.

Collision risk. The expected number of mid-air aircraft accidents in a prescribed volume of airspace for a specific number of flight hours due to loss of planned separation.

Exclusionary RVSM airspace. Airspace in which flight cannot be planned by civil aircraft which do not hold a valid RVSM approval from the appropriate State authority.

Note.— One collision is considered to result in two accidents.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Note 1. – A pressure type altimeter calibrated in accordance with the standard atmosphere:

a) when set to a QNH altimeter setting, will indicate altitude;

b) when set to a QFE altimeter setting, will indicate height above the QFE reference datum;

c) when set to 1013.2 hPa, may be used to indicate flight levels.

Note 2.– The terms "height" and "altitude, used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

Flight technical error (FTE). The difference between the altitude indicated by the altimeter display being used to control the aircraft and the assigned altitude/flight level.

Height. The vertical distance of a level, a point or and object considered as a point, measured from a specified datum.

Height-keeping capability. Aircraft height-keeping performance that can be expected under nominal environmental operating conditions with proper aircraft operating practices and maintenance.

Height-keeping performance. The observed performance of an aircraft with respect to adherence to cleared flight level.

Non-compliant aircraft. An aircraft configured to comply with the requirements of the RVSM MASPS which, through height monitoring, is found to have a total vertical error (TVE) or an assigned altitude deviation (AAD) of 90 m (300 ft) or greater, or an altimetry system error (ASE) greater than 75 m (245 ft) .

Non-exclusionary RVSM airspace. Airspace where a vertical separation of 300 m (1 000 ft) is applied between RVSM approved aircraft, but in which flight may be planned by civil aircraft which do not hold a valid RVSM approval from the appropriate State authority. In such airspace, a vertical separation of 600 m (2 000 ft) must be applied between any non-RVSM approved aircraft and all other aircraft.

Occupancy. A parameter of the collision risk model which is twice the number of aircraft proximate pairs in a single dimension divided by the total number of aircraft flying the candidate paths in the same time interval.

Operational approval. The process by which the State authority ensures that an operator meets all the requirements for operating aircraft in RVSM airspace.

Operational error. Any vertical deviation of an aircraft from the correct flight level as a result of incorrect action by ATC or the flight crew.

Overall risk. The risk of collision due to all causes, which includes the technical risk (see definition) and the risk due to operational errors and in-flight emergencies.

Passing frequency. The frequency with which aircraft are in longitudinal overlap when traveling in the same or opposite direction on the same route at adjacent flight levels and at the planned vertical separation.

RVSM approval. The term used to describe the successful completion of airworthiness approval and operational approval.

Target level of safety (TLS). A generic term representing the level of risk which is considered acceptable in particular circumstances.

Technical risk. The risk of collision associated with aircraft height-keeping performance.

Total vertical error (TVE). The vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

Track. The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (true, magnetic, or grid).

Vertical separation. The spacing provided between aircraft in the vertical plane.

Vertical separation minimum (VSM). VSM is documented in the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) as being a nominal 300 m (1 000 ft) below FL 290 and 600 m (2 000 ft) above FL 290 except where, on the basis of regional agreement, a value of less than 600 m (2 000 ft) but not less than 300 m (1 000 ft) is prescribed for use by aircraft operating above FL 290 within designated portions of the airspace.

CHAPTER 1

INTRODUCTION

1.1 Purpose of the Manual

1.1.1 The purpose of this manual is to provide a set of working principles common to all RMAs. It is not intended to provide exhaustive guidance on how to operate a regional monitoring agency (RMA). Information on what is required of an RMA will be found in the *Manual on Implementation of a 300 M (1 000 ft) Vertical Separation Minimum between FL 290 and FL 410 inclusive* (Doc 9574).

1.2 General description of RMA functions

1.2.1 An RMA supports the implementation and continued safe use of RVSM within a designated airspace. In the context of RVSM, "safe" has a quantitative meaning: satisfaction of the agreed safety goal, or target level of safety (TLS). Section 2.1 of Doc 9574 describes the safety objectives associated with RVSM implementation and use. Paragraph 2.1.4 of Doc 9574 specifies that the TLS attributable to aircraft height-keeping performance, or the technical TLS, should be no greater than 2.5×10^{-9} fatal accidents per aircraft flight hour. Paragraph 2.1.6 specifies that the safety goal for overall risk in connection with RVSM should be set by regional agreement, with several examples of precedent indicating that the value used in practice should be consistent with 5×10^{-9} fatal accidents per aircraft flight hour.

1.2.2 Paragraphs 6.4.4 and 6.4.5 of Doc 9574 provide a detailed list of RMA duties and responsibilities. These are also reproduced in Appendix A of this manual. For the purposes of this overview, the functions of an RMA can be summarized as:

a) establish and maintain a database of RVSM approvals;

b) monitor aircraft height-keeping performance and the occurrence of large height deviations, and report results appropriately;

c) conduct safety and readiness assessments and report results appropriately;

d) monitor operator compliance with State approval requirements after RVSM implementation; and

e) initiate necessary remedial actions if RVSM requirements are not met.

1.2.3 The intent of this manual is to provide guidance on RMA operating procedures, in order to achieve a standardized approach to the way in which RMAs carry out these functions and the associated detailed duties and responsibilities of Doc 9574.

1.2.4 The manual also lists, in Appendix A, the RMA responsible for the provision of monitoring and safety assessment activities in each FIR in which RVSM has been implemented.

1.3 Requirements for establishment and operation of an RMA

1.3.1 An RMA must have both the authority and technical competence to carry out its functions. In establishing an RMA, it is therefore necessary to ensure that:

a) the organization must receive authority to act as an RMA as the result of a decision by a State, a group of States or a planning and implementation regional group (PIRG); and

b) the organization acting as an RMA has adequate personnel with the technical skills and experience to carry out the functions listed in 1.2.2.

1.3.2 It is the responsibility of the body authorizing establishment of an RMA to ensure that these requirements are met. An example of a process satisfying this requirement would be for the organization intending to be an RMA to participate in a training programme under the guidance of one of the established RMAs, e.g. the North Atlantic Central Monitoring Agency (NAT CMA), the European Organisation for the Safety of Air Navigation (Eurocontrol) or the Pacific Approvals Registry and Monitoring Organization (PARMO). For an organization with no prior experience with RVSM monitoring, such a programme could take as long as one year and should include both formal and on-the-job training.

CHAPTER 2

WORKING PRINCIPLES COMMON TO ALL REGIONAL MONITORING AGENCIES

This chapter presents the working principles common to all RMAs, and describes the activities associated with the five main RMA functions listed in Section 1.3 of this manual. More detailed information, including agreed data formats, required communication linkages and appropriate references to ICAO documents and regional materials, is provided in the Appendices.

2.1 Establishment and maintenance of an RVSM approvals database

2.1.1 The experience gained through the introduction of RVSM has shown that the RMA plays an essential role in ensuring safety in a region. It has a significant role in all aspects of the monitoring process. One of its functions is to establish a database of aircraft approved by their respective State authorities for operations in RVSM airspace in the region for which the RMA has responsibility. This information is of vital importance if the height-keeping performance data collected by the height-monitoring systems is to be effectively utilized in the risk assessment.

2.1.2 Aviation is a global industry and many aircraft operating in a region where RVSM has not previously been implemented may, nevertheless, be approved for RVSM operations and will have their approvals registered with another RMA. While each RMA will need to establish an RVSM approvals database, there is considerable scope for database sharing. So while a region introducing RVSM will need its own RMA to act as a focal point for the collection and collation of RVSM approvals for aircraft operating solely in that region, it may not need to maintain a complete database of all aircraft in the world that are RVSM approved. It will, however, need to establish links with other RMAs in order to determine the RVSM status of aircraft it has monitored, or intends to monitor, so that a valid assessment of the technical height-keeping risk can be made.

2.1.3 To avoid duplication by States in registering approvals with RMAs, the concept of a designated RMA for the processing of approval data has been established. Under the designated RMA concept, all States are associated with a particular RMA for the processing of RVSM approvals. Appendix B provides a listing of States and the respective designated RMA for RVSM approvals. RMAs may contact any State to address safety matters without regard to the designated RMA.

2.1.4 It is important to note that, in general, the aircraft operating in airspace where the introduction of RVSM is planned can be divided into two categories. The first category of aircraft either operate solely within the airspace for which the introduction of RVSM is being planned, or if they do operate beyond this, do not operate in areas where RVSM has already been introduced, and therefore would not be expected to have received prior RVSM approval. The second category consists of aircraft that also operate in other airspace where RVSM has already been introduced, and will therefore already have received RVSM approval. It is the responsibility of the RMA supporting introduction of RVSM to gather State approvals for the first category of aircraft from the State authorities issuing those approvals — to do so requires that the RMA establish procedures for communicating with each such authority and providing the authority with a precise description of the information required. Appendix C provides the

pertinent forms that an RMA should supply to a State authority to obtain information on aircraft RVSM approval status, together with a brief description of their use.

2.1.5 Where possible, the RMA should collect State RVSM approvals information for the second category of aircraft — those which already operate in RVSM airspace — from other RMAs. This collection will be facilitated if each RMA maintains, in electronic form, a database of State RVSM approvals containing, as a minimum, a standard set of data, common to all RMAs, for each approval.

2.1.6 Appendix D specifies the minimum database content, and the format in which it should be maintained by an RMA. Appendix D also contains a description of the data to be shared by RMAs and the procedures for sharing.

2.2 Monitoring and reporting aircraft height-keeping performance and the occurrence of large height deviations

2.2.1 An RMA must be prepared to collect the information necessary to assess the in-service technical height-keeping performance of the aircraft operating in the airspace for which it has the monitoring responsibility. In addition, it must establish procedures for the collection of information concerning large deviations from cleared flight level and operational errors caused by non-compliance with air traffic control (ATC) instructions or loop errors within the ATC system.

2.2.2 Experience has shown that monitoring of aircraft technical height-keeping performance is a challenging task requiring specialized systems. Experience has also shown that organizing and overseeing the collection of large height deviation information necessitates special procedures. These two topics will be treated separately in this section. Data collection forms, database formats for storage of information and sharing with other RMAs, and reporting requirements and formats will be presented for each topic.

Monitoring aircraft height-keeping performance

2.2.3 Monitoring of aircraft height-keeping performance is a demanding enterprise, particularly as regards estimation of ASE. The following discussion of height-keeping performance monitoring first considers the technical requirements for a monitoring system, and then examines the application of monitoring before and after RVSM implementation in an airspace. Guidance on monitoring requirements for RVSM-approved aircraft is provided along with suggested formats for storing monitoring data to facilitate data exchange with other RMAs.

Establishment of a technical height monitoring function

2.2.4 The principal objectives of an RVSM monitoring programme are to:

a) provide evidence of the effectiveness of the RVSM minimum aviation performance specifications (MASPS), and altimetry system modifications made in order to comply with the MASPS, in achieving the desired height-keeping performance;

b) provide confidence that the TLS will be met when RVSM is implemented, and will continue to be met thereafter; and

c) provide evidence of ASE stability.

2.2.5 In order to achieve these objectives, a technical height-monitoring function has to be established. To date, regions which have implemented RVSM have used either ground-based height monitoring units (HMUs) or air portable global positioning system (GPS) monitoring units (GMUs). Whatever system(s) a region decides to use, the quality and reliability of the monitoring infrastructure and its output data must be ensured through correct specification of the systems and thorough verification of performance.

2.2.6 It is particularly important for RMAs to verify that height-monitoring data from whatever sources it uses can be combined for the purposes of the data analysis. For example, this is especially important in any work to establish ASE stability, as the different measurement errors in individual systems could distort the results and indicate ASE instability when none exists, or vice-versa.

2.2.7 As a means of ensuring both adequate accuracy in estimating total vertical error (TVE) and transferability of monitoring results, an RMA must establish that any TVE estimation system which it administers has a mean measurement error close to zero, and a standard deviation of measurement error not greater than 15 m (50 ft). Estimates of measurement errors associated with the HMU and the GPS-based monitoring system (GMS), which employs GMUs, indicate that each system satisfies these requirements, under the current operational conditions.

2.2.8 An RMA should work with the PIRG for its region to ensure that sufficient monitoring infrastructure is available to meet the region's requirements. A suitable monitoring infrastructure could be established through an arrangement with an existing RMA, the acquisition of monitoring facilities within the region, or by engaging a suitable contractor to operate the monitoring programme. If the latter option is selected, the choice of a support contractor should take into account their prior experience, and the suitability of the monitoring procedures and facilities which they propose using.

2.2.9 For further information on the merits and requirements of HMU and GMU monitoring systems, see Appendix N. If a new method of monitoring is proposed, the new system should, in addition to meeting the requirements of 2.2.7, be evaluated against existing systems, to ensure that the results are comparable.

2.2.10 For regions that have a limited monitoring capability, previous RVSM implementation programmes may provide a useful source of monitoring data for evaluation of technical risk. This should be borne in mind when establishing a technical height-monitoring programme for both pre- and post-implementation monitoring purposes.

Pre-implementation technical height monitoring requirements

2.2.11 The three objectives stated in Doc 9574, and noted in the previous section for aircraft height-keeping performance monitoring are applicable to both the pre- and post-implementation phases. However, in general, evidence of ASE stability would not normally be expected to be a product of the pre-implementation phase monitoring as this is a long-term consideration.

2.2.12 During the pre-implementation phase of an RVSM programme, it is necessary to verify that a sufficiently high proportion of the anticipated RVSM aircraft population meets the requirements of the RVSM MASPS. This is the purpose of a pre-implementation technical height monitoring programme.

2.2.13 The majority of current aircraft types are eligible for RVSM airworthiness approval under group approval provisions. These provisions permit the defining of aircraft type groups consisting of aircraft types which are designed and assembled by one manufacturer and are of nominally identical design and build with respect to all details that could influence the accuracy of height-keeping performance. Appendix E lists the aircraft types which are eligible for RVSM approval under the group provisions, and the groups to which they belong.

2.2.14 In assessing the results of technical height monitoring during the pre-implementation phase of an RVSM programme, the following should be taken into account:

a) it must be demonstrated that the technical TLS of 2.5×10^{-9} fatal accidents per flight hour has been met;

b) the number of aircraft monitored for each operator/aircraft-type combination must meet a pre-determined level;

c) aircraft type-groups must demonstrate performance such that the absolute value of the group mean ASE is not in excess of 25 m (80 ft) and that the sum of the absolute value of the mean ASE and 3 standard deviations (SD) of ASE is not in excess of 75 m (245 ft). No individual measurement should exceed 245 ft in magnitude, excluding monitoring system measurement error; and

d) no individual measurement of ASE for each aircraft approved on a non-group basis for RVSM operations may exceed 49 m (160 ft) in magnitude, excluding monitoring system measurement error.

Note 1.— Data from other regions may be used to meet the above objectives but the age of the data that may be used will be dependent the outcome of on-going work on ASE stability.

Note 2.— With reference to item b) above, the minimum number of aircraft of a particular type to be monitored is normally expressed as a percentage of the operator's fleet of that type, with a further provision that the number of aircraft must not be less than a specified number.

Note 3.— Subject to a satisfactory collision risk assessment and other operational considerations, performance verification could be terminated provided that 90 per cent of the flights in the region, or part thereof, would be made by operators that have met the pre-determined minimum monitoring requirements.

2.2.15 Guidance regarding the conduct of a safety assessment leading to an estimate of risk for comparison with the TLS referred to in 2.2.14 a) is provided in Section 2.3.

2.2.16 With regard to 2.2.14 b), Appendix E contains the agreed minimum monitoring requirements applicable to operator/aircraft-type combinations. Adjustments to the aircraft type groups

and minimum monitoring requirements may be necessary, based on the analysis of monitoring data. Any such changes should be coordinated among the RMAs. Appendix M contains guidance concerning the reduction of minimum monitoring requirements.

