International Civil Aviation Organization

Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG)

Fourteenth Meeting
(Jeddah, Saudi Arabia, 15-19 December 2013)

Agenda Item 5: Air Navigation Deficiencies and Safety Matters
5.2 Air Navigation Safety

MID RVSM SMR 2012-2013

(Presented by MIDRMA)

SUMMARY

This working paper details the principal results of the MID RVSM Safety Monitoring Report 2012-2013 and demonstrates according to the data used that the key safety objectives set out in section 2 of the SMR in accordance with ICAO Doc 9574 were met in operational service.

Action by the meeting is at paragraph 3.

REFERENCES

- ATM/AIM/SAR SG/13 Report
- MIDANPIRG/13 Report
- MIDRMA Board/11 & 12 Reports
- MID RVSM SMR 2011-2012

1. INTRODUCTION

1.1 The MID RVSM Safety Monitoring Report (SMR) 2012-2013 is issued by the Middle East Regional Monitoring Agency (MIDRMA) for endorsement by the Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG). The report presents evidence that, according to the data and methods used, the key safety objectives as set out in the MID RVSM Safety Policy in accordance with ICAO Doc 9574 (2nd Edition) continue to be met in the Middle East RVSM airspace.

1.2 The MID RVSM SMR 2012-2013 primarily covers the reporting period from May 2012 until August 2013 and based on corrected data by the MIDRMA, the original data received from some member states was corrupted and not useful for the analysis.

2. DISCUSSION

2.1 The meeting may wish to note that since the establishment of the MIDRMA, Eurocontrol continued to offer generous assistance to train the MIDRMA team for conducting safety analysis according to the collision risk model developed for the European region, this model was found to be very complex and more abstract, which focuses on the statistical distribution of deviation from planned path. It is thus over conservative and sometimes over estimates risk, moreover, the statistical derivation does not make it easy to see what the key parameters are and thus what the areas of improvements. Because of these issues the MIDRMA decided to adopt the ICAO risk model as it reflects more real picture and very close to reality.

2.2 The Safety Monitoring Report consists of estimating the risk of collision associated with RVSM and comparing this risk to the agreed RVSM safety goal, the Target Level Safety (TLS). A key issue for the assessment of RVSM safety is the satisfaction of the three Safety Objectives defined for the MIDRMA.

2.3 The safety assessment work is accomplished through the collection of data related to the operations in the RVSM airspace and, with the help of the MID RVSM Scrutiny Group which convened back to back with the MIDRMA Board 12 meeting on 16th December 2012 and attended by five MIDRMA member States only (Bahrain, Egypt, Kuwait, Iran and Saudi Arabia), the meeting analyzed the operational errors for the SMR production period and the final conclusions of the data processed have been severely limited by the continued NIL reporting of Large Height Deviations (LHDs) and Coordination Failure Reports (CFRs) from some MIDRMA Member States.

2.4 The MIDRMA would like to address the MIDANPIRG the low level of participants engagement in all Scrutiny Group (SG) Meetings especially the Third Meeting, this is a serious problem because the Scrutiny Group will not be able to receive explanations from the absent States involved in contributing large height deviation reports so that adverse trends can be identified by the meeting and remedial actions can be taken to ensure that risk due to operational errors will not be increased and can be reduced or eliminated, therefore the MIDRMA urge all MID Sates to attend and participate in future Scrutiny Group Meetings.

2.5 The MIDRMA continuously stressed the importance of all MIDRMA member states to submit the required data to adequately assess and calculate all relevant safety parameters and factors, however the MIDRMA still suffers problems with some member States due to the late submission of the traffic data and due to the corrupted data which caused excessive delay for calculating the SMR safety parameters.

2.6 Reference to MIDANPIRG CONCLUSION 13/71 concerning the development of the MID RVSM SMR 2012 - 2013, the FPL/traffic data for the period 1-31 October 2012 shall be used for the development of the MID RVSM Safety Monitoring Report , the descriptions of the total traffic data collected from each MIDRMA member State is depicted in the table below, a total of 214,609 flights were gathered for all aircraft operated in the MID RVSM airspace, all these flights were evaluated and processed very carefully to ensure accurate results according to the data submitted.

SN	MID States	June 2009	Jan 2011	Oct-12	Jan 2100 vs Oct 2012 (%)
1	Bahrain FIR	24285	30099	39345	23.5
2	Muscat FIR	22520	28224	30357	7.03
3	Jeddah/Riyadh FIR	22422	25499	30944	17.6
4	Cairo FIR	19228	14270	26332	45.81
5	Emirates FIR	15868	21076	24676	14.59
6	Tehran FIR	10479	10638	17523	39.29
7	Damascus FIR	9774	11719	8027	**-45.99**
8	Amman FIR	8554	10689	6857	**-55.88**
9	Kuwait FIR	3570	10364	13596	23.77
10	Sana'a FIR	3490	4305	5170	16.73
11	Beirut FIR	2949	3845	1286	**-66.5**
12	Baghdad FIR	-	-	10496	
	Total	**143,139**	**170,728**	**214,609**	**20.45**

MID States RVSM Traffic Data used for the SMRs

2.7 Safety Monitoring Report 2012 - 2013 Results:

2.7.1 **RVSM Safety Objective 1:**

The risk of collision in MID RVSM airspace due solely to technical height-keeping performance meets the ICAO target level of safety (TLS) of 2.5 x 10^{-9} fatal accidents per flight hour.
The 2013 value computed for technical height risk is **$6.37x10^{-12}$**. This meets RVSM Safety Objective 1.

Technical Risk Values				
Year 2006	Year 2008	Year 2010	Year 2012	**Year 2013**
$2.17x10^{-14}$	$1.93x10^{-13}$	$3.96x10^{-15}$	5.08 x 10^{-14}	**$6.37x10^{-12}$**

2.7.1.1 According to the technical risk values as shown in the above table from the previous SMRs, the TLS value increased from the last SMR but it is still safe comparing to the ICAO TLS 2.5 x 10^{-9}.

2.7.1.2 The MIDRMA was able to measure the TLS through the new TLS software for each FIR in the Middle East Region, the table below reflects all the TLS results:

No	**FIR**	**Flying Time**	**TLS Result**
1	Baghdad	2,794 hours	1.73×10^{-11}
2	Kuwait	3,289 hours	1.70×10^{-11}
3	Bahrain	23,624 hours	1.61×10^{-11}
4	Cairo	24,904 hours	3.92×10^{-12}
5	Muscat	19,059 hours	3.68×10^{-12}
6	Jeddah/Riyadh	26,925 hours	3.49×10^{-12}
7	Tehran	19,836 hours	3.33×10^{-12}
8	UAE	5,384 hours	3.21×10^{-12}
9	Damascus	955 hours	2.47×10^{-12}
10	Amman	1,468 hours	1.97×10^{-12}
11	Sana'a	3,434 hours	1.96×10^{-12}
12	Beirut	195 hours	1.91×10^{-12}
	MID Region TLS	131,867 hours	**6.37×10^{-12}**

MIDRMA Member States TLS 2012 - 2013

2.7.1.3 From the above table the TLS measured for Baghdad FIR is the highest in the MID Region followed by Kuwait and Bahrain, although the results satisfy the ICAO TLS 2.5 x 10^{-9} but with the continuous traffic growth and the limitation in the alternative routings to/from Europe through these FIRs is reflecting serious concern in the future TLS.

2.7.1.4 The MIDRMA is planning to measure the TLS at least two times within the next cycle of the MID RVSM SMR in five FIRs in the Middle East Region, Baghdad, Bahrain, Kuwait, UAE and Muscat, these FIRs are considered as a chain linked with each other which handle the main flow of air traffic from East to West and vice versa through the Middle East Region. This will ensure the TLS will be monitored in a shorter period and will enable the MIDRMA to warn any Member State when the TLS has increased or getting close to an alarming level.