2.2.17 It is especially important that an RMA takes appropriate action if the height-keeping performance monitoring system detects an individual aircraft whose ASE, after accounting for measurement error, is in excess of the 75 m (245 ft) limit noted in 2.2.14 c). Similarly, appropriate action should be taken if either an aircraft's observed TVE after accounting for measurement error, or its assigned altitude deviation (AAD), is 90 m (300 ft) or more. In all cases, the action should include notifying the aircraft operator and the State authority which granted the aircraft's RVSM approval. Appendix F contains an example of such a letter of notification.

2.2.18 Procedures also need to be established whereby the PIRG is provided with timely notification of all actions taken under the provisions of 2.2.17.

2.2.19 In order to facilitate the exchange of aircraft height-keeping performance monitoring data between RMAs, an RMA should maintain the minimum information identified in Appendix G for each observation of aircraft height-keeping performance obtained from the airspace within which it exercises its functions.

Post-implementation technical height monitoring requirements

2.2.20 The PIRG which established an RMA should determine the reporting requirements for that RMA. These requirements would normally include the demonstration, on an annual basis, that the technical TLS of 2.5×10^{-9} fatal accidents per flight hour continues to be met within the airspace for which the RMA has responsibility.

2.2.21 Aircraft type-groups must demonstrate performance such that the absolute value of the group mean ASE is not in excess of 25 m (80 ft) and that the sum of the absolute value of mean ASE and 3SD of ASE is not in excess of 75 m (245 ft). No individual measurement should exceed 75 m (245 ft), excluding monitoring system measurement error.

2.2.22 No individual measurement of ASE for each aircraft approved on a non-group basis for RVSM operations, may exceed 49 m (160 ft) in magnitude, excluding monitoring system measurement error.

2.2.23 Operator/aircraft-type combinations not previously monitored prior to implementation should be targeted for monitoring.

2.2.24 Aircraft operator/aircraft-type combinations should continue to be monitored to meet a pre-determined level at the frequency prescribed by the RMA.

Note 1.— The specific requirements for post-implementation monitoring, in addition to those listed above, are dependent on the stability of ASE. These requirements, including the frequency and time period required, are still under consideration.

Note 2.— Data from other regions may be used to meet the above objectives. However, the age of the data that may be used will be dependent on the on-going work on ASE stability.

Reporting of aircraft height-keeping performance statistics

2.2.25 Where an RMA is employing a height-keeping performance monitoring system producing substantial estimates of aircraft ASE, tabulations of ASE by aircraft type groups, as identified in Appendix E, should be kept. For each group, the magnitude of mean ASE and the magnitude of mean ASE + 3SD of ASE should be compared, respectively, to the limits of (25 m) 80 ft and 75 m (245 ft), noted above, and reported annually to the body which authorized the establishment of the RMA.

2.2.26 In order to provide for situations where one or both of these limits is exceeded for an aircraft type group, an RMA should have a process in place to examine the findings, e.g. through consultation with airworthiness and operations specialists. This could be achieved, where necessary, by establishing a group within the region consisting of specialists in these fields. Alternatively, and in particular in cases where the observed performance deficiency is affecting more than one region, it may be possible to achieve this through cooperation with other regions which have established airworthiness and operations groups.

2.2.27 It is the RMA's responsibility to bring performance issues having an impact on safety to the attention of State authorities, aircraft manufacturers and PIRGs. Should the examination of monitoring results indicate a potential systematic problem in group performance, the RMA, or other appropriate body, should notify both the State authority that issued the airworthiness approval for the aircraft type group in question and the aircraft manufacturer. Where applicable, the RMA may also propose remedial measures. An RMA does not have the regulatory authority to require that improvements to performance be made; only the State which approved the RVSM airworthiness documents for the aircraft type group has such authority. However, the State is required, under the provisions of Annex 6, Parts I and II, paragraph 7.2.6, to take immediate corrective action with regard to aircraft which are reported by an RMA as not complying with the height-keeping requirements.[2]

2.2.28 The RVSM airworthiness approval documents — in the form of an approved service bulletin, supplementary type certificate or similar State-approved material — provide directions to an operator regarding the steps necessary to bring an aircraft type into compliance with RVSM requirements. If there is a flaw in the ASE performance of an aircraft type, the ultimate goal of the RMA is to influence appropriate corrections to these documents. An RMA's actions to achieve this goal should be the following: assemble all ASE monitoring data for the aircraft type from the airspace for which the RMA is responsible in accordance with the approach shown in Appendix H;

a) assemble the measurement-error characteristics of the monitoring system or systems used to produce the results in a);

b) as deemed relevant by the RMA, assemble all summary monitoring data — consisting of mean ASE, ASE SD, minimum ASE, maximum ASE, and details of any flights found to be non-compliant with ASE requirements — from other regions or airspace where the aircraft type has been monitored; and

[2] See Note to Foreword

c) by means of an official RMA letter, similar in form to that shown in Appendix H, inform the State authority which approved the airworthiness documents for the aircraft type group, and the manufacturer, of the observation of allegedly inadequate ASE performance, citing:

1) the requirement that the absolute value of an aircraft-type group's mean ASE be no greater than 25 m (80 ft), and that the sum of the absolute value of the group's mean ASE and 3SD of ASE be no greater than 75 m (245 ft);

2) the data described in a) and b) and, as necessary, c), which will be provided on request;

3) the need for compliance with these requirements in order to support safe RVSM operations; and

4) a request to be informed of consequent action taken by the State and/or manufacturer to remedy the cause or causes of the observed performance, including any changes to the State airworthiness approval documents.

Monitoring the occurrence of large height deviations

2.2.29 Experience has shown that large height deviations — errors of 90 m (300 ft) or more in magnitude — have had significant influence on the outcome of safety assessments before and after implementation of RVSM. RMAs play a key role in the collection and processing of reports of such occurrences.

2.2.30 The causes of such errors have been found to be:

a) an error in the altimetry or automatic altitude control system of an aircraft;

b) turbulence and other weather-related phenomena;

c) an emergency descent by an aircraft without the crew following established contingency procedures;

d) response to airborne collision avoidance system (ACAS) resolution advisories;

e) not following an ATC clearance, resulting in flight at an incorrect flight level;

f) an error in issuing an ATC clearance, resulting in flight at an incorrect flight level; and

g) errors in coordination of the transfer of control responsibility for an aircraft between adjacent ATC units, resulting in flight at an incorrect flight level.

2.2.31 The aircraft height-keeping performance monitoring programme administered by an RMA addresses the first of these causes. There is, however, a need to establish, at a regional level, the

means to detect and report the occurrence of large height deviations due to the remaining causes. While the RMA will be the recipient and archivist for reports of large height deviations, it is important to note that the RMA alone cannot be expected to conduct all activities associated with a comprehensive programme to detect and report large height deviations. This needs to be addressed through the appropriate PIRG and its subsidiary bodies, as part of an overall regional safety management programme.

2.2.32 Experience has shown that the primary sources for reports of large height deviations are the ATC units providing air traffic control services in the airspace where RVSM is or will be applied. The surveillance information available to these units, in the form of voice reports, or where available, automatic dependent surveillance (ADS) reports and secondary surveillance radar Mode C returns, provides the basis for identifying large height deviations. A programme for identifying large height deviations should be established, and ATC units should report such events monthly. It is the responsibility of the RMA to collect this information, and to provide periodic reports of observed height deviations to the appropriate PIRG and/or its subsidiary bodies, in accordance with procedures prescribed by the PIRG.

2.2.33 The reports from ATC units to the RMA should contain, as a minimum, the following information:

a) reporting unit;

b) location of deviation, either as latitude/longitude or a bearing and distance from a significant point;

c) date and time of large height deviation;

d) sub-portion of airspace, such as established route system, if applicable;

e) flight identification and aircraft type;

f) assigned flight level;

g) final reported flight level or altitude and basis for establishment (e.g. pilot report or Mode C);

h) duration at incorrect level or altitude;

i) cause of deviation;

j) any other traffic in potential conflict during deviation;

k) crew comments when notified of deviation; and

l) remarks from ATC unit making report.

A suggested form for these monthly reports is shown in Appendix I.

2.2.34 Other sources for reports of large height deviations should also be explored. For example, an RMA should investigate, in conjunction with the responsible PIRG, whether operators within the airspace for which it is responsible would be prepared to share pertinent summary information from internal safety occurrence databases. Arrangements should also be made for access to information which may be pertinent to the RVSM airspace from State databases of air safety incident reports and voluntary reporting safety databases, such as the Aviation Safety Reporting System administered by the United States. National Aeronautics and Space Administration (NASA), all of which could be possible sources of information concerning large height deviation incidents in the airspace for which the RMA is responsible.

2.3 Conducting safety and readiness assessments and reporting results before RVSM implementation

2.3.1 A safety assessment consists of estimating the risk of collision associated with RVSM and comparing this risk to the agreed RVSM safety goal, the TLS. An RMA needs to acquire an in-depth knowledge of the use of the airspace within which RVSM will be implemented. This requirement will continue after implementation. Experience has shown that such knowledge can be gained, in part, through a review of charts and other material describing the airspace, and through periodic collection of samples of traffic movements within the airspace. However, it is also important that the personnel of the RMA have sufficient understanding of the way in which an ATC system operates to enable them to correctly interpret the information from these sources. It should also be noted that currently, there is no standard collision risk model (CRM) applicable to all airspace. It will be necessary to adapt existing CRMs to take account of regional variations.

2.3.2 A readiness assessment is an examination of the approval status of operators and aircraft using airspace where RVSM is planned in order to evaluate whether a sufficiently high proportion of operations will be conducted by approved operators and aircraft when RVSM is introduced.

2.3.3 An RMA is responsible for conducting both safety and readiness assessments prior to RVSM implementation. The responsibility for conducting safety assessments continues after RVSM is introduced.

Safety assessment

2.3.4 One of the principal duties of an RMA is to conduct a safety assessment prior to RVSM implementation. It is strongly recommended that an RMA conduct a series of safety assessments prior to RVSM implementation. These should start at least one year prior to the planned implementation date, in order to provide the body overseeing RVSM introduction with early indications of any problems which must be remedied before RVSM may be implemented.

2.3.5 The PIRG will specify the safety reporting requirements for the RMA.

Establishing the competence necessary to conduct a safety assessment

2.3.6 Conducting a safety assessment is a complex task requiring specialized skills that are not widely available. As a result, an RMA will need to pay special attention to ensuring that it has the necessary competence to complete this task prior to and after RVSM implementation.

2.3.7 Ideally, an RMA should have the internal competence to conduct a safety assessment. However, recognizing that personnel with the required skills may not be available internally, it may be necessary for the RMA to augment its internal staff capabilities, through arrangements with another RMA or some other organization possessing the necessary competence.

2.3.8 If it is necessary to use an external organization to conduct a safety assessment, the RMA must nevertheless have the internal competence to judge that such an assessment is done properly. This competence should be acquired through an arrangement with an RMA that has experience in the conduct of safety assessments.

Preparations for conduct of a safety assessment

2.3.9 In preparing to support an RVSM implementation, the responsible RMA needs to ensure that the safety assessment takes account of all the factors which influence collision risk within the airspace where RVSM will be applied. RMAs therefore need to establish the means for collecting and organizing the pertinent data and other information that is needed to adequately assess all the relevant airspace factors. As is noted below, some data sources from other airspace where RVSM has been implemented may assist an RMA in conducting a safety assessment. However, the overall safety assessment results from another portion of worldwide airspace may not be used as the sole justification for concluding that the TLS will be met in the airspace where the RMA has safety assessment responsibility.

Assembling a sample of traffic movements from the airspace

2.3.10 Samples of traffic movements should be collected for the entire airspace where RVSM will be implemented. As a result, ATC providers within the airspace may need to cooperate in the collection of samples. In this case, the RMA will need to coordinate collection of traffic movement samples through the body overseeing RVSM implementation.

2.3.11 The first sample of traffic movement data should be collected as soon as is practicable after the decision to implement RVSM within a particular airspace has been made. However, it is also necessary that the operational details of the implementation are agreed prior to the data collection. For example, RVSM may be implemented as exclusionary airspace, in which an aircraft must have RVSM approval to flight plan through the airspace, or as non-exclusionary airspace, in which flight by non-RVSM approved aircraft is permitted. In the latter case, a minimum of 600 m (2 000 ft) vertical separation must be provided between the non-approved aircraft an all other aircraft. The RMA also needs to be aware of any changes to the ATS route structure, including changes to the permitted directions of flight on existing routes. Operational factors such as these need to be taken into account in the safety assessment.

2.3.12 The RMA should plan to collect at least two samples of traffic movement data prior to RVSM implementation, with the timing of the first as noted in the previous paragraph. The timing of the second sample should be as close to the planned time of implementation as is practicable in light of the time required to collect, process and analyze the sample, and to extract information necessary to support final safety and readiness assessments.

2.3.13 In planning the time and duration of a traffic sample, the RMA should take into account the importance of capturing any periods of heavy traffic flow which might result from seasonal or other factors. The duration of any traffic sample should be at least 30 days, with a longer sample period left to the judgment of the RMA.

2.3.14 The following information should be collected for each flight in the sample:

a) date of flight;

b) aircraft identification, in standard ICAO format;

c) aircraft type designator;

d) aircraft registration mark, if available;

e) location indicator for the aerodrome of origin;

f) location indictor for the destination aerodrome;

g) entry point into RVSM airspace (as a significant point or latitude/longitude);

h) time at entry point;

i) flight level at entry point;

j) exit point from RVSM airspace (as a significant point or latitude/longitude);

k) time at exit point;

l) flight level at exit point; and

m) as many additional position/time/flight-level combinations as the RMA judges are necessary to capture the traffic movement characteristics of the airspace.

2.3.15 Where possible, in coordinating the collection of the sample, the RMA should specify that information be provided in electronic form, for example, in a spreadsheet. Appendix J contains a sample specification for the collection of traffic movement data in electronic form, where the entries in the first column may be used as column headings on a spreadsheet template.

2.3.16 Acceptable sources for the information required in a traffic movement sample are one or more of the following: special ATC observations, ATC automation systems, automated air traffic management systems, and secondary surveillance radar (SSR) reports.

Review of operational procedures and airspace organization

2.3.17 Experience has shown that the operational procedures and airspace organization associated with an RVSM implementation can substantially affect the collision risk in RVSM airspace. A

further example of this, in addition to those already given in 2.3.11, would be a decision to apply the Table of Cruising Levels in Appendix 3 of Annex 2 — *Rules of the Air*, while using routes in a unidirectional manner. The consequence of this decision would be to provide an effective 600 m (2 000 ft) vertical separation between aircraft at adjacent usable flight levels on these routes.

2.3.18 In light of such possibilities, the RMA should carefully review the proposed operational procedures and airspace organization in order to identify any features that might influence risk. The body responsible for the planning and oversight of the RVSM implementation should be informed about any aspects of the proposals which could adversely affect risk.

Agreed process for determining whether the TLS is met as the result of a safety assessment

2.3.19 "Technical risk" is the term used to describe the risk of collision associated with aircraft height-keeping performance. Some of the factors which contribute to technical risk are:

a) errors in aircraft altimetry and automatic altitude control systems;

b) aircraft equipment failures resulting in unmitigated deviation from the cleared flight level, including those where not following the required procedures further increased the risk; and

c) responses to false ACAS resolution advisories.

Intuitively, such factors affect risk more if the planned vertical separation between a pair of aircraft is 300 m (1 000 ft) than if a 600 m (2 000 ft) standard is in use.

2.3.20 The term "operational error" is used to describe any vertical deviation of an aircraft from the correct flight level as a result of incorrect action by ATC or the flight crew. Examples of such actions are:

a) a flight crew misunderstanding an ATC clearance, resulting in the aircraft operating at a flight level other than that issued in the clearance;

b) ATC issuing a clearance which places an aircraft at a flight level where the required separation from other aircraft cannot be maintained;

c) a coordination failure between ATC units in the transfer of control responsibility for an aircraft, resulting in either no notification of the transfer or in transfer at an unexpected flight level;

d) inappropriate response to a valid ACAS resolution advisory; and

e) wrong pressure setting on the altimeters, e.g. QNH remains set.

2.3.21 On initial consideration, the relation between the required vertical separation and the risk due to operational errors may be less clear than is the case with technical risk. However, as will be pointed out during subsequent discussion of risk modelling, introduction of RVSM does increase the risk

associated with such errors if all other factors remain unchanged when transitioning from a 600 m (2 000 ft) to a 300 m (1 000 ft) vertical separation minimum. When carrying out the risk assessment, care should be taken to avoid including a single event in both the assessment of technical and operational risk.

2.3.22 The overall RVSM safety goal which must be satisfied is a TLS value of 5×10^{-9} fatal accidents per flight hour due to all causes of risk associated with RVSM. However, as noted in 1.2.1, there is also an upper limit to the permissible technical risk. In order to declare that the safety goal has been met, the RMA must therefore show that the following two conditions are satisfied simultaneously:

a) the technical risk does not exceed 2.5×10^{-9} fatal accidents per flight hour; and

b) the sum of the technical risk and the risk resulting from operational errors does not exceed 5×10^{-9} fatal accidents per flight hour.

2.3.23 While there is a firm bound on technical risk of 2.5×10^{-9} fatal accidents per flight hour, there is no similar maximum tolerable value for risk due to operational errors. Thus, it is possible that the application of risk modelling can result in an estimate of technical risk less than 2.5×10^{9} fatal accidents per flight hour and an estimate of operational risk in excess of this value, with the sum of the two still satisfying the overall TLS. On the other hand, if the estimate of technical risk exceeds 2.5×10^{-9} fatal accidents per flight hour, it is not possible to satisfy the overall safety goal, even if the sum of the estimated technical and operational risks does not exceed 5×10^{-9} fatal accidents per flight hour.

The collision risk model used in safety assessment

2.3.24 This guidance will not present derivation or details of the collision risk model to be used in conducting a safety assessment. An RMA should acquire that background knowledge through review of the following publications:

a) *Report of the Sixth Meeting of the Review of the General Concept of Separation Panel* (RGCSP/6) (Doc 9536) Montreal, 28 November to 15 December 1988, Volume 1 *(History and Report)* and Volume 2 *(Annexes A to E)*;

b) *Risk Assessment and System Monitoring*[3], August 1996, available from the ICAO European and North Atlantic Office;

c) *EUR RVSM Mathematical Supplement*, Document RVSM 830, European Organisation for the Safety of Air Navigation (Eurocontrol), August 2001; and

d) *Guidance Material on the Implementation of a 300 m (1 000 ft) Vertical Separation Minimum (VSM) for Application in the Airspace of the Asia Pacific Region*, Appendix C, ICAO Asia and Pacific Office, Bangkok, October 2000.

[3] This material was contained in NAT Doc 002 which is no longer in print; however, the Supplement is still available.

2.3.25 The report of RGCSP/6 contains the derivation of the basic mathematical vertical collision risk model, as well as a description of the choice of a value for the portion of the TLS applied to technical risk.

2.3.26 The North Atlantic and Eurocontrol documents contain the detailed safety assessment processes and procedures applied in the two Regions in preparation for RVSM implementation. Appendix K presents an overview of the mathematical models used in the North Atlantic safety assessment process.

Readiness assessment

2.3.27 A readiness assessment is a comparison of the actual and predicted proportion of operations conducted by State-approved operators and aircraft in an airspace prior to RVSM implementation to a threshold proportion established by the body overseeing the implementation. Such an assessment is most meaningful when the oversight body has agreed that RVSM will be applied on an exclusionary basis, that is, that all flights planned to be operated in the airspace must be conducted by an operator and aircraft with State RVSM approval.

2.3.28 A readiness assessment requires information from two sources; a sample of traffic movements in the relevant airspace, and the database of State RVSM approvals.

2.3.29 The RMA should organize the traffic movement sample by the number of operations for each operator/aircraft-type pair and then, if registration marks are available in the sample, by the number of operations for the individual aircraft within each operator/aircraft-type pair. The approval status of each aircraft should then be checked using the database of State approvals. If registration marks are not available in the sample data, it will be necessary to make some assumptions about the proportion of the operations by the operator/aircraft-type pair in question that were flown by RVSM approved aircraft. In the absence of more specific data, this could be based on the proportion of the operator's fleet of aircraft of that type which were RVSM approved.

2.3.30 Once the classification of all operations as approved or non-approved is complete, the sum of RVSM approved operations is divided by the total number of operations in the sample, to give the proportion of operations conducted by RVSM-approved operators and aircraft. This can then be compared to the readiness threshold.

2.3.31 The RMA should prepare periodic reports of the readiness status of operators and aircraft during the period of preparation for RVSM implementation. Typically, such a report would be provided for each meeting of the body overseeing RVSM implementation.

2.3.32 Experience indicates that it is important to take into account the future plans of operators regarding RVSM approval when conducting a readiness assessment. The RMA should, therefore, attempt to establish the intentions of operators regarding the approval of existing aircraft, and acquisition of new aircraft types, and include this information as a companion report to the readiness assessment.

2.4 Safety reporting and monitoring operator compliance with State approval requirements after RVSM implementation

2.4.1 The responsibilities of an RMA continue after RVSM implementation. The overall function of RMA activities after implementation is to support the continued safe use of RVSM.

2.4.2 After RVSM implementation, the RMA should conduct periodic safety assessments in order to determine whether the TLS continues to be met. The frequency of these reports would be as required by the responsible PIRG. The minimum requirement should be annual reports.

2.4.3 One important post-implementation activity is to carry out periodic checks of the approval status of operators and aircraft using airspace where RVSM is applied. This activity is especially important if RVSM is applied on an exclusionary basis. This activity is termed monitoring operator compliance with State approval requirements.

2.4.4 An RMA will require two sources of information to monitor operator compliance with State approval requirements: a listing of the operators, and the type and registration marks of aircraft operating in the airspace; and the database of State RVSM approvals.

2.4.5 Ideally, this compliance monitoring should be done for the entire airspace on a daily basis. Difficulties in accessing traffic movement information may make such daily monitoring impossible. As a minimum, the responsible RMA should conduct compliance monitoring of the complete airspace for at least a 30-day period annually.

2.4.6 When conducting compliance monitoring, the filed RVSM approval status shown on the flight plan of each traffic movement should be compared to the database of State RVSM approvals. When a flight plan shows an aircraft as RVSM approved, but the approval is not recorded in the database, the appropriate State authority should be contacted for clarification of the discrepancy. The RMA should use a letter similar in form to that shown in Appendix L for the official notification.

2.4.7 RMAs should keep in mind that it is the responsibility of the State authority to take appropriate action should an operator be found to have filed a false declaration of RVSM approval status.

2.5 Remedial actions

2.5.1 Remedial actions are those measures taken to remove causes of systematic problems associated with factors affecting safe use of RVSM. Remedial actions may be necessary to remove the causes of problems such as the following:

a) failure of an aircraft type group to comply with group ASE requirements;

b) aircraft operating practices resulting in large height deviations; or

c) operational errors.

2.5.2 All RMAs should periodically review monitoring results in order to determine if there is evidence of any recurring problems.

2.5.3 An RMA should design its height-keeping performance monitoring programme to provide ongoing summary information of ASE performance by aircraft type group so that adverse trends can be identified quickly. When non-compliant ASE performance is confirmed for an aircraft type group, the RMA should follow the procedures described in this guidance.

2.5.4 As a minimum, RMAs should conduct an annual review of reports of large height deviations with a view toward uncovering systematic problems. Should such a problem be discovered, the RMA should report its findings to the body overseeing RVSM implementation if RVSM has not yet been introduced. Post-implementation, these reports should be submitted in accordance with the requirements specified by the body that authorized the establishment of the RMA. The reports should include details of large height deviations suggesting the existence of a systematic problem.

APPENDIX A

REGIONAL MONITORING AGENCY DUTIES AND RESPONSIBILITIES

Based on paragraphs 6.4.4 and 6.4.5 of the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive *(Doc 9574)*

The duties and responsibilities of a regional monitoring agency are to:

1. establish a database of aircraft approved by the respective State authorities for operations within RVSM airspace in that region.

2. receive reports of height deviations of aircraft observed to be non-compliant, based on the following criteria:

    a) TVE ≥90 m (300 ft);
    b) ASE >75 m (245 ft);
    c) AAD ≥90 m (300 ft).

3. take the necessary action with the relevant State and operator to:

    a) determine the likely cause of the height deviation; and
    b) verify the approval status of the relevant operator.

4. recommend, wherever possible, remedial action;

5. analyse data to detect height deviation trends and, hence, to take action as in the previous item;

6. undertake such data collections as are required by the PIRG to:

    a) investigate height-keeping performance of the aircraft in the core of the distribution;

    b) establish or add to a database on the height-keeping performance of:

        — the aircraft population
        — aircraft types or categories; and
        — individual airframes

7. monitor the level of risk as a consequence of operational errors and in-flight contingencies as follows:

    a) establish a mechanism for collation and analysis of all reports of height deviations of 90 m (300 ft) or more resulting from the above errors/actions;

    b) determine, wherever possible, the root cause of each deviation together with its size and duration;

    c) calculate the frequency of occurrence;

d) assess the overall risk (technical combined with operational and in-flight contingencies) in the system against the overall safety objectives (see 2.1 of Doc 9574); and

e) initiate remedial action as required.

8. initiate checks of the "approval status" of aircraft operating in the relevant RVSM airspace (see 4.3.3 to 4.3.6 of Doc 9574), identify non-approved operators and aircraft using RVSM airspace and notify the appropriate State of Registry/State of the Operator accordingly;

9. circulate regular reports on all height-keeping deviations, together with such graphs and tables necessary to relate the estimated system risk to the TLS, employing the criteria detailed in 6.2.8 of Doc 9574, for which formats are suggested in Appendix A to Doc 9574; and

10. submit annual reports to the PIRG.

Flight Information Regions and Responsible Regional Monitoring Agency

Responsible RMA	FIR
APARMO	Anchorage Oceanic
APARMO	Auckland Oceanic
APARMO	Brisbane Oceanic
APARMO	Honiara
APARMO	Inchon
APARMO	Melbourne Oceanic
APARMO	Nadi
APARMO	Naha
APARMO	Nauru
APARMO	Oakland Oceanic
APARMO	Port Moresby
APARMO	Tahiti
APARMO	Tokyo
CARSAMMA	Antofagasta
CARSAMMA	Asuncion
CARSAMMA	Barranquilla
CARSAMMA	Belem
CARSAMMA	Bogota
CARSAMMA	Brasilia
CARSAMMA	Central American
CARSAMMA	Comodoro Rivadavia
CARSAMMA	Cordoba
CARSAMMA	Curacao
CARSAMMA	Curitiba
CARSAMMA	Easter Island
CARSAMMA	Ezeiza
CARSAMMA	Georgetown
CARSAMMA	Guayaquil
CARSAMMA	Havana
CARSAMMA	Kingston
CARSAMMA	La Paz
CARSAMMA	Lima
CARSAMMA	Maiquetia
CARSAMMA	Mendoza
CARSAMMA	Montevideo
CARSAMMA	Panama
CARSAMMA	Paramaribo
CARSAMMA	Piarco
CARSAMMA	Port Au Prince
CARSAMMA	Porto Velho
CARSAMMA	Puerto Montt
CARSAMMA	Punta Arenas

Responsible RMA	FIR
CARSAMMA	Recife
CARSAMMA	Resistencia
CARSAMMA	Rouchambeau
CARSAMMA	Santiago
CARSAMMA	Santo Domingo
CMA	Bodo Oceanic
CMA	Gander
CMA	New York Oceanic
CMA	Reyjkvik
CMA	Santa Maria
CMA	Shanwick
EUROCONTROL	Ankara
EUROCONTROL	Athinai
EUROCONTROL	Barcelona
EUROCONTROL	Beograd
EUROCONTROL	Berlin
EUROCONTROL	Bodø
EUROCONTROL	Bratislava
EUROCONTROL	Bremen
EUROCONTROL	Brest
EUROCONTROL	Brindisi
EUROCONTROL	Bruxelles
EUROCONTROL	Bucuresti
EUROCONTROL	Budapest
EUROCONTROL	Chisinau
EUROCONTROL	Düsseldorf
EUROCONTROL	France
EUROCONTROL	Frankfurt
EUROCONTROL	Hannover
EUROCONTROL	Istanbul
EUROCONTROL	Kaliningrad
EUROCONTROL	Kharkiv
EUROCONTROL	København
EUROCONTROL	Kyiv
EUROCONTROL	Lisboa
EUROCONTROL	Ljubljana
EUROCONTROL	London
EUROCONTROL	L'viv
EUROCONTROL	Madrid
EUROCONTROL	Malmö
EUROCONTROL	Malta
EUROCONTROL	Milano
EUROCONTROL	Minsk
EUROCONTROL	München

Responsible RMA	FIR
EUROCONTROL	Nicosia
EUROCONTROL	Odesa
EUROCONTROL	Oslo
EUROCONTROL	Praha
EUROCONTROL	Rhein
EUROCONTROL	Riga
EUROCONTROL	Roma
EUROCONTROL	Rovaniemi
EUROCONTROL	Sarajevo
EUROCONTROL	Scottish
EUROCONTROL	Shannon
EUROCONTROL	Simferopol
EUROCONTROL	Skopje
EUROCONTROL	Sofia
EUROCONTROL	Stavanger
EUROCONTROL	Stockholm
EUROCONTROL	Sundsvall
EUROCONTROL	Switzerland
EUROCONTROL	Tallinn
EUROCONTROL	Tampere
EUROCONTROL	Tirana
EUROCONTROL	Trondheim
EUROCONTROL	Varna
EUROCONTROL	Vilnius
EUROCONTROL	Warszawa
EUROCONTROL	Wien
EUROCONTROL	Zagreb.
EUROCONTROL	Amsterdam
MAAR	Bangkok
MAAR	Calcutta
MAAR	Chennai
MAAR	Colombo
MAAR	Delhi
MAAR	Dhaka
MAAR	Hanoi
MAAR	Ho Chi Minh
MAAR	Hong Kong
MAAR	Jakarta
MAAR	Karachi
MAAR	Kathmandu
MAAR	Kota Kinabalu
MAAR	Kuala Lumpur
MAAR	Lahore
MAAR	Male

Responsible RMA	FIR
MAAR	Manila
MAAR	Mumbai
MAAR	Phnom Penh
MAAR	Sanya AOR
MAAR	Singapore
MAAR	Taibei
MAAR	Ujung Pandang
MAAR	Vientiane
MAAR	Yangon
MECMA	Amman
MECMA	Bahrain
MECMA	Beriut
MECMA	Cario
MECMA	Jeddah
MECMA	Muscat
MECMA	Tehran
MECMA	UAE
NAARMO	Albuquerque
NAARMO	Anchorage
NAARMO	Anchorage Arctic
NAARMO	Anchorage Continental
NAARMO	Atlanta
NAARMO	Boston
NAARMO	Chicago
NAARMO	Cleveland
NAARMO	Denver
NAARMO	Edmonton
NAARMO	Fort Worth
NAARMO	Gander Domestic
NAARMO	Houston
NAARMO	Houston Oceanic
NAARMO	Indianapolis
NAARMO	Jacksonville
NAARMO	Kansas City
NAARMO	Los Angeles
NAARMO	Mazatlan
NAARMO	Mazatlan Oceanic
NAARMO	Memphis
NAARMO	Merida
NAARMO	Mexico
NAARMO	Miami
NAARMO	Miami Oceanic
NAARMO	Minneapolis
NAARMO	Monkton

Responsible RMA	FIR
NAARMO	Monterrey
NAARMO	Montreal
NAARMO	New York
NAARMO	Oakland
NAARMO	Salt Lake
NAARMO	San Juan
NAARMO	Seattle
NAARMO	Toronto
NAARMO	Vancouver
NAARMO	Washington
NAARMO	Winnipeg
SATMA	Recife
SATMA	Canarias South
SATMA	Dakar Oceanic
SATMA	SAL Oceanic

APPENDIX B

STATES AND DESIGNATED RMA FOR THE REPORTING OF RVSM APPROVALS

The following table provides a listing of States and the respective designated RMA for the reporting of RVSM approvals, for distribution by the designated RMA.