2.7.1.5 MID States Minimum Monitoring Requirement (MMR)

In order to accomplish the ICAO Annex 6 height monitoring requirements, the MIDRMA coordinated with all Member States to publish the MMR table which reflects all height monitoring requirements for each state, this table is continuously reviewed at regular intervals or when requested by any Member State, the MIDRMA Board 12 meeting agreed that the performance target for height monitoring needs to reach 95% of the total population the RVSM approved aircraft in the Middle East Region, this percentage of height monitored aircraft in the Region require states to enforce the MMR on all airline operators required to be monitored and shall take all necessary measures for operators not complying with height monitoring, however the response of the MID States to comply with their MMRs vary from satisfactory to unsatisfactory, the table below reflects the total number of aircraft required to be monitored for each

MIDRMA Member State:

No	MID STATES	ACFT MMR
1	Bahrain	**0**
2	Jordan	**0**
3	Kuwait	**0**
4	Oman	**0**
5	Syria	**0**
6	Qatar	**2**
7	Iraq	**2**
8	Egypt	**11**
9	Yemen	**6**
10	Lebanon	**9**
11	UAE	**9**
12	KSA	**29**
13	Iran	**51**
	TOTAL	**119**

Minimum Monitoring Requirements for the MIDRMA Member States until Oct. 2013

2.7.1.6 **Pz(1000) compliance**

The Pz(1000) is the probability that two aircraft at adjacent RVSM flight levels will lose vertical separation due to technical height keeping errors. The value of the probability of vertical overlap Pz(1000), based on the actual observed ASE and typical AAD data is estimated to be of **5.26×10^{-9}** . This value meets the Global System Performance Specification that the probability of two aircraft will lose procedural vertical separation of 1000ft should be no greater than **1.7×10^{-8}**.

2.7.1.7 Middle East RVSM Airspace Horizontal Overlap Frequency (HOF):

a. The airspace to the northern part of Bahrain FIR continued to be the busiest and most complex airspace in the Middle East Region, however the northern and eastern part of Muscat FIR is also very complex and so is the airspace around HIL in Jeddah/Riyadh FIR. Accordingly, the determination of the Horizontal Overlap Frequency was measured in four different FIRS, Bahrain, Kuwait (including the southern part of Baghdad FIR), Muscat and the Central part of Jeddah/Riyadh FIRs.

b. The MIDRMA merged all radar data through the RADAC system and calculated the horizontal overlap frequency from the four radars which was estimated to be **4.33×10^{-8}** per flight hour.

Horizontal Overlap Frequency (HOF)				
Year 2006	Year 2008	Year 2010	Year 2011-2012	**Year 2012 -2013**
6.99×10^{-3}	5.1×10^{-11}	2.88×10^{-6}	6.49×10^{-5}	**4.34×10^{-8}**

c. It should be noted that the radar data available may not be totally representative of the traffic patterns for the whole MID region, particularly as western states in this area are subject to a level of unrest that has had a significant impact on the level of traffic.

Overall, though as the airspace monitored in the MID region is considered to be both busy and complex, and has been so in the past in the western states, the results are considered to be valid.

2.7.2 **RVSM Safety Objective 2:**

The overall risk of collision due to all causes which includes the technical risk and all risk due to operational errors and in-flight contingencies in the MID RVSM airspace meets the ICAO overall TLS of 5×10^{-9} fatal accidents per flight hour.

2.7.2.1 The computed overall risk of collision due to all causes which includes the technical risk and all risk due to operational errors and in-flight contingencies in the MID RVSM airspace is **3.63×10^{-11}** which meets the ICAO overall TLS of **5×10^{-9}** fatal accidents per flight hour, the table below reflects a comparison with the overall risk values calculated for the previous SMRs.

Overall Risk Values				
Year 2006	Year 2008	Year 2010	Year 2011-2012	**Year 2012 -2013**
Not calculated due to the absence of suitable information on atypical errors	4.19×10^{-13}	6.92×10^{-12}	1.04×10^{-11}	**3.63×10^{-11}**

2.7.2.2 The vertical risk estimation due to atypical errors has been demonstrated to be the major contributor in the overall vertical-risk estimation for the MID RVSM airspace, The final conclusions of the data processed have been severely limited by the continued NIL reporting of Large Height Deviations (LHDs) and Coordination Failure Reports (CFRs) from some members which does not support a high confidence in the result, the MIDRMA is reiterating the importance of submitting such reports especially from FIRs with high volume of traffic.

2.7.2.3 The table below shows the number of LHDs and CFRs that have been reported by the MIDRMA Member States:

	Months	**July 2011 - April 2012**		**May 2012 – August 2013**	
		ADR/LHD	**CFR**	**LHD**	**CFR**
1	**Kuwait**	0	54	0	125
2	**Oman**	0	96	0	52
3	**Syria**	0	2	0	7
4	**UAE**	10	30	2	3
5	**Iran**	0	37	3	21
6	**Saudi Arabia**	3	25	4	0
7	**Bahrain**	2	189	5	201
8	**Egypt**	0	28	6	6
9	**Jordan**	27	21	28	0
10	**Iraq**	0	24	54	271
11	**Qatar**	N/A	N/A	N/A	N/A
12	**Lebanon**	1	0	0	0
13	**Yemen**	0	0	0	0

2.7.3 RVSM Safety Objective 3

Address any safety-related issues raised in the SMR by recommending improved procedures and practices, and propose safety level improvements to ensure that any identified serious or risk-bearing situations do not increase and, where possible, that they decrease. This should set the basis for a continuous assurance that the operation of RVSM will not adversely affect the risk of en-route mid-air collision over the years.

2.7.3.1 Conclusions for RVSM Safety Objective 3:

a) Current risk-bearing situations have been identified and actions will be taken to ensure resolving all violations and information was collected during the MID RVSM Scrutiny Group meeting on 16th December 2012 in order to identify operational issues and potential mitigations.

b) The MIDRMA will include in its work program training activity and briefings on RVSM safety assessment requirements to raise the awareness of ATC, RVSM approval Authorities and Air Operators personnel.

Therefore, it is concluded that this Safety Objective is currently met.

2.8 Conclusions and Recommendations

a) The 2013 value computed for technical height risk is **$6.37x10^{-12}$** this value meets the ICAO Target Level of Safety (TLS) of 2.5×10^{-9} fatal accidents per flight hour.

b) The computed overall risk of collision due to all causes which includes the technical risk and all risk due to operational errors and in-flight contingencies in the MID RVSM airspace is **3.63×10^{-11}** which meets the ICAO overall TLS of 5×10^{-9} fatal accidents per flight hour.

c) The value of the probability of vertical overlap Pz(1000), based on the actual observed ASE and typical AAD data is estimated to be of **5.26×10^{-9}** . This value meets the Global System Performance Specification that the probability of two aircraft will lose procedural vertical separation of 1000ft should be no greater than $1.7x10^{-8}$.

d) The MIDRMA will continue to conduct height monitoring during 2013/2014 for all airline operators registered in the Middle East Region to achieve the performance target for height monitoring of 95% from the total number of the RVSM approved aircraft in the region.

e) The MIDRMA shall carry out continuous survey and investigation on the number and causes of non-approved aircraft operating in the MID RVSM airspace.

f) The MIDRMA shall continue to cooperate with the Member States required to submit their radar data and arrange for RADAC upgrade to include their radar data format.

g) The MIDRMA will continue to encourage States to provide Large Height Deviation Reports.

h) The MIDRMA will continue to enhance the MID VCR Software and shall include hot spot and other visualization features in phase 2 of the software project.

i) Current risk-bearing situations have been identified and actions will be taken to ensure resolving all violations and information was collected during the MID RVSM Scrutiny Group meeting on 16th December 2012 in order to identify operational issues and potential mitigations.

j) The MIDRMA will include in its work program training activity and briefings on RVSM safety assessment requirements to raise the awareness of ATC, RVSM approval Authorities and Air Operators personnel.