ICAO Contracting State	Designated RMA for RVSM Approvals
Afghanistan	MAAR
Albania	EUROCONTROL
Algeria	EUROCONTROL
Andorra	EUROCONTROL
Angola	EUROCONTROL
Antigua and Barbuda	CARSAMMA
Argentina	CARSAMMA
Armenia	EUROCONTROL
Australia	APARMO
Austria	EUROCONTROL
Azerbaijan	EUROCONTROL
Bahamas	CARSAMMA
Bahrain	MECMA
Bangladesh	MAAR
Barbados	CARSAMMA
Belarus	EUROCONTROL
Belgium	EUROCONTROL
Belize	CARSAMMA
Benin	EUROCONTROL
Bhutan	MAAR
Bolivia	CARSAMMA
Bosnia and Herzegovina	EUROCONTROL
Botswana	EUROCONTROL
Brazil	CARSAMMA
Brunei Darussalam	APARMO
Bulgaria	EUROCONTROL
Burkina Faso	EUROCONTROL
Burundi	EUROCONTROL
Cambodia	MAAR
Cameroon	EUROCONTROL
Canada	NAARMO
Cape Verde	SATMA
Central African Republic	EUROCONTROL
Chad	EUROCONTROL
Chile	CARSAMMA
China	MAAR
Colombia	CARSAMMA

ICAO Contracting State	Designated RMA for RVSM Approvals
Comoros	EUROCONTROL
Congo	EUROCONTROL
Cook Islands	APARMO
Costa Rica	CARSAMMA
Côte d'Ivoire	EUROCONTROL
Croatia	EUROCONTROL
Cuba	CARSAMMA
Cyprus	EUROCONTROL
Czech Republic	EUROCONTROL
Democratic People's Republic of Korea	MAAR
Democratic Republic of the Congo	EUROCONTROL
Denmark	EUROCONTROL
Djibouti	EUROCONTROL
Dominican Republic	CARSAMMA
Ecuador	CARSAMMA
Egypt	MECMA
El Salvador	CARSAMMA
Equatorial Guinea	EUROCONTROL
Eritrea	EUROCONTROL
Estonia	EUROCONTROL
Ethiopia	EUROCONTROL
Fiji	APARMO
Finland	EUROCONTROL
France	EUROCONTROL
Gabon	EUROCONTROL
Gambia	EUROCONTROL
Georgia	EUROCONTROL
Germany	EUROCONTROL
Ghana	EUROCONTROL
Greece	EUROCONTROL
Grenada	CARSAMMA
Guatemala	CARSAMMA
Guinea	EUROCONTROL
Guinea-Bissau	EUROCONTROL
Guyana	CARSAMMA
Haiti	CARSAMMA
Honduras	CARSAMMA
Hungary	EUROCONTROL
Iceland	CMA
India	MAAR
Indonesia	MAAR
Iran (Islamic Republic of)	MECMA
Iraq	MECMA
Ireland	CMA
Israel	EUROCONTROL

ICAO Contracting State	Designated RMA for RVSM Approvals
Italy	EUROCONTROL
Jamaica	CARSAMMA
Japan	APARMO
Jordan	MECMA
Kazakhstan	EUROCONTROL
Kenya	EUROCONTROL
Kiribati	APARMO
Kuwait	MECMA
Kyrgyzstan	EUROCONTROL
Lao People's Democratic Republic	MAAR
Latvia	EUROCONTROL
Lebanon	MECMA
Lesotho	EUROCONTROL
Liberia	EUROCONTROL
Libyan Arab Jamahiriya	MECMA
Lithuania	EUROCONTROL
Luxembourg	EUROCONTROL
Madagascar	EUROCONTROL
Malawi	EUROCONTROL
Malaysia	MAAR
Maldives	MAAR
Mali	EUROCONTROL
Malta	EUROCONTROL
Marshall Islands	APARMO
Mauritania	EUROCONTROL
Mauritius	EUROCONTROL
Mexico	NAARMO
Micronesia (Federated States of)	APARMO
Monaco	EUROCONTROL
Mongolia	MAAR
Morocco	EUROCONTROL
Mozambique	EUROCONTROL
Myanmar	MAAR
Namibia	EUROCONTROL
Nauru	APARMO
Nepal	MAAR
Netherlands, the Kingdom of	EUROCONTROL
New Zealand	APARMO
Nicaragua	CARSAMMA
Niger	EUROCONTROL
Nigeria	EUROCONTROL
Norway	CMA
Oman	MECMA
Pakistan	MECMA
Palau	APARMO

ICAO Contracting State	Designated RMA for RVSM Approvals
Panama	CARSAMMA
Papua New Guinea	APARMO
Paraguay	CARSAMMA
Peru	CARSAMMA
Philippines	APARMO
Poland	EUROCONTROL
Portugal	CMA
Qatar	MECMA
Republic of Korea	APARMO
Republic of Moldova	EUROCONTROL
Romania	EUROCONTROL
Russian Federation	EUROCONTROL
Rwanda	EUROCONTROL
Saint Kitts and Nevis	CARSAMMA
Saint Lucia	CARSAMMA
Saint Vincent and the Grenadines	CARSAMMA
Samoa	APARMO
San Marino	EUROCONTROL
Sao Tome and Principe	EUROCONTROL
Saudi Arabia	MECMA
Senegal	SATMA
Serbia and Montenegro	EUROCONTROL
Seychelles	EUROCONTROL
Sierra Leone	EUROCONTROL
Singapore	MAAR
Slovakia	EUROCONTROL
Slovenia	EUROCONTROL
Solomon Islands	APARMO
Somalia	EUROCONTROL
South Africa	EUROCONTROL
Spain	SATMA
Sri Lanka	MAAR
Sudan	MECMA
Suriname	CARSAMMA
Swaziland	EUROCONTROL
Sweden	CMA
Switzerland	EUROCONTROL
Syrian Arab Republic	MECMA
Tajikistan	EUROCONTROL
Thailand	MAAR
The former Yugoslav Republic of Macedonia	EUROCONTROL
Togo	EUROCONTROL
Tonga	APARMO
Trinidad and Tobago	CARSAMMA

ICAO Contracting State	Designated RMA for RVSM Approvals
Tunisia	EUROCONTROL
Turkey	EUROCONTROL
Turkmenistan	EUROCONTROL
Uganda	EUROCONTROL
Ukraine	EUROCONTROL
United Arab Emirates	MECMA
United Kingdom	CMA
United Republic of Tanzania	EUROCONTROL
United States	NAARMO
Uruguay	CARSAMMA
Uzbekistan	EUROCONTROL
Vanuatu	APARMO
Venezuela	CARSAMMA
Viet Nam	MAAR
Yemen	MECMA
Zambia	EUROCONTROL
Zimbabwe	EUROCONTROL

APPENDIX C

RMA FORMS FOR USE IN OBTAINING RECORD OF RVSM APPROVALS FROM A STATE AUTHORITY

NOTES TO AID COMPLETION OF RMA FORMS F1, F2, AND F3

1. Please read these notes before attempting to complete forms RMA F1, F2, and F3.

2. It is important for the RMAs to have an accurate record of a point of contact for any queries that might arise from on-going height monitoring. Recipients are therefore requested to include a completed RMA F1 with their first reply to the RMA. Thereafter, there is no further requirement unless there has been a change to the information provided.

3. If recipients are unable to pass the information requested in the RMA F2 to the RMA through the Internet, by direct electronic transfer, or by data placed on a 3.5" floppy disk, a hard copy RMA F2 must be completed for each aircraft granted RVSM approval. The numbers below refer to the superscript numbers on the blank RMA F2.

   (1) Enter the one or two letter nationality identifier for the State as specified in ICAO *Location Indicators* (Doc 7910). In the case of there being more than one identifier designated for the State, use the identifier that appears first.

   (2) Enter the operator's 3 letter ICAO designator as contained in *Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services* (Doc 8585). For international general aviation, enter "IGA". For military aircraft, enter "MIL". If none, place an X in this field and write the name of the operator/owner in the Remarks row.

   (3) Enter the ICAO designator as contained in *Aircraft Type Designators* (Doc 8643): e.g. for Airbus A320-211, enter A320; for Boeing B747-438 enter B744.

   (4) Enter series of aircraft type or manufacturer's customer designation, e.g. for Airbus A320-211, enter 211; for Boeing B747-438, enter 400 or 438.

   (5) Enter the allocated Mode S aircraft address.

   (6) Enter yes or no.

   (7) Example: For October 26 1998, write 26/10/1998.

   (8) Use a separate sheet of paper if insufficient space available.

4. Form RMA F3, *Withdrawal of Approval to Operate in RMA RVSM Airspace,* must be completed and forwarded to the RMA immediately when the State of Registry has cause to withdraw the approval of an operator/aircraft for operations in RVSM airspace. The same superscript numbers as used in Form RMA F2 also appear on Form RMA F3. The instructions in section 3 above also apply to form RMA F3.

RMA F1
STATE POINT OF CONTACT DETAILS/CHANGE OF POINT OF CONTACT DETAILS FOR MATTERS RELATING TO RVSM APPROVALS

This form should be completed and returned to the address below on the first reply to the RMA or when there is a change to any of the details requested on the form (PLEASE USE BLOCK CAPITALS).

STATE:

ICAO 1 OR 2 LETTER
IDENTIFIER FOR STATE

Enter the nationality identifier as contained in ICAO Doc 7910. In the event that there is more than one identifier for the same State, the one that appears first in the list should be used.

ADDRESS:

CONTACT PERSON FOR MATTERS CONCERNING RVSM APPROVALS:

Full Name:

Title: Surname: Initials:

Post/Position:

Telephone #: Fax #:

E-mail:

Initial Reply*/Change of Details* (**Delete as appropriate)*

When complete, please return to the following address:

(RMA Address)

Telephone: Fax:
E-Mail:

RMA F2
RECORD OF APPROVAL TO OPERATE IN RVSM AIRSPACE

1. When a State of Registry OR State of the Operator approves or amends the approval of an operator/aircraft for RVSM operations, details of that approval must be recorded and sent to the appropriate RMA without delay.

2. *Before providing the information requested below, reference should be made to the accompanying notes* **(PLEASE USE BLOCK CAPITALS)**.

State of Registry[1]:

Name of Operator[2]:

State of the Operator[1]:

Aircraft Type[3]:

Aircraft Series[4]:

Manufacturers Serial No:

Registration Mark:

Mode S aircraft address[5]:

Airworthiness Approval[6]:

Date Issued[7]:

RVSM Approval[6]:

Date Issued[7]:

Date of Expiry[7] (If Applicable):

Method of Compliance (Service Bulletin, STC etc):

Remarks[8]:

When complete, please return to the following address.

(RMA Address)

Telephone: Fax:
E-Mail:

RMA F3
WITHDRAWAL OF APPROVAL TO OPERATE IN RVSM AIRSPACE

1. When a State of Registry or State of the Operator has cause to withdraw the approval of an operator/aircraft for operations within the RMA airspace, details as requested below must be submitted to the RMA by the most appropriate method.

2. *Before providing the information as requested below, reference below, reference should be made to the accompanying notes* **(PLEASE USE BLOCK CAPITALS)**.

State of Registry[1]:

Name of Operator[2]:

State of the Operator[1]:

Aircraft Type[3]:

Aircraft Series[4]:

Manufacturers Serial No:

Registration Mark:

Mode S aircraft address[5]:

Date of Withdrawal of RVSM Approval[7]:

Reason for Withdrawal of RVSM Approval[8]:

Remarks:

When complete, please return to the following address.

(RMA Address)

Telephone: Fax:
E-Mail:

APPENDIX D

MINIMUM INFORMATION FOR EACH STATE RVSM APPROVAL TO BE MAINTAINED IN ELECTRONIC FORM BY AN RMA

1. Aircraft RVSM approvals data

1.1. To properly maintain and track RVSM approval information, some basic aircraft identification information is required (e.g. manufacturer, type, serial number, etc.) as well as details specific to an aircraft's RVSM approval status. Table D-1 lists the minimum data fields to be collected by an RMA for an individual aircraft. Table D-2 describes the approvals database record format.

Note.— This appendix primarily details the different data elements to be stored by and/or exchange between RMAs. The details of data types, unit and format will be defined in document TBA.

Table D-1. Aircraft RVSM Approvals Data

Field	***Description***
Registration mark	Aircraft's current registration mark.
Mode S	Current Mode S aircraft address (6 hexadecimal digits).
Serial number	Aircraft serial number as given by manufacturer.
ICAO aircraft type designator	Aircraft type designator as specified in Doc 8643.
Series	Aircraft generic series as described by the aircraft manufacturer (e.g. 747-100, series = 100).
State of Registry	Nationality identifier as specified in Doc 7910 for current State of Registry.
Reg. Date	Date registration was active for current operator.
ICAO designator for Operator	ICAO designator for the current Operator as defined in Doc 8585.
Operator name	Name of the current Operator.
State of the Operator	State of the Operator, using the 1 or 2 letter nationality indicator specified in Doc 7910.
Civil or military indication *	Aircraft is civil or military.
Airworthiness (MASPS) approved	Yes or no indication of airworthiness approval.
Date airworthiness approved	Date of airworthiness approval.
RVSM approved	Yes or no indication RVSM approval.
Region for RVSM approval	Name of region where the RVSM approval is applicable. (Only required if RVSM Approval is issued for a specific region.)
State issuing RVSM approval	State granting RVSM approval, using the 1 or 2 letter nationality indicator specified in Doc 7910.
Date RVSM approved	Date of RVSM approval.
Date of RVSM expiry	Date of expiry of RVSM approval.
Method of compliance (service bulletin or STC)	Reference number/name of compliance method used to make the aircraft MASPS compliant.
Remarks	Open comments.
Date of withdrawal of airworthiness (MASPS) approval	Date of withdrawal of the aircraft's airworthiness approval (if applicable).

Field	*Description*
Date of withdrawal of RVSM operational approval	Date of withdraw of the aircraft's RVSM operational approval (if applicable).
Info by Authority	Yes or no indication "Was the information provided to the RMA by a State Authority?"

* Not necessarily a separate field. Can be a field on its own. It is indicated in the operator ICAO code as MIL when the military has an ICAO code designator.

Table D-2. Approvals Database Record Format

Field	*Description*	*Type*	*Width*	*Valid Range*
1	State of Registry	Alphabetic	2	AA-ZZ
2	Operator	Alphabetic	3	AAA-ZZZ
3	State of the Operator	Alphabetic	2	AA-ZZ
4	Aircraft type	Alphanumeric	4	e.g. MD11
5	Aircraft mark/series	Alphanumeric	6	
6	Manufacturer's serial/construction number	Alphanumeric	12	
7	Aircraft registration mark	Alphanumeric	10	
8	Mode S aircraft address (hexadecimal)	Alphanumeric	6	
9	Airworthiness approved	Alphabetic	1	"Y", "N"
10	Date airworthiness approval issued (dd/mm/yyyy)	Date	8	e.g. 31/12/1999
11	RVSM approved	Alphabetic	1	"Y", "N"
12	State issuing RVSM approval	Alphabetic	2	AA-ZZ
13	Date RVSM operational approval issued (dd/mm/yyyy)	Date	8	e.g. 31/12/1999
14	Date of expiry of RVSM operational approval (if any) (dd/mm/yyyy)	Date	8	e.g. 31/12/1999
15	National remarks	Alphanumeric	60	ASCII text
16	Method of compliance	Alphanumeric	60	ASCII text
17	Date of withdrawal of RVSM airworthiness approval (dd/mm/yyyy)	Date	8	e.g. 31/12/1999
18	Date of withdrawal of RVSM operational approval (dd/mm/yyyy)	Date	8	e.g. 31/12/1999
19	Information provided by State authority	Alphabetic	1	"Y", "N"

2. Aircraft re-registration/operating status change data

2.1. Aircraft frequently change registration information. Re-registration and change of operating status information is required to properly maintain an accurate list of the current population as well as to correctly identify height measurements. Table D-3 lists the minimum data fields to be maintained by an RMA to manage aircraft re-registration/operating status change data.