3. Action by the Meeting

3.1 The meeting is invited to review and endorse the MID RVSM SMR 2012 - 2013 at **Appendix A** to this working paper.

APPENDIX A

THE MID RVSM SAFETY

MONITORING REPORT 2012 - 2013

MIDANPRIG/14 Endorsement Edition.

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Document Characteristic

Report Title: The MID RVSM SAFTY MONITORING REPORT 2012-2013

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Abstract
This document constitutes the RVSM Safety Monitoring Report for the MID RVSM Airspace for 2012-2013. The aim of this document is to highlight by means of argument and supporting evidence that the implementation of RVSM in the Middle East is acceptably safe.

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The MIDRMA would like also to extend their deep gratitude to the Civil Aviation Affairs of the Kingdom of Bahrain for providing the MIDRMA with an excellent environment, facilities and support to continue running all the assigned MIDRMA's duties and responsibilities in a convenient manner.

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DOCUMENT CHANGE RECORD

VERSION NUMBER	EDITION DATE	REASON FOR CHANGE
0.1		Draft version presented to ATM/SAR/AIS SG/13.
0.2		Revised version by MIDRMA.
0.3		MIDANPRIG/14 Endorsement Edition.

EXECUTIVE SUMMARY

The MID RVSM Safety Monitoring Report is issued by the Middle East Regional Monitoring Agency (MIDRMA) for endorsement by the Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG).

The report presents evidence that according to the data and methods used, the key safety objectives set out in the MID RVSM Safety Policy in accordance with ICAO Doc 9574 (2nd Edition) continue to be met in operational service in the Middle East RVSM airspace .

To conclude on the current safety of RVSM operations, the three key safety objectives endorsed by MIDANPIRG have to be met:

Objective 1 The risk of collision in MID RVSM airspace due solely to technical height-keeping performance meets the ICAO target level of safety (TLS) of **2.5×10^{-9}** fatal accidents per flight hour.

The value computed for technical height risk is **6.37×10^{-12}**. This meets RVSM Safety Objective 1.

Objective 2 The overall risk of collision due to all causes which includes the technical risk and all risk due to operational errors and in-flight contingencies in the MID RVSM airspace meets the ICAO overall TLS of **5×10^{-9}** fatal accidents per flight hour.

The value computed for overall risk is **3.63×10^{-11}.** This meets RVSM Safety Objective 2.

Objective 3 Address any safety-related issues raised in the SMR by recommending improved procedures and practices; and propose safety level improvements to ensure that any identified serious or risk-bearing situations do not increase and, where possible, that they decrease. This should set the basis for a continuous assurance that the operation of RVSM will not adversely affect the risk of en-route mid-air collision over the years.

Conclusions

(i) The estimated risk of collision associated with aircraft height- keeping performance is **6.37×10^{-12}** and meets the ICAO TLS of **2.5×10^{-9}** fatal accidents per flight hour (RVSM Safety Objective1).

(ii) The estimated overall risk of collision due to all causes which includes the technical risk and all risk due to operational errors and in-flight contingencies is **3.63×10^{-11}** and meets the ICAO overall TLS of **5×10^{-9}** fatal accidents per flight hour (RVSM Safety Objective 2).

(iii) Based on currently-available information, there is no evidence available to the RMA to state that the continued operation of RVSM adversely affects the overall vertical risk of collision.

1 INTRODUCTION

1.1 Background

Reduced Vertical Separation Minima (RVSM) was introduced in the Middle East RVSM airspace on 27th November 2003. In compliance with Annex 11 and ICAO Doc. 9574 provisions, a monitoring programme was established by the MIDRMA and a safety monitoring report is presented to each MIDANPIRG meeting. The present document represents the Safety Monitoring Report which covers the period from May 2012 until August 2013.

1.2 Aim

This Report responds to the official ICAO request to MIDRMA to show by means of argument and supporting evidence that the implementation of RVSM in the Middle East Region satisfies the safety objectives defined in Section 2 of this Report.

The Report is issued for endorsement by MIDANPIRG.

1.3 Scope

The geographic scope of the MID RVSM Safety Monitoring Report covers the MID RVSM Airspace which comprises the following FIRs/UIRs:

Amman	**Bahrain**	**Baghdad**	**Beirut**	**Cairo**	**Damascus**
Emirates	**Jeddah**	**Kuwait**	**Muscat**	**Sana'a**	**Tehran**

T-1: FIRs/UIRs of the Middle East RVSM Airspace

The Data Sampling periods covered by the SMR 2012-2013 are as displayed in the below table

Report Element	Time Period
Vertical Overlap - Traffic Sample Data & Radar Data	01/10/2012 – 31/10/2013
Operational Errors	01/05/2012 – 31/08/2013

T-2: Time period for the reported elements

1.4 Structure of the Document

The Report is constructed using an approach that claims that the risk of collision under MID RVSM will be tolerably low. There are three main safety objectives which collectively represent the conditions to be met for the above claim to be true. This report demonstrates the veracity of the claim by demonstration that these three key safety objectives are met.

- **Section 0** of this document describes the three RVSM safety objectives and the individual components that relate directly to the on-going safety of MID RVSM.
- **Sections 3, 4, 5** details the assessment made against the safety objectives.
- **Section 6** Conclusions and Recommendations related to the three safety objectives.
- **Appendices**
  - **Appendix A:** Provides Member States Traffic Data Analysis.
  - **Appendix B:** Provides MID States Registered ACFT Required Monitoring.
  - **Appendix C:** Provides RMAs RVSM MINIMUM MONITORING EQUIREMENTS Table (Updated on 29/06/2010).
  - **Appendix D:** Provides MIDRMA Duties and Responsibilities.
  - **Appendix E:** Provides Definitions and Explanations of RVSM Terms.
  - **Appendix F:** Provides Abbreviations

2 MID RVSM SAFETY OBJECTIVES

A key issue for the assessment of RVSM safety is the satisfaction of a number of safety objectives defined in the Safety Policy for RVSM. The following three safety objectives endorsed by MIDANPIRG are directly relevant to the on-going safety of RVSM:

Objective 1 The risk of collision in MID RVSM airspace due solely to technical height-keeping performance meets the ICAO target level of safety (TLS) of **2.5×10^{-9}** fatal accidents per flight hour.

Objective 2 The overall risk of collision due to all causes which includes the technical risk and all risk due to operational errors and in-flight contingencies in the MID RVSM airspace meets the ICAO overall TLS of **5×10^{-9}** fatal accidents per flight hour.

Objective 3 Address any safety-related issues raised in the SMR by recommending improved procedures and practices; and propose safety level improvements to ensure that any identified serious or risk-bearing situations do not increase and, where possible, that they decrease. This should set the basis for a continuous assurance that the operation of RVSM will not adversely affect the risk of en-route mid-air collision over the years.

2.1 Considerations on the RVSM Safety Objectives

When considering the three safety objectives for RVSM, the following considerations should be borne in mind:

1. The assessment of risk against the TLS, both for technical and overall risk estimates, relies on height keeping performance data to assess the risk in the vertical plane and studies of traffic density to calculate the risk in the horizontal plane.
2. The Aircraft performance is assessed by individual airframe and by monitoring group. A monitoring group consists of aircraft that are nominally of the same type with identical performance characteristics that are made technically RVSM compliant using a common compliance method. Monitoring group analysis is necessary to verify that the Minimum Aviation System Performance Standards (MASPS) for that group is valid. Aircraft that are made RVSM compliant on an individual basis are termed non-group.
3. The RVSM Safety Objective 2, dealing with overall risk, takes into account the technical risk presented in Section 3 together with the risk from all other causes. In practice this relates to the human influence and assessment of this parameter relies on adequate reporting of Large Height Deviation (LHD) Reports, Coordination Failures (CFRs) and the correct interpretation of events for input to the CRM.

4. RVSM Safety Objective 3 requires the RMA to monitor long term trends and to identify potential future safety issues. This Section compares the level of risk bearing incidents for the current reporting period to equivalent periods from previous years. It also highlights issues that should be carried forward as recommendations to be adopted for future reports.

2.2 Vertical-collision risk – general concept

The mathematical model for vertical-collision risk has three key components:

a. First component is the frequency with which aircraft flying at the vertical separation minimum pass directly overhead one another. This is termed the horizontal-overlap frequency.

b. Second component is the probability that aircraft, which are nominally separated by the vertical-separation minimum, are actually, for reasons of error, flying at the same level. This is termed the probability of vertical overlap.

c. Third component is the analysis of validated LHD Reports and CFR's by the MID RVSM Scrutiny Group

It is the product of these three components which results in the collision risk in the vertical dimension. The data used to estimate each component is dependent on the type of vertical risk being considered, i.e. technical or operational vertical-collision risk.

3 TECHNICAL HEIGHT KEEPING PERFORMANCE RISK ASSESSMENT

RVSM Safety Objective 1

The risk of collision in MID RVSM airspace due solely to technical height-keeping performance meets the ICAO target level of safety (TLS) of **2.5×10^{-9}** fatal accidents per flight hour.

3.1 Direct evidence of compliance with TLS for technical height-keeping error

The result shows that the risk of collision due to technical height-keeping performance is estimated to be **6.37×10^{-12}** fatal accidents per flight hour, which meets the ICAO TLS of **2.5×10^{-9}**.

3.2 Supporting evidence of compliance with TLS for technical height-keeping performance

To demonstrate that the result is reliable, it is necessary to demonstrate that the following assumptions are true:

a. The estimated value of the frequency of horizontal overlap, used in the computations of vertical-collision risk, is valid;

b. Pz(1000) – the probability of vertical overlap due to technical height-keeping performance, between aircraft flying 1000 ft. separation in MID RVSM airspace is **5.26×10^{-9}** valid and is less than the ICAO requirement of **1.7×10^{-8}**.

c. All aircraft flying 1000ft separation in MID RVSM airspace meet the ICAO Global Height Keeping Performance specification for RVSM;

d. All aircraft flying 1000ft separation in MID RVSM airspace meet the individual ICAO performance specification for the components of total vertical error (TVE).

e. The monitoring target for the MID RVSM height-monitoring programme is an on-going process.

f. The input data used by the CRM is valid.

g. An adequate process is in place to investigate and correct problems in aircraft technical height-keeping performance.

3.2.1 Horizontal Frequency Overlap

a. The airspace to the northern part of Bahrain FIR continued to be the busiest and most complex airspace in the Middle East Region, however the northern and eastern part of Muscat FIR is also very complex and so is the airspace around HIL in Jeddah/Riyadh FIR. Accordingly, the determination of the Horizontal Overlap Frequency was measured in four different FIRS, Bahrain, Kuwait (including the southern part of Baghdad FIR), Muscat and the Central part of Jeddah/Riyadh FIRs.

b. The MIDRMA merged all radar data through the RADAC system and calculated the horizontal overlap frequency from the four radars which was estimated to be **4.33×10^{-8}**.

c. It should be noted that the radar data available may not be totally representative of the traffic patterns for the whole MID region, particularly as western states in this area are subject to a level of unrest that has had a significant impact on the level of traffic.

d. Overall, though as the airspace monitored in the MID region is considered to be both busy and complex, and has been so in the past in the western states, the results are considered to be valid.

3.2.2 Measuring of Horizontal Overlap Frequency (HOF)

Frequency of Horizontal Overlap				
Year 2006	**Year 2008**	**Year 2010**	**Year 2011-2012**	**Year 2012-2013**
6.99×10^{-3}	**5.1×10^{-11}**	**2.88×10^{-6}**	**6.49×10^{-5}**	**4.34×10^{-8}**

The Frequency of HOF Values

3.2.3 Pz(1000) compliance

The Pz(1000) is the probability that two aircraft at adjacent RVSM flight levels will lose vertical separation due to technical height keeping errors. The value of the probability of vertical overlap Pz(1000), based on the actual observed ASE and typical AAD data is estimated to be of **5.26×10^{-9}** . This value meets the Global System Performance Specification that the probability that two aircraft will lose procedural vertical separation of 1000ft should be no greater than **1.7×10^{-8}**.

3.3 Evolution of Technical Risk Estimate

Technical Risk Values				
Year 2006	**Year 2008**	**Year 2010**	**Year 2011-2012**	**Year 2012-2013**
2.17×10^{-14}	**1.93×10^{-13}**	**3.96×10^{-15}**	**5.08×10^{-14}**	**6.37×10^{-12}**

The Technical Risk values

4 ASSESSMENT OF OVERALL RISK DUE TO ALL CAUSES AGAINST THE TLS OF 5 X 10^{-9} FATAL ACCIDENTS PER FLIGHT HOUR

RVSM Safety Objective 2

The overall risk of collision due to all causes which includes the technical risk and all risk due to operational errors and in-flight contingencies in the MID RVSM airspace meets the ICAO overall TLS of **5 x 10^{-9}** fatal accidents per flight hour.

The overall risk of collision due to all causes which includes the technical risk and all risk due to operational errors and in-flight contingencies in the MID RVSM airspace. The computed value is **3.63 x 10^{-11}** which meets the ICAO overall TLS of **5 x 10^{-9}** fatal accidents per flight hour.

4.1 Evolution of the overall Risk Estimate

Overall Risk Values				
Year 2006	**Year 2008**	**Year 2010**	**Year 2011-2012**	**Year 2012-2013**
Not calculated due to the absence of suitable information on atypical errors	$4.19x10^{-13}$	$6.92x10^{-12}$	$1.04x10^{-11}$	**$3.63 x 10^{-11}$**

The vertical risk estimation due to atypical errors has been demonstrated to be the major contributor in the overall vertical-risk estimation for the MID RVSM airspace, The final conclusions of the data processed have been severely limited by the continued NIL reporting of Large Height Deviations (LHDs) and Coordination Failure Reports (CFRs) from some members which does not support a high confidence in the result, the MIDRMA is reiterating the importance of submitting such reports especially from FIRs with high volume of traffic.

The table below shows the number of LHDs and CFRs that have been reported by the MID States:

MID States LHD, CFR & RVSM status report

	Months	July 2011 - April 2012		May 2012 - Aug 2013	
		ADR/LHD	CFR	LHD	CFR
1	**Kuwait**	0	54	0	125
2	**Oman**	0	96	0	52
3	**Syria**	0	2	0	7
4	**UAE**	10	30	2	3
5	**Iran**	0	37	3	21
6	**Saudi Arabia**	3	25	4	0
7	**Bahrain**	2	189	5	201
8	**Egypt**	0	28	6	6
9	**Jordan**	27	21	28	0
10	**Iraq**	0	24	54	271
11	**Qatar**	N/A	N/A	N/A	N/A
12	**Lebanon**	1	0	0	0
13	**Yemen**	0	0	0	0

4.2 Effects of future traffic growth

The effect of future traffic growth on the vertical collision risk can be evaluated on the assumption of a linear relationship between traffic growth and frequency of horizontal overlap, which will directly affect the two components of the risk, the risk due to technical height-keeping performance and due to atypical operational errors.