Table D-3. Aircraft re-registration/operating status change data

Field	*Description*
Reason for change	Reason for change. e.g. aircraft was re-registered, destroyed, parked, etc.
Previous registration mark	Aircraft's previous registration mark
Previous Mode S aircraft address	Aircraft's previous Mode S address.
Previous operator name	Name of previous operator of the aircraft.
Previous operator designator	ICAO designator for previous aircraft operator.
Previous State of the Operator	ICAO nationality identifier for the previous State of the Operator.
New State of the Operator	ICAO nationality identifier for the State of the Operator for the current aircraft operator.
New registration mark	Aircraft's current registration mark.
New State of Registry	Aircraft's current State of Registry.
New operator name	Name of the current operator of the aircraft.
New operator designator	ICAO designator for the current aircraft operator.
Aircraft type designator	Aircraft type designator as specified in ICAO Doc 8643.
Aircraft Series	Aircraft generic series as described by the aircraft manufacturer (e.g., 747-100, series = 100).
Serial Number	Aircraft serial number as given by manufacturer.
New Mode S aircraft address	Aircraft's current Mode S address as 6 hexadecimal digits.
Date change is effective	Date new registration/change of status became effective.

3. Contact data

3.1. An accurate and up to date list of contacts is essential for an RMA to do business. Table D-4 lists the minimum content for organizational contacts and Table D-5 lists the minimum content for individual points-of-contact.

Table D-4. Organizational Contact Data

Field	*Description*
Type	Type of contact (e.g. Operator, Airworthiness Authority, Manufacturer)
State	Full name of State in which the organization is located.
State – ICAO identifier	ICAO nationality identifier for the State in which the organization is located.
Company/Authority	Name of the company/authority (e.g. Bombardier)
Fax No.	Fax number for the organization.
Telephone No.	Telephone number for the organization.
Address (1-4)	Address lines 1-4 filled as appropriate for the organization.
Place	Place (city, etc.) in which the organization is located.
Postal code	Postal code for the organization.
Country	Country in which the organization is located.
Remarks	Open comments

Field	*Description*
Modification date	Last modification date.
Web Site	Organization's web address.
E-mail	Company e-mail address.
Civil/Mil.	Civil or military.

Table D-5. Individual Point of Contact Data

Field	*Description*
Title contact	Mr., Mrs., Ms., etc.
Surname contact	Surname of point of contact.
Name contact	Name of point of contact.
Position contact	Work title of the point of contact.
Company/authority	Name of the company/authority (e.g. Bombardier).
Department	Department for the point of contact.
Address (1-4)	Address lines 1-4 filled as appropriate for the point of contact.
Place	Place (city, etc.) in which the point of contact is located.
Postal code	Postal code for the location of the point of contact.
Country	Country in which the point of contact is located.
State	State in which the point of contact is located.
E-mail	E-mail of the point of contact.
Telex	Telex number of the point of contact.
Fax No	Fax number of the point of contact.
Telephone No. 1	First telephone number for the point of contact.
Telephone No. 2	Second telephone number for the point of contact.

4. Data exchange between RMAs

4.1. The following sections describe how data is to be shared between RMAs as well as the minimum data set that should be passed from one RMA to another. This minimum sharing data set is a sub-set of the data defined in previous sections of Appendix D.

4.2. All RMAs receiving data have responsibility to help ensure data integrity. A receiving RMA must report back to the sending RMA any discrepancies or incorrect information found in the sent data. Also, for detailed questions about a height measurement, an RMA must refer Operator or Authority to the RMA responsible for taking the measurement.

5. Data exchange procedures

5.1. The standard mode of exchange shall be e-mail or FTP. Data shall be presented in Microsoft Excel or Access. Because of the size of the data files, any large height-monitoring-data requests shall be made by arrangement between RMAs. RMAs must realize when making a request, that the data is current only to the date of creation of the file.

Table D-6. RMA Data Exchange Procedures

Data type	Data Subset	Frequency	When
RVSM approvals	All	Monthly	First week in month
Aircraft re-registration/status	New since last broadcast	Monthly	First week in month
Contact	All	Monthly	First week in month
Height monitoring data	As specified (HMU, GMS or HMU and GMS) height-monitoring data from region that created the data	As requested	
Monitoring targets	All	As required	Whenever changed
Non-compliant aircraft/group	All	As required	As occurs

5.2. In addition to regular data exchanges, responses to one-off queries from another RMA shall be given on request. This includes requests for data in addition to the minimum exchanged data set such as additional height measurement fields or service bulletin information.

6. Exchange of aircraft approvals data

6.1. An RMA shall only exchange RVSM Approvals data with another RMA when an aircraft is, as a minimum, Airworthiness Approved. The following table defines the fields required for sending a record to another RMA.

Table D-7. Exchange of Aircraft Approvals Data

Field	Needed to Share
Registration mark	Mandatory
Mode S aircraft address	Desirable
Serial number	Mandatory
ICAO aircraft type designator	Mandatory
Series	Mandatory
State of Registry	Mandatory
Registration date	Desirable
Operator – ICAO designator	Mandatory
Operator name	Desirable
State of the Operator	Mandatory
Civil or military indication (not a field on its own. It is indicated in the ICAO operator code as MIL except when the military has a code)	Desirable
Airworthiness (MASPS) approved	Mandatory

Field	Needed to Share
Date airworthiness approved	Mandatory
RVSM approved	Mandatory
State issuing RVSM operational approval	Mandatory
Date of RVSM operational approval	Mandatory
Date of expiry of RVSM approval	Mandatory
Method of compliance (e.g. service bulletin or STC)	Desirable
Remarks	No
Date of withdrawal of airworthiness (MASPS) approval	Mandatory
Date of withdrawal of RVSM operational approval	Mandatory
Info by authority	Mandatory

7. **Aircraft re-registration/operating status change data**

7.1. An RMA shall share all re-registration information.

Table D-8. Exchange of aircraft re-registration/operating status change data

Field	Need to Share
Reason for change (ie. re-registered, destroyed, parked)	Mandatory
Previous registration mark	Mandatory
Previous Mode S aircraft address	Desirable
Previous operator name	Desirable
Previous operator – ICAO designator	Mandatory
Previous State of the Operator	Mandatory
New State of the Operator	Mandatory
New registration mark	Mandatory
New State of Registry	Mandatory
New operator name	Desirable
New ICAO designator for operator	Desirable
ICAO aircraft type designator	Mandatory
Aircraft series	Mandatory
Serial number	Mandatory
New Mode S aircraft address	Mandatory
Date change is effective	Desirable

8. **Exchange of height measurement data**

8.1. Height measurement data shall only be exchanged when the data can be positively linked to an aircraft that is RVSM airworthiness approved. In addition, this data must be reliable as measured by the geometric reliability and the met quality data and quality control checks.

Table D-9. Exchange of height measurement data

Field	Need to Share
Date of measurement	Mandatory
Time of measurement	Mandatory
Measurement instrument*	Mandatory
Mode S aircraft address as recorded by measurement system	Mandatory
Aircraft registration mark	Mandatory
Aircraft serial number.	Mandatory
ICAO aircraft type designator	Mandatory
Operator – ICAO designator	Mandatory
ICAO aircraft type designator	Mandatory
Aircraft series	Mandatory
Mean Mode C altitude during measurement	Mandatory
Assigned altitude at time of measurement	Mandatory
Estimated TVE	Mandatory
Estimated AAD	Mandatory
Estimated ASE	Mandatory
Compliance status **	Mandatory

9. **Exchange of contact data**

9.1. Only State data, manufacturer and design organizations.

Table D-10. Exchange of organizational contact data fields

Field	Need to Share
Type	Mandatory
State	Mandatory
State – ICAO indicator	Desirable
Company/Authority	Mandatory
Fax No.	Desirable
Telephone No.	Desirable
Address (1-4)	Desirable
Place	Desirable
Postal code	Desirable
Country	Desirable
E-mail	Desirable
Civ/mil.	Desirable

Table D-11. Exchange of individual point of contact data fields

Field	Need to Share
Title contact	Desirable
Surname contact	Mandatory
Name contact	Desirable
Position contact	Desirable
Company/authority	Mandatory
Department	Desirable
Address (1-4)	Desirable
Place	Desirable
Postal code	Desirable
Country	Desirable
State	Desirable
E-mail	Desirable
Fax No.	Desirable
Telephone No. 1	Desirable
Telephone No. 2	Desirable

10. **Monitoring targets**

10.1. All data that defines an RMAs monitoring targets shall be shared.

11. **Confirmed non-compliant information**

11.1. As part of its monitoring assessments an RMA may identify a non-compliant aircraft or discover an aircraft group that is not meeting the ICAO performance requirements or the MASPS. This should be made available to other RMAs.

11.2. When identifying a non-compliant aircraft an RMA should include:

a) Notifying RMA;
b) Date sent;
c) Field;
d) Registration mark;
e) Mode S aircraft address;
f) Serial number;
g) ICAO aircraft type designator;
h) State of Registry;
i) Registration date;
j) ICAO designator for the Operator;
k) Operator name;
l) State of the Operator;
m) Date(s) of non-compliant measurement(s);
n) Action started (y/n);
o) Date aircraft fixed.

11.3. When identifying an aircraft group that is not meeting the MASPS an RMA should include:

a) Notifying RMA;
b) Aircraft type group;
c) Action started (y/n);
d) Specific monitoring data analysis information.

12. **Data specific to height monitoring and risk assessment**

12.1. This data will **not** be shared between RMAs as it is specific to the airspace being assessed and in some cases, may contain confidential information. This includes flight plan data, operational error data, occupancy data, aircraft type proportions, and flight time information.

13. **Fixed parameters — Reference Data Sources**

13.1. Some of the data that are used internally within an RMA and form some of the standard for data formats are listed below.

ICAO documents:

— *Location Indicators* (Doc 7910)
— *Designators for Aircraft Operating Agencies, Aeronautical Authorities, and Services* (Doc 8585)
— *Aircraft Type Designators* (Doc 8643)

IATA documents:

— *Airline Coding Directory*

APPENDIX E

MINIMUM MONITORING REQUIREMENTS

Monitoring prior to the issue of RVSM approval is not a requirement. However, operators should be prepared to submit monitoring plans to their State aviation authority to demonstrate how they intend to meet the requirements specified in the table below. Monitoring in accordance with this table may be carried out:

a) pre-RVSM-implementation, once the aircraft has received RVSM airworthiness approval;

b) post-RVSM-implementation, only after the aircraft operator has been approved for RVSM operations.

Table E-1. Minimum monitoring requirements

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS CHART MONITORING PRIOR TO THE ISSUE OF RVSM APPROVAL IS **NOT** A REQUIREMENT			
CATEGORY		**AIRCRAFT TYPE**	**MINIMUM OPERATOR MONITORING FOR EACH AIRCRAFT GROUP**
1	GROUP APPROVED: DATA INDICATES COMPLIANCE WITH THE RVSM MASPS	[A30B, A306], [A312 (GE) A313(GE)], [A312 (PW) A313(PW)], A318, [A319, A320, A321], [A332, A333], [A342, A343], A345, A346 B712, [B721, B722], B732, [B733, B734, B735], B737(Cargo), [B736, B737/BBJ, B738/BBJ, B739], [B741, B742, B743], B74S, B744 (5" Probe), B744 (10" Probe), B752, B753, [B762, B763], B764, B772, B773 CL60(600/601), CL60(604), C560, [CRJ1, CRJ2], CRJ7, DC10, F100, GLF4, GLF5, LJ60, MD10, MD11, MD80 (All series), MD90, T154	10% or two airframes from each fleet* of an operator to be monitored as soon as possible but not later than 6 months after the issue of RVSM approval and thereafter as directed by the RMA. * *Note.— For the purposes of monitoring, aircraft within parenthesis* [ ] *may be considered as belonging to the same fleet. For example, an operator with six A332 and four A333 aircraft may monitor one A332 and one A333* ***or*** *two A332 aircraft* ***or*** *two A333 aircraft.*

	CATEGORY	AIRCRAFT TYPE	MINIMUM OPERATOR MONITORING FOR EACH AIRCRAFT GROUP
2	GROUP APPROVED: INSUFFICIENT DATA ON APPROVED AIRCRAFT	Other group aircraft other than those listed above including: A124, ASTR, B703, B731, BE20,BE40, C500, C25A, C25B, C525, C550**, C56X, C650, C750, CRJ9, [DC86, DC87], DC93, DC95, [E135, E145], F2TH, [FA50 FA50EX], F70, [F900, F900EX], FA20, FA10, GLF2(II), GLF(IIB), GLF3, GALX,, GLEX, H25B(700), H25B(800), H25C, IL62, IL76, IL86, IL96, J328, L101, L29(2), L29(731), LJ31, [LJ35,LJ36], LJ45, LJ55, SBR1, T134, T204, P180, PRM1,YK42	60% of airframes from each fleet of an operator **or** individual monitoring, as soon as possible but not later than 6 months after the issue of RVSM approval and thereafter as directed by the RMA. ** Refer to aircraft group table for detail on C550 monitoring.
3	NON-GROUP	Non-group approved aircraft	100% of aircraft shall be monitored as soon as possible but not later than 6 months after the issue of RVSM approval.

Note.— The above table represents the minimum monitoring requirements, but RMAs may increase these requirements at their discretion.