It is clear that even for the most optimistic forecast range of 13%, the overall risk of collision will continue to meet the TLS at least until 2017. With the current uncertainty over traffic growth this issue will be revisited when the Middle East economic conditions return to more normal growth.

5 ASSESSMENT OF SAFETY-RELATED ISSUES RAISED IN THIS REPORT

RVSM Safety Objective 3

Address any safety-related issues raised in the SMR by recommending improved procedures and practices; and propose safety level improvements to ensure that any identified serious or risk-bearing situations do not increase and, where possible, that they decrease. This should set the basis for a continuous assurance that the operation of RVSM will not adversely affect the risk of en-route mid-air collision over the years.

5.1 Methodology

The identified safety-related issues are:

a. Confirmation of the approval status of aircraft filling RVSM flight plan (W in field 10).

b. Accuracy contents and quantity of supplied data is detaining the accurate determination of operational risk assessment.

c. Identification of operators requiring monitoring and address the minimum monitoring requirements to all MIDRMA member states.

Reference c. the recommended practice in this case is addressing all operators in the Middle East region which required conducting height monitoring**;** the MIDRMA published a new MMR for all member states. **Appendix-B** shows all operators requiring height monitoring in the MID Region.

5.2 Conclusions

a. Current risk-bearing situations have been identified and actions will be taken to ensure resolving all violations and information was collected during the MID RVSM Scrutiny Group meeting on 16th December 2012 in order to identify operational issues and potential mitigations.

b. The MIDRMA will include in its work program training activity and briefings on RVSM safety assessment requirements to raise the awareness of ATC, RVSM approval Authorities and Air Operators personnel.

Therefore, it is concluded that this Safety Objective is currently met.

5.3 Recommendations Applicable To Safety Objective 3

(i) MIDRMA to continue monitoring RVSM operations in the whole Middle East RVSM airspace over the months by the collection the Large Height Deviation reports from the participating States in accordance with the new MIDRMA requirements as detailed in the MIDRMA manual

(ii) MIDRMA shall coordinate with all member states to assist their airline operators requesting to conduct GMU monitoring.

(iii) MIDRMA to address the Minimum Monitoring Requirements for all member states.

(iv) The MIDRMA will coordinate with the RMACG (Regional Monitoring Agencies Coordination Group) to conduct a global audit of flight plans for the verification of RVSM approvals.

6 Conclusions and Recommendations

a. The 2012 - 2013 value computed for technical height risk is **6.37×10^{-12}**, this value meets the ICAO Target Level of Safety (TLS) of **2.5×10^{-9}** fatal accidents per flight hour.

b. The computed overall risk of collision due to all causes which includes the technical risk and all risk due to operational errors and in-flight contingencies in the MID RVSM airspace is **3.63×10^{-11}** which meets the ICAO overall TLS of **5×10^{-9}** fatal accidents per flight hour.

c. The value of the probability of vertical overlap Pz(1000), based on the actual observed ASE and typical AAD data is estimated to be of **5.26×10^{-9}** . This value meets the Global System Performance Specification that the probability of two aircraft will lose procedural vertical separation of 1000ft should be no greater than **1.7×10^{-8}**.

d. The MIDRMA will continue to conduct height monitoring during 2014 for all airline operators registered in the Middle East Region to achieve the performance target for height monitoring of 95% from the total number of the RVSM approved aircraft in the region.

e. The MIDRMA shall carry out continuous survey and investigation on the number and causes of non-approved aircraft operating in the MID RVSM airspace.

f. The MIDRMA shall continue to cooperate with the Member States required to submit their radar data and arrange for RADAC upgrade to include their radar data format.

g. The MIDRMA will continue to encourage States to provide Large Height Deviation Reports.

h. The MIDRMA will continue to enhance the MID VCR Software and shall include hot spot and other visualization features in phase 2 of the software project.

i. Current risk-bearing situations have been identified and actions will be taken to ensure resolving all violations and information was collected during the MID RVSM Scrutiny Group meeting on 16th December 2012 in order to identify operational issues and potential mitigations.

j. The MIDRMA will include in its work program training activity and briefings on RVSM safety assessment requirements to raise the awareness of ATC, RVSM approval Authorities and Air Operators personnel. MIDRMA to continue monitoring RVSM operations in the whole Middle East RVSM airspace over the months by the collection the Large Height Deviation reports from the participating States in accordance with the new MIDRMA requirements as detailed in the MIDRMA manual

k. MIDRMA shall coordinate with all member states to assist their airline operators requesting to conduct GMU monitoring.

l. MIDRMA to address the Minimum Monitoring Requirements for all member states.

m. The MIDRMA will coordinate with the RMACG (Regional Monitoring Agencies Coordination Group) to conduct a global audit of flight plans for the verification of RVSM approvals.

C.3.1.2 Scrutiny Group Technical Observations:

The Third Meeting of the MID RVSM Scrutiny Group convened on 16th December 2012 in Kuwait, back to back with MIDRMA Board 12 Meeting (17-19 December 2012) and was attended by representatives from 5 Member States ONLY (Bahrain, Egypt, Iran, Kuwait and Saudi Arabia) , the meeting was monitored by ICAO MID Office and chaired by the MIDRMA.

The MIDRMA reported to the ATM/AIM/SAR Meeting 13 the low level of participants engagement in all Scrutiny Group (SG) Meetings especially the third meeting, this is a serious problem because the Scrutiny Group will not be able to receive explanations from the absent States involved in contributing large height deviation reports so that adverse trends can be identified by the meeting and remedial actions can be taken to ensure that risk due to operational errors will not be increased and can be reduced or eliminated.

The MIDRMA presented to the Scrutiny Group all Coordination Failure Reports (CFRs) and Large Height Deviation Reports (LHDs) received from all MIDRMA member states during the period of 1st May 2012 until 30th November 2012. The MIDRMA validated and endorsed the rest of the reports received for the remaining reporting period until 31st August 2013. A total of 55 LHDs and CFRs contributed in the risk analysis. The Scrutiny Group observed that the extreme majority of the LHDs and CFRs were reports of the transferring units fail to coordinate their traffic to the accepting units, the participants analysed the reports and discussed their impact on the implementation of RVSM in the Middle East region and determined parameter values necessary for the collision risk estimation.

The MIDRMA continued to raise their serious concern for the third consecutive Scrutiny Group Meeting concerning the lack of reporting Large Height Deviations and Coordination Failures by some of the MIDRMA Member States, the MIDRMA did not see any improvement in the level of reporting by some Member States since 2007, the final conclusions of the evaluated reports have been severely limited by the continued NIL reporting of Large Height Deviations (LHDs) and Coordination Failure Reports (CFRs) which does not support a high confidence in the results of the Safety Monitoring Report.

The LHD and CFR occurrences in the MID Region airspace are summarized as follows:

i. Total number of LHDs received was 102 – (Only 27 were categorized as relevant for the report) deviation period = 24.1minutes.
ii. Total number of CFRs received was 686 (28 were categorized as LHDs) = 22.78 minutes.
iii. From 01st May 2012 until 31st August 2013 there have been a total of 46.88 minutes of Altitude Deviation occurrences.

The Scrutiny Group and the MIDRMA validated all essential LHDs and CFRs related to the attended countries to the meeting, these reports have direct impact on the RVSM operations within the Middle East Region. The following observations were addressed and discussed during the meeting:

a. Bahrain continued to score the highest volume of traffic in the Middle East Region according to the submitted traffic data used for the SMR 2013, and the traffic situation in the airspace from North of the Qatari Peninsula to the North of Dammam continued to be the most congested and complex airspace in the Middle East Region. The FIR boundary waypoint BALUS between Bahrain and Emirates FIRs (which does not exist anymore), scored the highest volume of traffic. The MIDRMA would like to extend their deep gratitude and appreciation to Bahrain and Emirates ATC Units for their response to resolve the traffic congestion at position BALUS and for the effective coordination and team work between the two units which resulted the implementation of the new RNAV1 airways between the two FIRs and facilitated the transit of Westbound traffic entering the Bahrain FIR from the Emirates FIR.

b. Bahrain submitted 5 LHDs and 201 CFRs to the MIDRMA during the SMR 2012 - 2103 reporting period. The extreme majority of the CFRs received from Bahrain were concentrated at waypoints BALUS, DETKO, RABAP, GIBUS, TAGSO and ULOVO also several CFRs reported in the Southern sector, where a FLAS is implemented, these CFRs required a careful evaluation by the Scrutiny Group due to their serious impact on RVSM implementation. The MIDRMA consider the level of reporting by Bahrain is Satisfactory.

c. The Scrutiny Group discussed the reports received from Egypt and noticed a sharp decrease in the number of the submitted CFRs and LHDs during the reporting period of the SMR 2012 - 2013, only few CFRs received against Tripoli ACC at the FIR boundary points LOSUL and DETAR. Egypt representative reported the situation with Tripoli ACC remains the same since the last SMR, although there is good radar coverage at LOSUL and DETAR, Cairo ATC still continuing to suffer from traffic entering their FIR without prior coordination. The Scrutiny Group also noticed the lack of reports at position SILKA on AWY UM872 which is the FIR transfer point between Jeddah and Cairo ACCs, this point used to be exposed to a lot of CFRs by Jeddah and Cairo ATC units, both units succeeded to improve traffic handling at this point in response to the observations from the last Scrutiny Group meeting which resulted normal operation at this point. Egypt representative informed that no CFRs had been received against Larnaca and Athens FIRs for a long time, and requested that this issue be followed up with the Cairo ACC. The MIDRMA urged the representative of Egypt to improve the reporting of CFRs and LHDs to the MIDRMA.

d. The Scrutiny Group evaluated the reports received from the I.R. of Iran and found most the CFRs were against Karachi ATCU at position JIWANI and some CFRs reported against Muscat ATCU at position DENDA, the representative of the I.R. of Iran reported that Tehran ACC is still suffering from coordination problems with Baghdad ACC due to lack of adequate communication with them and he urged Iraq to find a quick solution to this chronic problem. The MIDRMA informed the meeting that no reports received from Iran against Kabul, Ashgabat, Turkmenbashi, Baku, Yerevan and Ankara FIRs since 2007. The MIDRMA urged the representative of Iran to improve the reporting of CFRs and LHDs to the MIDRMA.

e. The extreme majority of the CFRs received from Kuwait were against Baghdad ACC concentrated at position SIDAD, these CFRs can cause a serious threat to the safety of air traffic during busy periods, and because of the short flying time within Kuwait FIR for the traffic entering via SIDAD and leaving via RABAP or DETKO these CFRs can be extended to effect traffic entering Bahrain FIR via these two points. The MIDRMA did not receive any LHDs from Kuwait for the SMR 2011 - 2012 and SMR 2012 - 2013 reporting periods. The MIDRMA urged the representative of Kuwait to improve the reporting of CFRs and LHDs to the MIDRMA.

f. During the SMR 2012 - 2013 reporting period, the MIDRMA received 4 LHDs only from Saudi Arabia. All these LHDs were filed at position WEJ and Saudi Arabia reported the occurrences were traffic converging at same flight levels transferred by Cairo ATC to Jeddah ATC without prior coordination or approval from Jeddah ATC. The Scrutiny Group addressed the continued NIL reporting of LHDs and CFRs to the representative of Saudi Arabia for the SMR 2012 - 2013 reporting period as this is reflecting unrealistic picture of Jeddah/Riyadh FIRs which handle very busy traffic especially during the Haj period. The MIDRMA urged the representative of Saudi Arabia to improve the reporting of CFRs and LHDs to the MIDRMA.

g. The MIDRMA was forced to follow the same evaluation mechanism during this meeting for the reported CFRs and LHDs by the absent states and determined which reports from those are influence in the risk of collision associated with the implementation of RVSM, although this process was supposed to be carried out by the absent member states , the MIDRMA could not find any other way to overcome the lack of endorsing the reports other than validating and calculating the total deviations period by themselves.

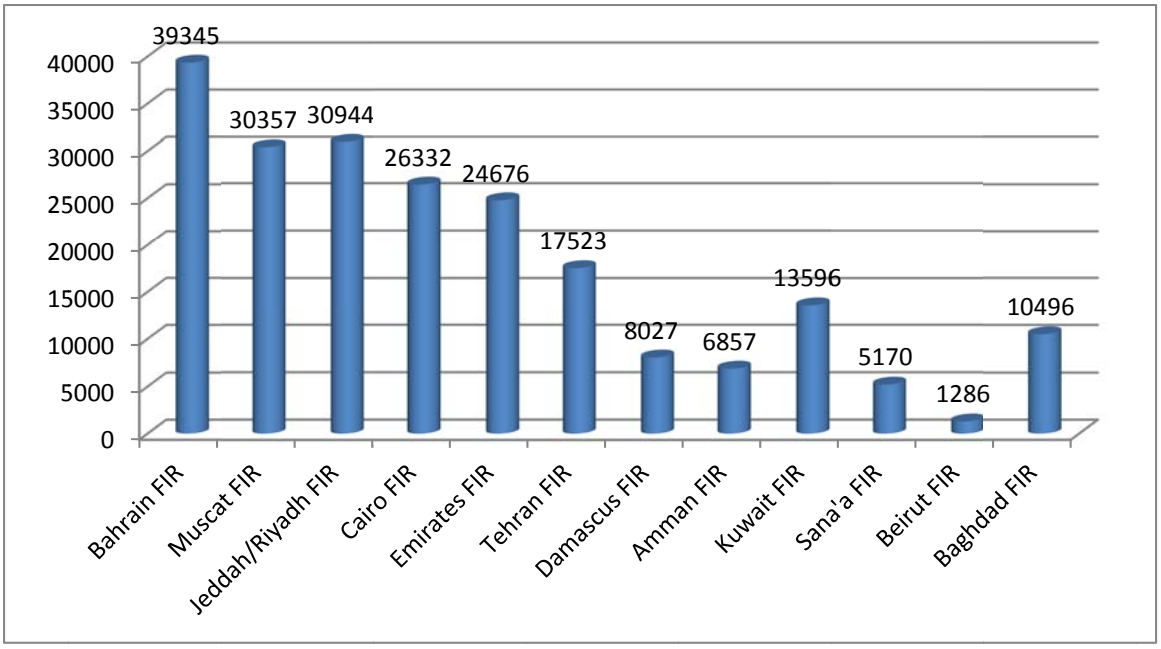
h. The CFRs and LHDs reported by Jordan, Iraq, Syria, Lebanon, Oman, Yemen and UAE were only discussed with the neighbouring members attended the meeting which could not help to find or discuss the reported occurrences very effectively due to the lack of explanation by the reported States and because of the proposed solutions by the SG might not be feasible or acceptable by the States concerned. The reporting of CFRs and LHDs levels by UAE, Jordan and Iraq are Satisfactory and the MIDRMA urged the focal points of Oman, Lebanon, Syria and Yemen to improve the reporting of CFRs and LHDs to the MIDRMA.