Table E-2. Aircraft type groups for aircraft certified under group approval provisions

Monitoring Group	A/C ICAO	A/C Type	A/C Series
A124	A124	AN-124 RUSLAN	ALL SERIES
A300	A306 A30B	A300 A300	600, 600F, 600R, 620, 620R, 620RF B2-100, B2-200, B4-100, B4-100F, B4-120, B4-200, B4-200F, B4-220, C4-200
A310-GE	A310	A310	200, 200F,300, 300F
A310-PW	A310	A310	220, 220F,320
A318	A318	A318	ALL SERIES
A320	A319 A320 A321	A319 A320 A321	CJ , 110, 130 110, 210, 230 110, 130, 210, 230
A330	A332, A333	A330	200, 220, 240, 300, 320, 340
A340	A342, A343,	A340	210, 310
A345	A345	A340	540
A346	A346	A340	640
A3ST	A3ST	A300	600R ST BELUGA

Monitoring Group	**A/C ICAO**	A/C Type	A/C Series
AN72	AN72	AN-74, AN-72	ALL SERIES
ASTR	ASTR	1125 ASTRA	ALL SERIES
ASTR-SPX	ASTR	ASTR SPX	ALL SERIES
AVRO	RJ1H, RJ70, RJ85	AVRO	RJ70, RJ85, RJ100
B712	B712	B717	200
B727	B721 B722	B727	100, 100C, 100F,100QF, 200, 200F
B732	B732	B737	200, 200C
B737CL	B733 B734 B735	B737	300, 400, 500
B737NX	B736 B737 B738 B739	B737 B737 B737 B737	600 700, 700BBJ 800, BBJ2 900
B737C	B737	B737	700C
B747CL	B741 B742 B743	B747	100, 100B, 100F, 200B, 200C, 200F, 200SF, 300
B74S	B74S	B747	SR, SP
B744-5	B744	B747	400, 400D, 400F (With 5 inch Probes)
B744-10	B744	B747	400, 400D, 400F (With 10 inch Probes)
B752	B752	B757	200, 200PF
B753	B753	B757	300
B767	B762 B763	B767	200, 200EM, 200ER, 200ERM, 300, 300ER, 300ERF
B764	B764	B767	400ER
B772	B772	B777	200, 200ER, 300, 300ER
B773	B773	B777	300, 300ER
BE40	BE40	BEECHJET 400A	ALL SERIES
BE20	BE20	BEECH 200 -KINGAIR	ALL SERIES
C500	C500	500 CITATION, 500 CITATION I, 501 CITATION I SINGLE PILOT	ALL SERIES
C525	C525	525 CITATIONJET, 525 CITATIONJET I	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
C525-II	C25A	525A CITATIONJET II	ALL SERIES
C525 CJ3	C25B	CITATIONJET III	ALL SERIES
C550-552	C550	552 CITATION II	ALL SERIES
C550-B	C550	550 CITATION BRAVO	ALL SERIES
C550-II	C550	550 CITATION II, 551 CITATION II SINGLE PILOT	ALL SERIES
C550-SII	C550	S550 CITATION SUPER II	ALL SERIES
C560	C560	560 CITATION V, 560 CITATION V ULTRA, 560 CITATION V ULTRA ENCORE	ALL SERIES
C56X	C56X	560 CITATION EXCEL	ALL SERIES
C650	C650	650 CITATION III , 650 CITATION VI , 650 CITATION VII	ALL SERIES
C750	C750	750 CITATION X	ALL SERIES
CARJ	CRJ1, CRJ2	REGIONALJET	100, 200, 200ER, 200LR
CRJ-700	CRJ7	REGIONALJET	700
CRJ-900	CRJ9	REGIONALJET	900
CL600	CL60	CL-600 CL-601	CL-600-1A11 CL-600-2A12, CL-600-2B16
CL604	CL60	CL-604	CL-600-2B16
BD100	CL30	CHALLENGER 300	ALL SERIES
BD700	GL5T	GLOBAL 5000	ALL SERIES
CONC	CONC	CONCORDE	ALL SERIES
DC10	DC10	DC-10	10, 10F, 15, 30, 30F, 40, 40F
DC86-7	DC86, DC87	DC-8	62, 62F, 72, 72F
DC93	DC93	DC-9	30, 30F
DC95	DC95	DC-9	SERIES 51
E135-145	E135, E145	EMB-135, EMB-145	ALL SERIES
F100	F100	FOKKER 100	ALL SERIES
F2TH	F2TH	FALCON 2000	ALL SERIES
F70	F70	FOKKER 70	ALL SERIES
F900	F900	FALCON 900, FALCON 900EX	ALL SERIES
FA10	FA10	FALCON 10	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
FA20	FA20	FALCON 20 FALCON 200	ALL SERIES
FA50	FA50	FALCON 50, FALCON 50EX	ALL SERIES
GALX	GALX	1126 GALAXY	ALL SERIES
GLEX	GLEX	BD-700 GLOBAL EXPRESS	ALL SERIES
GLF2	GLF2	GULFSTREAM II (G-1159),	ALL SERIES
GLF2B	GLF2	GULFSTREAM IIB (G-1159B)	ALL SERIES
GLF3	GLF3	GULFSTREAM III (G-1159A)	ALL SERIES
GLF4	GLF4	GULFSTREAM IV (G-1159C)	ALL SERIES
GLF5	GLF5	GULFSTREAM V (G-1159D)	ALL SERIES
H25B-700	H25B	BAE 125 / HS125	700B
H25B-800	H25B	BAE 125 / HAWKER 800XP, BAE 125 / HAWKER 800, BAE 125 / HS125	ALL SERIES/A, B/800
H25C	H25C	BAE 125 / HAWKER 1000	A , B
IL86	IL86	IL-86	NO SERIES
IL96	IL96	IL-96	M , T, 300
J328	J328	328JET	ALL SERIES
L101	L101	L-1011 TRISTAR	1 (385-1), 40 (385-1), 50 (385-1), 100, 150 (385-1-14), 200, 250 (385-1-15), 500 (385-3)
L29B-2	L29B	L-1329 JETSTAR 2	ALL SERIES
L29B-731	L29B	L-1329 JETSTAR 731	ALL SERIES
LJ31	LJ31	LEARJET 31	NO SERIES, A
LJ35/6	LJ35 LJ36	LEARJET 35 LEARJET 36	NO SERIES, A
LJ40	LJ40	LEARJET 40	ALL SERIES
LJ45	LJ45	LEARJET 45	ALL SERIES
LJ55	LJ55	LEARJET 55	NO SERIES B, C
LJ60	LJ60	LEARJET 60	ALL SERIES
MD10	MD10	MD-10	ALL SERIES
MD11	MD11	MD-11	COMBI, ER, FREIGHTER, PASSENGER
MD80	MD81,	MD-80	81, 82, 83, 87, 88

Monitoring Group	**A/C ICAO**	A/C Type	A/C Series
	MD82, MD83, MD87, MD88		
MD90	MD90	MD-90	30, 30ER
P180	P180	P-180 AVANTI	ALL SERIES
PRM1	PRM1	PREMIER 1	ALL SERIES
T134	T134	TU-134	A, B
T154	T154	TU-154	A , B, M, S
T204	T204, T224, T234	TU-204, TU-224, TU-234	100, 100C, 120RR, 200, C
YK42	YK42	YAK-42	ALL SERIES

Note.— This list is not considered exhaustive.

APPENDIX F

SAMPLE LETTER TO AN OPERATOR OF AN AIRCRAFT OBSERVED TO HAVE EXHIBITED AN ALTIMETRY SYSTEM ERROR IN EXCESS OF 245 FT IN MAGNITUDE

(Name and address of Operator)

HEIGHT-KEEPING PERFORMANCE IN RVSM AIRSPACE

Dear *(Contact name)*,

On *(date)*, a 1 000 ft reduced vertical separation minimum (RVSM) was introduced in *(name or description of airspace)*. The introduction and continued operation of RVSM is conditional on the risk of collision as a consequence of the loss of vertical separation being less that the agreed target level of safety (TLS) of 5 x 10^{-9} fatal accidents per flight hour.

Since *(date of implementation of RVSM)*, as part of the process of verifying that the TLS is being achieved, the height-keeping performance of aircraft holding RVSM minimum aircraft system performance specification (MASPS) approval has been monitored in accordance with ICAO requirements.

On *(date)* a flight, aircraft registration *(insert aircraft registration),* Modes S aircraft address *(insert Mode S address)*, which we believe to be operated by you and notified as being RVSM MASPS compliant by *(operator)*, was monitored by the *(Monitoring unit)* and an altimetry system error (ASE) of *(value)* was observed.

For a detailed explanation on the height-keeping requirements you may wish to refer to *(JAA TGL 6, FAA 91-RVSM, or other appropriate document).*

This measurement indicates that the aircraft **may not be** compliant with the height keeping accuracy requirements for RVSM airspace. It is therefore requested that an immediate investigation be undertaken into this discrepancy and that the necessary arrangements be made for a repeat measurement at the earliest opportunity, following any rectification or inspection of the altimetry system.

The findings of your investigation should be summarized in the enclosed "Height-Keeping Investigation Form" and returned to *(name of RMA)* at the address given.

We would ask that you acknowledge receipt of this communication as soon as possible by fax or telephone to:

(RMA Contact details)

Thank you for your continued cooperation.

Yours faithfully,

CC: *(State authority issuing RVSM approval)*

HEIGHT-KEEPING ERROR INVESTIGATION FORM

Part 1 — General information

State of Registry	
Operator	
State of the Operator	
Aircraft type and series	
Registration mark	
Serial number	
Mode S aircraft address	

Part 2 — Details of height-keeping error

A shaded box with bold figures indicates an excess of the JAA TGJ6 REV1 requirements (taking into account measurement error).

Date and time of measurement	Assigned flight level	Altimetry system error (feet)	Assigned altitude deviation (feet)	Total vertical error (feet)

Provide details below of the fault found (if any) plus date and nature of the rectification work. Please also include an estimate of the number of flights the aircraft has performed in RVSM airspace between the date of measurement and rectification.

When complete, please return to:

(RMA Contact details)

APPENDIX G

MINIMIM INFORMATION FOR EACH MONITORED AIRCRAFT TO BE MAINTAINED IN ELECTRONIC FORM BY AN RMA

AIRCRAFT HEIGHT-KEEPING PERFORMANCE MONITORING DATA RECORD FORMAT

FIELD	FIELD IDENTIFIER	FIELD DATA TYPE	WIDTH	RANGE
1	Validity Indicator	Alphabetic	1	C: Compliant A: Aberrant N: Non-Compliant
2	Date of Measurement (dd/mm/yyyy)	Date	8	e.g. 01/01/1996
3	Time of Measurement (hh:mm:ss)	Time	8	e.g. 12:00:00
4	Measuring Instrument	Alphanumeric	4	e.g. “HYQX” “G123”
5	Aircraft Mode A code (octal)	Alphanumeric	4	
6	Mode S aircraft address (hexadecimal)	Alphanumeric	6	
7	Aircraft Registration Mark	Alphanumeric	10	
8	Flight Call Sign	Alphanumeric	7	
9	Operator	Alphabetic	3	
10	Aircraft Type	Alphanumeric	4	
11	Aircraft Mark/Series	Alphanumeric	6	
12	Flight Origin	Alphabetic	4	
13	Flight Destination	Alphabetic	4	
14	Mean Mode C Altitude During Measurement	Numeric	5	0-99999 This field may be Null for GMS
15	Assigned Altitude at Time of Measurement	Numeric	5	0-99999
16	Mean Estimated Geometric Height of Aircraft	Numeric	5	0-99999
17	SD of Estimated Geometric Height of Aircraft	Numeric	5	0-99999
18	Mean Geometric Height of Assigned Altitude	Numeric	5	0-99999
19	Estimated TVE	Numeric	4	0-9999
20	Minimum Estimated TVE*	Numeric	4	0-9999
21	Maximum Estimated TVE*	Numeric	4	0-9999
22	SD of Estimated TVE*	Numeric	4	0-9999
23	Estimated AAD	Numeric	4	0-9999
24	Minimum Estimated AAD*	Numeric	4	0-9999
25	Maximum Estimated AAD*	Numeric	4	0-9999
26	SD of Estimated AAD*	Numeric	4	0-9999
27	Estimated ASE	Numeric	4	0-9999
28	Minimum Estimated ASE*	Numeric	4	0-9999
29	Maximum Estimated ASE*	Numeric	4	0-9999
30	SD of Estimated ASE*	Numeric	4	0-9999
31	Indicator for Reliability of Geometric Height Measurement	Numeric	3	HMU: 0.0-1.0 GMU: 0.0-9.9
32	Indicator of Reliability of Met Data	Numeric	1	0.1
33	Aircraft Serial/Construction Number	Alphanumeric	12	e.g. 550-0848

** only when more than one data point is available*

APPENDIX H

ALTIMETRY SYSTEM ERROR DATA AND ANALYSIS TO BE PROVIDED TO STATE AND MANUFACTURER BY AN RMA

When an RMA judges that monitoring data from the airspace for which it is responsible indicates that an aircraft group may not meet ASE requirements for mean magnitude and standard deviation (SD), the following monitoring results should be assembled:

a) The mean magnitude of ASE and ASE SD of all monitored flights;

b) The following information for each monitored flight:

1) the ASE estimate;

2) the date on which monitoring took place;

3) the registration mark of the aircraft conducting the flight;

4) the Mach number flown during monitoring (if available);

5) the altimetry system — captain's or first officer's — observed by the monitoring system (if available);

6) the date on which RVSM airworthiness approval was granted for the monitored aircraft;

7) the date on which the aircraft was first put into service by an operator (if available);

8) the monitoring system used to obtain the estimate; and

9) the location where the monitoring took place.

SAMPLE LETTER

To: *(State concerned)*

Dear *(Name and title)*,

RE: *(aircraft type)* RVSM HEIGHT-KEEPING PERFORMANCE

As you are aware, *(name of organization*), acting as the Regional Monitoring Agency (RMA) for *(region or area of responsibility)*, is required to perform height-keeping performance assessment to enable the identification of performance issues, and for ongoing safety assessments, in connection with the application of RVSM in *(specify airspace)*.

As a basis for the safety of RVSM operations, ICAO has set a height-keeping performance requirement for aircraft type groups. The requirement is that the mean altimetry system error (ASE) must not be greater than 25 m (80 ft) and the absolute value of the mean ASE plus 3 standard deviations of ASE must not be greater than 75 m (245 ft). From this requirement, RVSM certification requirements have been derived which are laid down in *(JAA TGL6, FAA 91-RVSM, or other appropriate document),* to ensure that this important safety requirement is not exceeded.

When monitored altimetry system performance indicates that an aircraft type group is not meeting the above requirements, and is continuing to operate as RVSM approved in RVSM airspace, this may have unacceptable safety implications. Therefore, in this situation, immediate action needs to be taken to ensure the on-going safety of RVSM operations, and to bring the performance of the group into compliance with the group performance requirements. This may be achieved by (1) withdrawing the RVSM approval for the aircraft type(s) involved, in order to reconsider the effectiveness of the RVSM solution for the aircraft type, or by (2) removing the approval for those aircraft for which available performance data indicates that without these aircraft the group performance requirement would be met, until such time as the cause of the problem is identified, and the performance is brought into compliance.

After adjusting the data set regarding the latest approval status of *(aircraft type)* aircraft and the associated measurement history, the present group performance has been reassessed. The data as of the *(date)* shows that the group performance is exceeding the requirements set by ICAO. The current group performance has been determined to be:

	(*aircraft type*)
Mean ASE	(*insert value*)
|Mean ASE| + 3 SD	(*insert value*)

As previously stated this performance may have safety implications. We therefore request that you take the necessary action to ensure that the group performance of the RVSM approved *(aircraft type)* aircraft operating in RVSM airspace complies with the ICAO requirement with immediate effect, or that these aircraft no longer operate in RVSM airspace until group compliance with the ICAO requirement can be achieved.

Please do not hesitate to inquire if we can help you in any way to support your activities to resolve this issue.

Your urgent response would be appreciated.

Yours sincerely,

CC: *(Manufacturer)*

APPENDIX I

SUGGESTED FORM FOR ATC UNIT MONTHLY REPORT OF LARGE HEIGHT DEVIATIONS

REGIONAL MONITORING AGENCY NAME

Report of Large Height Deviation

Report to the *(Regional Monitoring Agency Name)* of a height deviation of 90 m (300 ft) or more, including those due to ACAS, turbulence and contingency events.

Name of ATC unit:_____

Please complete Section I or II as appropriate

SECTION I:

There were no reports of large height deviations for the month of _____

SECTION II:

There was/were _____ report(s) of a height deviation of 90 m (300 ft) or more between FL 290 and FL 410. Details of the height deviation are attached.

(Please use a separate form for each report of height deviation).

SECTION III:

When complete please forward the report(s) to:

(Regional Monitoring Agency Name)
(Postal address)

Telephone:
Fax:
E-Mail:

APPENDIX J

SAMPLE CONTENT AND FORMAT FOR COLLECTION OF SAMPLE OF TRAFFIC MOVEMENTS

The following table lists the information required for each flight in a sample of traffic movements.