6.1 Appendix A – Member States Traffic Data Analysis:

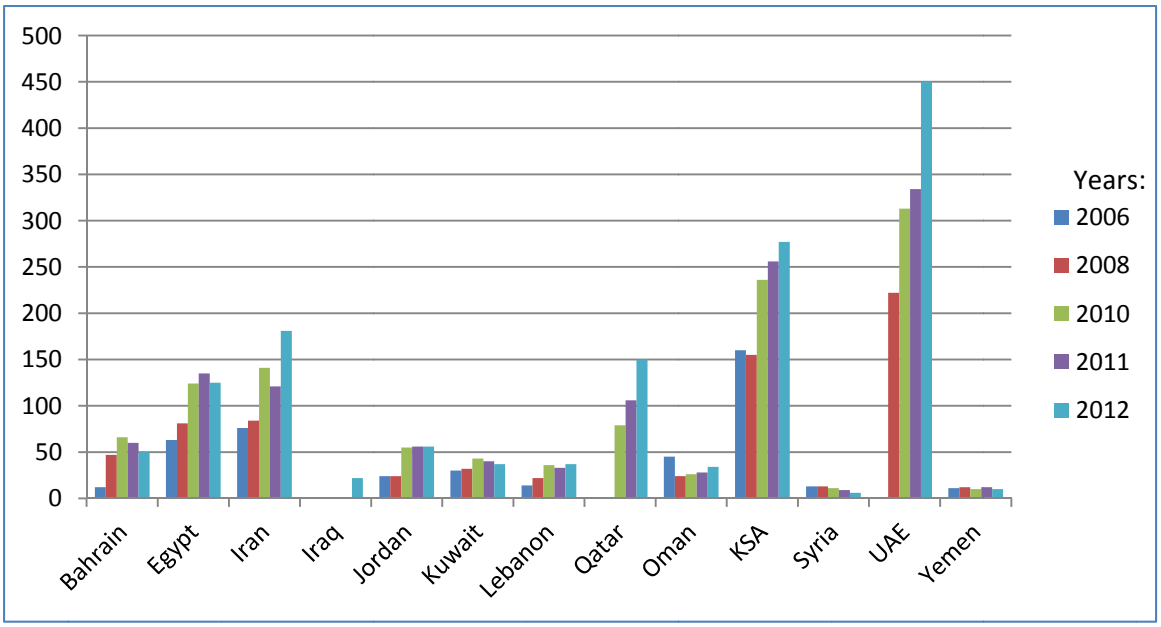
The quality of the SMR traffic data received from all State members varies from one State to another. The MIDRMA monitoring team spent a considerable time to correct the contents and fill all missing fields,

SN	MID States	Jun. 2009	Jan. 2011	Oct. 2012	Jan 2010 vs. Oct 2012 (%)
1	Bahrain FIR	24285	30099	39345	23.5
2	Muscat FIR	22520	28224	30357	7.03
3	Jeddah/Riyadh FIR	22422	25499	30944	17.6
4	Cairo FIR	19228	14270	26332	45.81
5	Emirates FIR	15868	21076	24676	14.59
6	Tehran FIR	10479	10638	17523	39.29
7	Damascus FIR	9774	11719	8027	**-45.99**
8	Amman FIR	8554	10689	6857	**-55.88**
9	Kuwait FIR	3570	10364	13596	23.77
10	Sana'a FIR	3490	4305	5170	16.73
11	Beirut FIR	2949	3845	1286	**-66.5**
12	Baghdad FIR	-	-	10496	
	Total	**143,139**	**170,728**	**214,609**	**20.45**

MID States RVSM Traffic Data used for the SMRs



MID States FIRs Total Flights Number for October 2012



MID States RVSM Approvals Since 2006

The following Tables present the status of provision of LHDs, CFRs and RVSM Approvals by States for the period May 2012 – August 2013

#	Months	July 2011 - April 2012		May 2012 - Aug 2013	
		ADR/LHD	CFR	LHD	CFR
1	Kuwait	0	54	0	125
2	Oman	0	96	0	52
3	Syria	0	2	0	7
4	UAE	10	30	2	3
5	Iran	0	37	3	21
6	Saudi Arabia	3	25	4	0
7	Bahrain	2	189	5	201
8	Egypt	0	28	6	6
9	Jordan	27	21	28	0
10	Iraq	0	24	54	271
11	Qatar	N/A	N/A	N/A	N/A
12	Lebanon	1	0	0	0
13	Yemen	0	0	0	0

MID States ADR, CFR & RVSM status reports

6.2 Appendix B – MID States Registered ACFT Required Monitoring

The following tables show all Middle East registered ACFT requiring either HMU or GMU monitoring due to the absence of monitoring results during the period of data analysis.

Bahrain – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
Total Number of ACFT Required to be monitored = 0								

Egypt – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
1	AIR MEMPHIS	SUBME	MD83	83	25/11/2011	24/11/2013	1	
2	ALEXANDRIA AIRLINES	SUKHM	B737	500	26/11/2011	25/11/2013	1	
3	Alkan Air	SUMAN	H25B	850XP	31/08/2011	30/08/2013	1	
4	ALMASRIA UNIVERSAL AIRLINES	SUTCA	A320	232	28/11/2011	27/11/2013	2	Any Two
5	ALMASRIA UNIVERSAL AIRLINES	SUTCB	A320	232	29/11/2011	28/11/2013		
6	ALMASRIA UNIVERSAL AIRLINES	SUTCC	A321	211	06/10/2011	05/10/2013		
7	EGYPTAIR AIRLINES	SUGBA	A320	231	18/09/2011	17/09/2013	2	Any Two
8	EGYPTAIR AIRLINES	SUGBB	A320	231	08/09/2011	07/09/2013		
9	EGYPTAIR AIRLINES	SUGBC	A320	231	20/09/2011	19/09/2013		
10	EGYPTAIR AIRLINES	SUGBD	A320	231	15/09/2011	14/09/2013		
11	EGYPTAIR AIRLINES	SUGBE	A320	231	15/01/2011	14/01/2013		
12	EGYPTAIR AIRLINES	SUGBF	A320	231	26/08/2011	25/08/2013		
13	EGYPTAIR AIRLINES	SUGBG	A320	231	14/01/2011	13/01/2013		
14	EGYPTAIR AIRLINES	SUGBP	B777	266	09/10/2010	08/10/2012	2	Any Two
15	EGYPTAIR AIRLINES	SUGBS	B777	266	01/02/2011	31/01/2013		
16	EGYPTAIR AIRLINES	SUGBX	B777	266	25/11/2011	24/11/2013		
17	EGYPTAIR AIRLINES	SUGBY	B777	266	29/10/2010	28/10/2012		
18	SMART AVIATION	SUSMD	C680	680	17/10/2011	16/10/2013	1	
19	TRI STAR	SUBMZ	A30B	203F	08/11/2011	07/11/2013	1	
	Total Number of ACFT required to be monitored						**11**	