INFORMATION FOR EACH FLIGHT IN THE SAMPLE

The information requested for a flight in the sample is listed in the following table with an indication as to whether the information is necessary or is optional:

ITEM	EXAMPLE	NECESSARY OR OPTIONAL
Date (dd/mm/yyyy)	01/05/2000 for 1 May 2000	NECESSARY
Aircraft call sign	MAS704	NECESSARY
Aircraft type	B734	NECESSARY
Origin aerodrome	WMKK	NECESSARY
Destination aerodrome	RPLL	NECESSARY
Entry fix into RVSM airspace	MESOK	NECESSARY
Time at entry fix	0225	NECESSARY
Flight level at entry fix	330	NECESSARY
Exit fix from RVSM airspace	NISOR	NECESSARY
Time at exit fix	0401	NECESSARY
Flight level at exit fix	330	NECESSARY
First fix within RVSM airspace OR first airway within RVSM airspace	MESOK or G582	OPTIONAL
Time at first fix	0225	OPTIONAL
Flight level at first fix	330	OPTIONAL
Second fix within RVSM airspace OR second airway within RVSM airspace	MEVAS OR G577	
Time at second fix	0250	OPTIONAL
Flight level at second fix	330	OPTIONAL
(Continue with as many fix/time/flight-level entries as are required to describe the flight's movement within RVSM airspace)		OPTIONAL

Information Required for a Flight in Traffic Sample

APPENDIX K

DESCRIPTION OF MODELS USED TO ESTIMATE TECHNICAL AND OPERATIONAL RISK

This appendix presents a brief description of the collision risk model forms used to estimate technical and operational risk. The notation used in this appendix is that of *Risk Assessment and System Monitoring*[3], published by the ICAO European and North Atlantic Office, August 1996. The same notation is employed in the collision risk model development of Appendix B to *Guidance Material on the Implementation of a 300 (1 000 ft) Vertical Separation Minimum (VSM) for Application in the Airspace of the Asia Pacific Region,* ICAO Asia and Pacific Office, Bangkok, October 2000. *EUR RVSM Mathematical Supplement,* (Document RVSM 830), European Organization for the Safety of Air Navigation (Eurocontrol), August 2001, describes the collision risk model for RVSM in continental airspace.

Model for estimation of technical risk

The model for the total technical risk, N_{az}, expressed as the sum of three basic types of collision risk, is:

$$N_{az}\text{ (technical)} = N_{az}\text{ (same, technical)} + N_{az}\text{ (opposite, technical)} + N_{az}\text{ (cross, technical)} \quad (1)$$

where the terms on the right side of (1) are defined in Table K-1.

Table K-1. Technical risk model parameter definitions

Parameter	Description
N_{az} (technical)	Expected number of accidents per aircraft flight hour resulting from collisions due to the loss of planned vertical separation of 300 m (1 000 ft) between aircraft pairs at adjacent flight levels.
N_{az} (same, technical)	Expected number of accidents per aircraft flight hour resulting from collisions due to the loss of planned vertical separation of 300 m (1 000 ft) between aircraft pairs flying on the same route in the same direction at adjacent flight levels.
N_{az} (opposite, technical)	Expected number of accidents per aircraft flight hour resulting from collisions due to the loss of planned vertical separation of 300 m (1 000 ft) between aircraft pairs flying on the same route in opposite directions at adjacent flight levels.
N_{az} (cross, technical)	Expected number of accidents per aircraft flight hour resulting from collisions due to the loss of planned vertical separation of 300 m (1 000 ft) between aircraft pairs flying on crossing routes at adjacent flight levels.

[3] This material was originally published in NAT Doc 002, which is no longer in print; however, the Supplement is still available.

Same-route technical risk

The model form appropriate for the estimation of same-route technical risk for same- and opposite-direction traffic at adjacent flight levels is:

N_{az}*(same-route, technical)* = N_{az}*(same, technical)* + N_{az} *(opposite, technical)* =

$$P_z(S_z)P_y(0)\frac{\lambda_x}{S_x}\left\{E_z(same)\left[\frac{|\overline{\Delta V}|}{2\lambda_x}+\frac{|\overline{\dot{y}}|}{2\lambda_y}+\frac{|\overline{\dot{z}}|}{2\lambda_z}\right]+E_z(opp)\left[\frac{2|\overline{V}|}{2\lambda_x}+\frac{|\overline{\dot{y}}|}{2\lambda_y}+\frac{|\overline{\dot{z}}|}{2\lambda_z}\right]\right\} \quad (2)$$

where the parameters of the model presented in (2) are defined in Table K-2, below.

Table K-2. Same-route technical risk model parameter definitions

CRM Parameter	Description
S_z	Vertical separation minimum.
$P_z(S_z)$	Probability that two aircraft nominally separated by the vertical separation minimum S_z are in vertical overlap.
$P_y(0)$	Probability that two aircraft on the same track are in lateral overlap.
λ_x	Average aircraft length.
λ_y	Average aircraft wingspan.
λ_z	Average aircraft height with undercarriage retracted.
S_x	Length of longitudinal window used to calculate occupancy.
$E_z(same)$	Same-direction vertical occupancy for a pair of aircraft at adjacent flight levels on same route.
$E_z(opp)$	Opposite-direction vertical occupancy for a pair of aircraft at adjacent flight levels on same route.
$\|\overline{\Delta V}\|$	Average relative along-track speed between aircraft on same direction routes.
$\|\overline{V}\|$	Average absolute aircraft ground speed.
$\|\overline{\dot{y}}\|$	Average absolute relative cross track speed for an aircraft pair nominally on the same track.
$\|\overline{\dot{z}}\|$	Average absolute relative vertical speed of an aircraft pair that have lost all vertical separation

The term “overlap” used in Table K-2 means that the centres of mass of a pair of aircraft in a given dimension are at least as close as the extent (length, wingspan or height) of the average aircraft in that dimension.

The occupancy parameters, E_z(same) and $E_z(opp)$, in (2) are measures of the relative packing of aircraft at adjacent flight levels on the same route. An alternative measure of such packing is

passing frequency, or the number of aircraft per flight hour at an adjacent flight level which pass a typical aircraft. As with occupancies, passing frequencies are defined for traffic at adjacent flight levels operating in the same and opposite directions and represented symbolically as $N_x(same)$ and $N_x(opp)$. The relation between passing frequency and occupancy is shown below:

$$N_x(same) = \frac{\lambda_x}{\hat{S}_x} E_z(same) \frac{\overline{|\Delta V|}}{2\lambda_x}$$

and

$$N_x(opp) = \frac{\lambda_x}{\hat{S}_x} E_z(opp) \frac{|\overline{V}|}{\lambda_x}$$

Estimation of technical risk for pairs of aircraft on crossing routes

The general form for the model to estimate the collision risk between aircraft at adjacent flight levels on routes which cross, as presented in Volume 2 of RGCSP/6, is:

$$N_{az}(cross, technical) = P_z(S_z)\, P_h\, (\, (\, 2\, v_h / \pi\, \lambda_h) + (\, |z\, |/ 2\, \lambda_z)\,) \qquad (3)$$

where the parameters of the model are defined in table K-3.

Table K-3. Crossing-route technical risk model parameter definitions

CRM Parameter	Description
N_{az}(cross, technical)	Number of fatal accidents per flight hour due to loss of vertical separation between aircraft at adjacent flight levels on crossing routes.
S_Z	Vertical separation minimum.
$P_z(S_Z)$	Probability that two aircraft nominally separated by the vertical separation minimum S_Z are in vertical overlap.
P_h	Probability that two aircraft at adjacent flight levels on crossing routes are in horizontal overlap.
v_h	Average relative speed in horizontal plane of a pair of aircraft at adjacent flight levels on crossing routes while they are in horizontal overlap.
λ_h	Average diameter of a disk used to represent aircraft horizontal-plane shape.

It is important to note that this general form assumes that an RMA has accounted properly for angles of route intersection. A more detailed and complete form of the technical risk model for crossing routes can be found in Appendix A of "EUR RVSM Mathematical Supplement," Document RVSM 830, European Organisation for the Safety of Air Navigation (Eurocontrol), August 2001.

Model for estimation of risk due to operational errors

The model for estimation of the risk due to operational errors has the same form as (2), above, with one exception. The probability of vertical overlap for aircraft with planned vertical separation S_z, $P_z(S_z)$, is replaced by the following:

$$P_z\ (n\ x\ S_z) = P_z\ (0)\ Pi \qquad (4)$$

where the parameters are defined in table K-4.

Table K-4. Definitions of parameters required for operational risk model

CRM Parameter	Description
$P_z\ (n\ x\ S_z)$	Probability of vertical overlap arising from errors resulting in deviations of integral multiples of the vertical separation standard, S_Z
$P_z\ (0)$	Probability that two aircraft nominally flying at the same level are in vertical overlap
P_i	Proportion of total system flying time spent at incorrect levels

The proportion of total flying time spent at incorrect levels, P_i, is commonly estimated based on the latest 12 months of operational error data available.

APPENDIX L

LETTER TO STATE AUTHORITY REQUESTING CLARIFICATION OF THE APPROVAL STATE RVSM APPROVAL STATUS OF AN OPERATOR

Note.— When the RVSM approval status shown in a filed flight plan cannot be confirmed from an RMA's database of State approvals, a letter similar to the following should be sent to the relevant State authority.

(State authority address)

1. The *(RMA name)* has been established by the *(body authorizing RMA establishment)* to support safe implementation and use of the reduced vertical separation minimum (RVSM) in *(airspace where the RMA has responsibility)* in accordance with guidance published by the International Civil Aviation Organization.

2. Among other activities, the *(RMA name)* conducts a comparison of the State RVSM approval status notified by an operator to an air traffic control unit to the records of State RVSM approvals available to us. This comparison is considered vital to ensuring the continued integrity of RVSM operations.

3. This letter is to advise that an operator for which we believe you are the State of *(Registry or Operator, as appropriate)* provided notice of State RVSM approval which is not confirmed by our records. The details of the occurrence are as follows:

Date:
Operator name:
Aircraft flight identification:
Aircraft type:
Registration mark:
ATC unit receiving notification:

4 We request that you advise this office of the RVSM approval status of this operator. In the event that you have not granted RVSM approval to this operator, we request that you advise this office of any action which you propose to take.

Sincerely,

(RMA official)

APPENDIX M

REDUCTION OF MINIMUM MONITORING REQUIREMENTS

The following material describes the process used by Eurocontrol, in its role as operator of the European RMA, to determine whether minimum monitoring requirements for particular aircraft type groups may be reduced. It is provided as an example which may be used by other RMAs to assist in the development of criteria for the reduction of minimum monitoring requirements in their own areas of responsibility.

1. The value of the |mean ASE| + 3 SD of ASE ≤ 60 m (200 ft)

JAA TGL 6 and FAA 91-RVSM state that the ASE for an aircraft type group, when the aircraft are operating in the basic flight envelope, should meet the criterion of |mean ASE| + 3SD of ASE ≤ 60 m (200 ft). This performance standard is more strict than that set for aircraft in the total flight envelope (|mean ASE| + 3 SD of ASE ≤ 75 m (245 ft)). It should be noted that the latter is also the group requirement specified in Annex 6, Part I, Chapter 7, Appendix 3 and Annex 6, Part II, Chapter 7, Appendix 2.[4]

It is assumed that all monitoring data is collected while aircraft were flying within the basic flight envelope. It is also assumed that if the observed ASE monitoring data showed that an aircraft type group is meeting the standard for the basic flight envelope, then it is likely to satisfy |mean ASE| + 3 SD of ASE ≤ 75 m (245 ft) when operating in the total flight envelope. Therefore, when deciding whether or not the monitoring requirements for the group could be reduced, the stricter criterion for the basic flight envelope is applied.

To fully satisfy this criterion, the upper limit of a two-sided 95 per cent confidence interval for the standard deviation must also fall within the upper bound of the criteria for the basic flight envelope.

2. Percentage of operator population with at least one measurement

In addition to the first criterion, it is necessary to ensure that the monitoring data is representative of the total population. It is assumed that it is necessary for at least 75 per cent of the total operators to have at least one of their aircraft monitored to provide a good representation of the entire operator population.

3. Individual aircraft performance must be consistent with that of the group

For each aircraft type group, the individual aircraft means are compared to the classification mean ±1.96 times the between airframe standard deviation with a correction factor. The correction factor is dependent on the number of repeated samples, and corrects for any bias in the estimation of standard deviation. The individual aircraft means should fall within these upper and lower bounds in 95 per cent of the cases.

An additional examination should be made of the plots of individual aircraft standard deviations against the pooled estimate of the within airframe standard deviation with a 95 per cent two-

[4] See Footnote to Foreword.

sided confidence interval. This is based on the assumption that the within airframe variation of ASE is the same for all the aircraft of an aircraft type group.

4. Each operator has a fleet that is meeting individual measurement requirements

JAA TGL 6 and FAA 91-RVSM state that the absolute ASE of any measure for a non-group aircraft must not exceed 49 m (160 ft) for worst-case avionics. On the assumption that a group aircraft should perform equal to or better than a non-group aircraft, the absolute maximum ASE value was examined for all operator/aircraft type group combinations. To account for any measurement system error, an additional 9 m (30 ft) was considered when examining the measurements.

It was accepted that some of the fleet would be outside of these limits. However, if this were to grow to greater than 10 per cent of the fleet, then it would not be considered appropriate to reduce the monitoring requirement to as low at 10 per cent. To cater for small fleets, an operator that has at least two aircraft showing performance worse than 58 m (190 ft), and these constitute at least 10 per cent of the operator's measured fleet, is considered to have failed this criterion.

APPENDIX N

INFORMATION ON THE MERITS OF HMU AND GMU MONITORING SYSTEMS

1. Height-monitoring systems

1.1 The height-monitoring unit (HMU) is a fixed ground-based system whose technical capability and requirements are discussed in the following section. Its main advantage is the ability to capture a large amount of data which can be made available for analysis rapidly without manual intervention. The main disadvantage is that it requires a flight within range of the HMU.

1.2 The Global Positioning System (GPS) monitoring unit (GMU) is a carry-on system placed on an aircraft for a single flight. Its main advantage is the ability to target an individual aircraft for monitoring during normal operations without requiring that the aircraft fly in a particular portion of airspace. The GMU is a key element in the GPS-based monitoring system (GMS). The main disadvantages of the GMS are the requirements for cooperation from the target aircraft and significant intervention in operation and data extraction.

1.3 The HMU is used to monitor aircraft height-keeping performance in the North Atlantic and European Regions. The GMS is also used in these regions, as well as in several others.

2. Ground-based height-monitoring units (HMUs)

2.1 An HMU is a network of ground-based receiver stations which receive secondary surveillance radar (SSR) transponder signals from aircraft replying to interrogations from one (or more) radar stations, together with associated signal processing equipment. An HMU operates in a passive manner, in the sense that the system does not interrogate aircraft in the manner of a secondary surveillance radar. It receives random replies from aircraft as a result of uncorrelated interrogations. The replies have to be sorted, the form of reply which has been received (Mode A or C) has to be established, and those from the same aircraft chained to allow the smoothed value of the geometric height to be compared with the geometric height of the assigned flight levels and the reported flight level (Mode C). The elements of the system which are involved in the measurement of an aircraft's geometric height together comprise the height monitoring equipment (HME). Those elements of the system which perform the estimation of TVE comprise the total vertical error monitoring unit (TMU).

2.2 The HME determines the geometric height of each aircraft by comparing the time of reception of its SSR signals at each of the different receiver stations. The HME outputs the 3D position and associated identification (Mode A, C or S as appropriate) once per second. To evaluate TVE, the TMU requires meteorological data provided by MET offices. These data are further refined by evaluating the trends in the performance of the ensemble of aircraft being monitored during a particular time interval.

2.3 The size of the HMU coverage area and the number of HMUs needed depends upon the airspace route structure and the number of aircraft required to be monitored. For example, the NAT environment has gateway locations ensuring a large proportion of the aircraft will fly over a single HMU during their normal operations. No such gateway locations which would allow such a high coverage from a single HMU exist for European operations.

2.4 To provide cover over a number of air routes, for example as shown in Figure 1, and to avoid the need to inhibit ATC freedom, the HMUs necessary for the European RVSM programme need an operational radius of approximately 45 NM. To maintain the system accuracy over this area the HMU requires a five-site system with a distance of approximately 25 NM between the central station and the remaining 4 receiver stations arranged in a square around the central site.

2.5 The preferred sites identified for the European HMU were airfields and other installations owned by the ATS providers. The use of such sites simplifies procurement procedures and reduces the risk associated with application for planning permission. The second set of sites identified were sites where line-of-sight can be physically obtained. These are mainly communication towers.

3. The GPS-based monitoring system (GMS)

3.1 The GMS consists of one or more GMUs, and an off-line data processing system. The GMU is a portable unit. Depending upon the supplier, it may consist of one or two GPS receivers, plus a laptop computer for the processing and storage of data, and two separate GPS antennas. The antennas are attached to aircraft windows using suction pads. The GMU may be either battery powered, or have a power input to allow connection to the aircraft's power supply. After completion of the flight, the recorded GPS data is transferred to a central site where, using differential GPS post-processing, the aircraft geometric height is determined. The height data are then compared with the geometric height of the assigned flight levels as estimated from data provided by the MET offices. It is important to note that the MET data cannot be refined in the manner described for the HMU operation. SSR Mode C data, as recorded by the GMU or obtained from ATC providers as radar data output, are then combined with the height data and flight level heights to determine the aircraft altimetry system errors.

3.2 The analysis of the GMU data can be made available within a few days but this can extend up to a few weeks, dependent upon the logistics of the use of the GMU and the retrieval of the data.

3.3 To monitor a specific airframe, the GMU may be installed on the aircraft flight deck or within the cabin. It may require a power input and the antennas will need to be temporarily attached to the aircraft windows. This process may require appropriate certification of the GMU for the aircraft types in which it has to be installed. It also requires appropriate expertise for the installation and operation and active support from operators and pilots.

4. Advantages and disadvantages

4.1 In developing a monitoring system, an RMA is advised to consider carefully the goals of the monitoring programme, the flows of traffic within the airspace where the RVSM will be implemented and the availability of applicable monitoring data from other Regions. With this information, an RMA can then examine the merits of HMUs and GMUs as discussed above, which can be summarized as follows:

HMS		GMS
Measures all aircraft in the coverage area	↔	Aircraft individually targetable
Refinement of FL geometric height possible	↔	Refinement not possible
Large data set captured per day	↔	Small data set captured per day

HMS		GMS
Expensive to buy and deploy	↔	Inexpensive to buy
Inexpensive to operate	↔	Expensive to operate
Operation is transparent to aircraft	↔	Possible difficulties to install on flight deck
Trend detection of height-keeping performance for a/c type groups	↔	Uncertain trend detection

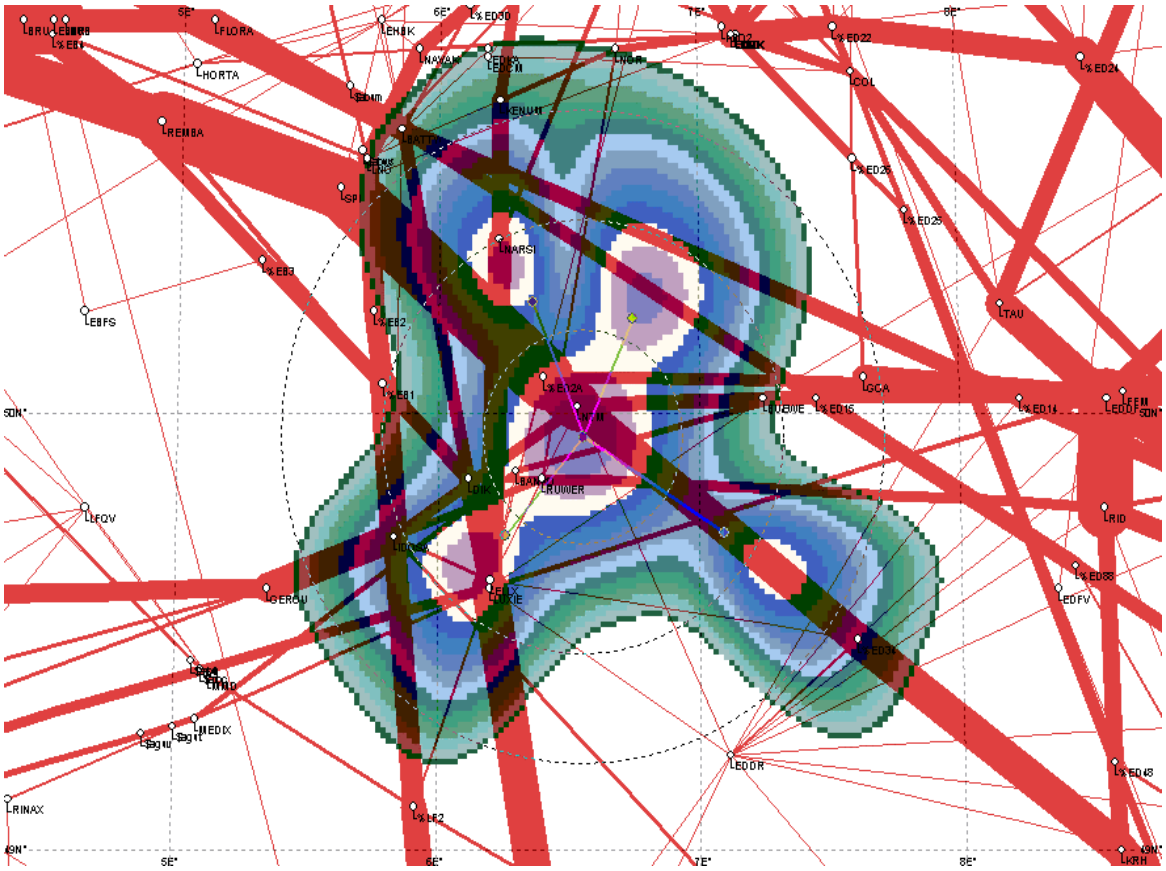

Figure 1. Coverage of Nattenheim HME

— END —

Appendix M to the RVSM/TF/26 Report
Task List

SN	Activity	Start	Complete	Present Status	Group Responsible	
1	**Identify Operational Need**					
2	Agree operational concept for Naha and Tokyo FIRs and Incheon FIR	5-Jul-04	7-Jul-04	**Completed**	ATC/WG, RVSM Task Force	
3	**Safety Assessment**					
4	Review available summary data (non-compliant aircraft, aberrant aircraft etc)	5-Jul-04	8-Jul-05	**Completed**	SAM/WG, MAAR, RVSM Task Force	
5	Examine history of height keeping errors related to ATC clearances and assess possible RVSM impact	5-Jul-04	8-Jul-05	**Completed**	SAM/WG, MAAR, RVSM Task Force	
6	Confirm RVSM risk model assumptions/parameters are consistent with airspace where RVSM is to be applied	5-Jul-04	8-Jul-05	**Completed**	SAM/WG, MAAR, RVSM Task Force	
7	Conduct simulations to predict occupancy after RVSM implementation	5-Jul-04	8-Jul-05	**Completed**	SAM/WG, MAAR, RVSM Task Force	
8	Collect weather and turbulence data for analysis	5-Jul-04	8-Jul-05	**Completed**	SAM/WG, OPSAIR, RVSM Task Force	
9	Report monthly large height deviations (including operational errors) to MAAR	1-Mar-04	On-going		ATS Providers, Users	
10	Collect traffic sample data for safety assessment for RVSM implementation	1-Aug-04	30-Sep-04	**Completed**	ATS Providers	
10	Collect traffic sample data for 90-day post-RVSM implementation review	1-Nov-05	30-Nov-05		ATS Providers	
10	Collect traffic sample data for 1-year post-RVSM implementation review	TBD	TBD		ATS Providers	
11	**Feasibility Analysis**					
12	Examine the operational factors and workload associated with RVSM implementation	5-Jul-04	8-Jul-05	**Completed**	ATC/WG, RVSM Task Force	
13	**Determination of Requirements (airborne & ground systems)**					
14	States assess the impact of RVSM implementation on controller automation systems and plan for upgrades/modifications	5-Jul-04	8-Jul-05	**Completed**	States	
15	**Aircraft & Operator Approval Requirements**					
16	Promulgate the operational approval process	5-Jul-04	8-Jul-05	**Completed**	OPS/AIR/WG, RVSM Task Force	
17	Notify States when significant changes occur to RVSM documentation	5-Jul-04	On-going		OPS/AIR/WG, RVSM Task Force	
18	**Perform Rulemaking (if required)**					
19	Recommend State airspace regulatory documentation	5-Jul-04	8-Jul-05	**Completed**	States	
20	**Perform Necessary Industry & International Co-ordination**					
21	Establish target implementation date	5-Jul-04	7-Jul-04	**Completed**	RVSM Task Force, States	
22	Report to ATM/AIS/SAR/SG/15	25-Jul-05	29-Jul-05		RVSM Task Force Chairman	
23	Process Doc 7030 amendment	5-Jul-04	In progress		ICAO Regional Office (to include Incheon FIR)	
24	Publish advance AIC	5-Jul-04	31-Jul-04	**Completed**	States	
25	Publish AIP Supplement / AIP Amendment containing RVSM policy/procedures	5-Jul-04	4-Aug-05		States	
26	Review inter-facility coordination procedures	5-Jul-04	31-Aug-05		States	
27	Finalize changes to Letters of Agreement	5-Jul-04	31-Aug-05		States	
28	Disseminate information on RVSM policy and procedures through RVSM Website	5-Jul-04	On-going		OPS/AIR WG, RVSM Task Force	
29	**Approval of Aircraft & Operators**					

Appendix M to the RVSM/TF/26 Report
Task List

SN	Activity	Start	Complete	Present Status	Group Responsible	
30	Establish approved operations readiness targets	5-Jul-04	7-Jul-04	**Completed**	IATA, ATC/WG, RVSM Task Force	
31	Assess operator readiness	5-Jul-04	8-Jul-05	**Completed**	IATA, OPS/AIR/WG	
32	**Develop Pilot & ATC Procedures**					
33	Review application of tactical offset procedure to mitigate the effects of wake turbulence and TCAS alerts	5-Jul-04	8-Jul-05	**Completed**	RVSM Task Force	
34	Review weather and contingency procedures for applicability under RVSM	5-Jul-04	4-Aug-05		RVSM Task Force	
35	Publish appropriate Pilot/ATC policy & procedures on RVSM website	5-Jul-04	4-Aug-05		RVSM Task Force	
36	Identify transition areas and procedures	5-Jul-04	8-Jul-05	**Completed**	States, ATC/WG	
37	Conduct simulation modelling to assess impact of RVSM operations	5-Jul-04	8-Jul-05	**Completed**	States, ATC/WG	
38	Report on simulation activity	5-Jul-04	8-Jul-05	**Completed**	ATC/WG, RVSM Task Force	
39	Coordinate use of ACAS II (TCAS V.7) for RVSM operations	5-Jul-04	8-Jul-05	**Completed**	OPS/AIR/WG, RVSM Task Force	
40	Develop procedures for handling non-compliant aircraft (inc ferry & mntce) in ATS documentation	5-Jul-04	8-Jul-05	**Completed**	OPS/AIR/WG, ATC/WG, RVSM Task Force	
41	Develop mutually acceptable ATC procedures for non-approved State acft to transit RVSM airspace	5-Jul-04	8-Jul-05	**Completed**	ATC/WG, RVSM Task Force	
42	Implement procedures for suspension of RVSM	5-Jul-04	29-Sep-05		ATC/WG, RVSM Task Force	
43	Liaise with State defense authorities regarding military operations	5-Jul-04	31-Aug-05		States	
44	**Pilot & ATC Training**					
45	Provide Pilot/ATC training documentation based on past experience	31-Oct-04	31-Aug-05		IATA, RVSM Task Force	
46	Conduct local RVSM training for air traffic controllers	5-Jul-04	31-Aug-05		States, ATC/WG	
47	**Perform System Verificiation**					
48	Height keeping performance monitoring needed to undertake initial safety analysis	5-Jul-04	8-Jul-05	**Completed**	MAAR and SAM/WG, RVSM Task Force	
49	Provide representative traffic movement data to MAAR	1-Aug-04	30-Sep-04	**Completed**	States	
50	Undertake initial safety analysis	1-Oct-04	8-Jul-05	**Completed**	SAM/WG, RVSM Task Force	
50	Undertake 90-day post RVSM implementation safety analysis	1-Jan-06	31-Jan-06		SAM/WG, RVSM Task Force	
50	Undertake 1-year post RVSM implementation safety analysis	TBD	TBD		SAM/WG, RVSM Task Force	
51	Prepare/maintain regional status report detailing RVSM implementation plans	5-Jul-04	8-Jul-05	**Completed**	RVSM Task Force	
52	**Final Implementation Decision**					
53	Review aircraft altitude-keeping performance and operational errors	5-Jul-04	8-Jul-05	**Completed**	SAM/WG, OPS/AIR/WG	
54	Complete ATS State documentation	5-Jul-04	4-Aug-05		States	
55	Publish Trigger NOTAM	22-Sep-05	22-Sep-05		States	
56	Complete operator readiness assessment	31-May-05	8-Jul-05	**Completed**	MAAR and SAM/WG, RVSM Task Force	
57	Complete safety analysis for RVSM implementation	31-May-05	8-Jul-05	**Completed**	MAAR and SAM/WG, RVSM Task Force	
57	Complete 90-day post RVSM implementation safety assessment	6-Feb-06	8-Feb-06		MAAR and SAM/WG, RVSM Task Force	
57	Complete 1-year post RVSM implementation safety assessment	TBD	TBD		MAAR and SAM/WG, RVSM Task Force	

SN	Activity	Start	Complete	Present Status	Group Responsible	
58	**Declare Initial Operational Capability**	4-Jul-05	8-Jul-05	**Completed**	MAAR and SAM/WG, RVSM Task Force	
59	**Monitor System Performance**					
60	Perform Follow-On Monitoring	29-Sep-05	On-going		PARMO, MAAR, OPS/AIR/WG, SAM/WG	
61	Adopt the global use of Minimum Monitoring Requirements (MMR)	5-Jul-04	8-Jul-05	**Completed**	RVSM Task Force	
62	**Declare Full Operational Capability**				RVSM Task Force	
63	Special ATS Coordination Meeting (Bangkok) - Japan & Korea Implementation - 3 days	5-Jul-04	7-Jul-04	**Completed**	RVSM Task Force	
64	Task Force/22 (Bangkok) - Review of FLOS for Western Pacific/South China Sea - 5 days	20-Sep-04	24-Sep-04	**Completed**	RVSM Task Force	
66	Task Force/23 (Bangkok) - Japan & Korea Implementation - 5 days	18-Oct-04	22-Oct-04	**Completed**	RVSM Task Force	
67	Task Force/24 (Bangkok) - 1 year follow up Bay of Bengal and Beyond implementation - 5 days	8-Nov-04	12-Nov-04	**Completed**	RVSM Task Force	
68	RVSM Seminar/6	21-Mar-05	22-Mar-05	**Completed**	RVSM Task Force	
69	Task Force/25 (Incheon) - Japan & Korea Implementation - 3 days	23-Mar-05	25-Mar-05	**Completed**	RVSM Task Force	
70	Task Force/26 (Tokyo) - Japan & Korea Implementation (Go/ No-Go Meeting) - 5 days	4-Jul-05	8-Jul-05	**Completed**	RVSM Task Force	
70	Task Force/27 (Bangkok) - 90 days follow up Japan & Korea implementation - 3 days	6-Feb-06	8-Feb-06		RVSM Task Force	
71	Task Force/28 (Bangkok) - Review of FLOS for Western Pacific/South China Sea - 5 days	9-Feb-06	10-Feb-06		RVSM Task Force	
71	Task Force/29 (Bangkok) - 1 year follow up Japan & Korea implementation - 3 days	00 Oct 06	00 Oct 06		RVSM Task Force	