Republic of Iran – Minimum Monitoring Requirements for RVSM Height Monitoring

Table 1 of 5

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
1	ATA AIR	EPTAB	A320	231			2	Any Two
2	ATA AIR	EPTAC	A320	231				
3	ATA AIR	URCFW	A320	231	14/09/2011	13/09/2013		
4	ATA AIR	EPTAQ	MD80	83			2	Any Two
5	ATA AIR	EPTAS	MD80	83				
6	ATA AIR	EPTAN	MD80	83				
7	ATA AIR	EPTAM	MD80	83				
8	ATA AIR	EPTAP	MD80	83				
9	ATA AIR	EPTAR	MD80	83				
10	Caspian Airlines	EPCPU	MD80	83			2	Any two
11	Caspian Airlines	EPCPV	MD80	83				
12	Caspian Airlines	EPCPX	MD80	83				
13	Caspian Airlines	EPCPZ	MD80	83				
14	Civil Aviation	EPFSC	F2TH	2000EX			1	
15	Iran Air	EPIBS	A30B	203			2	Any Two
16	Iran Air	EPIBT	A30B	203				
17	Iran Air	EPIBV	A30B	203				
18	Iran Air	EPIBZ	A30B	203				
19	Iran Air	EPIBI	A30B	2C				
20	Iran Air	EPIBJ	A30B	2C				
21	Iran Air	EPICE	A30B	203				
22	Iran Air	EPICF	A30B	203				
23	Iran Air	EPIBG	A30B	203				
24	Iran Air	EPIBH	A30B	203				
25	Iran Air	EPIBK	A310	304			2	Any Two
26	Iran Air	EPIBL	A310	304				
27	Iran Air	EPIBP	A310	203				
28	Iran Air	EPIBQ	A310	203				
29	Iran Air	EPIED	A320	212			2	Any Two
30	Iran Air	EPIEE	A320	211				
31	Iran Air	EPIEF	A320	211				
32	Iran Air	EPIEB	A320	232				
33	Iran Air	EPIEC	A320	232				
34	Iran Air	EPIEG	A320	211				
35	Iran Air	EPIRT	B722	286			2	Any Two
36	Iran Air	EPIRS	B722	286				
37	Iran Air	EPIRR	B722	286				
38	Iran Air	EPAGA	B732	286			1	
39	Iran Air	EPIAG	B742	286BM			2	Any Two
40	Iran Air	EPIAH	B742	286BM				
41	Iran Air	EPIAM	B742	186B				
42	Iran Air	EPIAI	B742	230BM				
43	Iran Air	EPICD	B742	21AC				
44	Iran Air	EPIAB	B74S	sp-86			1	Any Two
45	Iran Air	EPIAC	B74S	sp-86				
46	Iran Air	EPIAD	B74S	sp-86				

Republic of Iran – Minimum Monitoring Requirements for RVSM Height Monitoring

Table 2 of 5

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
47	Iran Air	EPIDA	F100				2	Any Two
48	Iran Air	EPIDD	F100					
49	Iran Air	EPIDF	F100					
50	Iran Air	EPIDG	F100					
51	Iran Air	EPCFD	F100					
52	Iran Air	EPCFE	F100					
53	Iran Air	EPCFH	F100					
54	Iran Air	EPCFK	F100					
55	Iran Air	EPCFL	F100					
56	Iran Air	EPCFJ	F100					
57	Iran Air	EPCFM	F100					
58	Iran Air	EPCFQ	F100					
59	Iran Air	EPCFI	F100					
60	Iran Air	EPCFO	F100					
61	Iran Air	EPCFP	F100					
62	Iran Air	EPCFR	F100					
63	Iran Airtour	EPMDD	MD80	82			2	Any Two
64	Iran Airtour	EPMDE	MD80	82				
65	Iran Airtour	URBHJ	MD80	83				
66	Iran Airtour	URBXI	MD80	82				
67	Iran Airtour	URBXL	MD80	82				
68	Iran Airtour	URBXM	MD80	82				
69	Iran Airtour	URCHW	MD80	82				
70	Iran Airtour	URCHX	MD80	82				
71	Iran Airtour	URCHY	MD80	82				
72	Iran Airtour	URCHZ	MD80	82				
73	Iran Airtour	URCJQ	MD80	82				
74	Iran Airtour	URCJZ	MD80	82				
75	Iran Aseman Airlines	EPAPA	A343	311			1	
76	Iran Aseman Airlines	EPASA	B722	228			2	Any Two
77	Iran Aseman Airlines	EPASB	B722	228				
78	Iran Aseman Airlines	EPASC	B722	228				
79	Iran Aseman Airlines	EPASD	B722	228				
80	Iran Aseman Airlines	EPATQ	B722	222F				
81	Iran Aseman Airlines	EPATT	B722	222F				

Republic of Iran – Minimum Monitoring Requirements for RVSM Height Monitoring

Table 3 of 5

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
82	Iran Aseman Airlines	EPASG	F100				2	Any Two
83	Iran Aseman Airlines	EPASH	F100					
84	Iran Aseman Airlines	EPASJ	F100					
85	Iran Aseman Airlines	EPASL	F100					
86	Iran Aseman Airlines	EPASQ	F100					
87	Iran Aseman Airlines	EPASM	F100					
88	Iran Aseman Airlines	EPASP	F100					
89	Iran Aseman Airlines	EPASR	F100					
90	Iran Aseman Airlines	EPASI	F100					
91	Iran Aseman Airlines	EPASK	F100					
92	Iran Aseman Airlines	EPAST	F100					
93	Iran Aseman Airlines	EPASO	F100					
94	Iran Aseman Airlines	EPASU	F100					
95	Iran Aseman Airlines	EPASX	F100					
96	Iran Aseman Airlines	EPASZ	F100					
97	Iran Aseman Airlines	EPATB	F100					
98	Iran Aseman Airlines	EPATC	F100					
99	Iran Aseman Airlines	EPATE	F100					
100	Iran Aseman Airlines	EPATF	F100					
101	Iran Aseman Airlines	EPATG	F100					
102	Iran Aseman Airlines	EPATD	F100					
103	Iranian Air Transport Company	EPAWZ	F100				2	Any Two
104	Iranian Air Transport Company	EPMIS	F100					
105	Iranian Air Transport Company	EPOPI	F100					
106	Iranian Air Transport Company	EPSUS	F100					
107	Kish Air	EPLCH	MD80	83			2	Any Two
108	Kish Air	EPLCI	MD80	83				
109	Kish Air	EPLCJ	MD80	82				
110	Kish Air	EPLCK	MD80	82				
111	Kish Air	EPLCL	MD80	82				
112	Kish Air	EPLCM	MD80	82				
113	Kish Air	EPLCN	MD80	83				
114	Kish Air	EPLCO	MD80	83				

Republic of Iran – Minimum Monitoring Requirements for RVSM Height Monitoring

Table 4 of 5

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
115	Mahan Air	EPMHG	A30B	203			2	Any Two
116	Mahan Air	EPMHF	A30B	103				
117	Mahan Air	EPMHL	A30B	203				
118	Mahan Air	EPMHA	A30B	3C				
119	Mahan Air	EPMHP	A30B	3C				
120	Mahan Air	EPMHM	A30B	3C				
121	Mahan Air	EPMNS	A30B	603				
122	Mahan Air	EPMNR	A30B	603				
123	Mahan Air	EPMNT	A30B	603				
124	Mahan Air	EPMNU	A30B	605				
125	Mahan Air	EPMNL	A30B	603				
126	Mahan Air	EPMNM	A30B	605				
127	Mahan Air	EPMNN	A30B	605				
128	Mahan Air	EPMNK	A30B	603				
129	Mahan Air	EPMNI	A30B	603				
130	Mahan Air	EPMNH	A30B	603				
131	Mahan Air	EPMNJ	A30B	603				
132	Mahan Air	EPMNG	A30B	603				
133	Mahan Air	EX011	A30B	622				
134	Mahan Air	EPMNQ	A30B	603				
135	Mahan Air	EPMHO	A310	304			2	Any Two
136	Mahan Air	FOJHI	A310	304				
137	Mahan Air	FOJHH	A310	304				
138	Mahan Air	EX301	A310	304				
139	Mahan Air	EPMNX	A310	304				
140	Mahan Air	EPMNO	A310	304				
141	Mahan Air	EPMNV	A310	304				
142	Mahan Air	EPMNP	A310	304				
143	Mahan Air	EPMMA	A343	311			1	
144	Mahan Air	EPMMB	A343	311			1	
145	Mahan Air	EPMNC	B744	422			2	Any Two
146	Mahan Air	EPMNA	B747	422				
147	Mahan Air	EPMNB	B747	422				
148	Mahan Air	EPMND	B747	3B3				
149	Mahan Air	EPMNE	B747	3B3				
150	MERAJ AIR	EPSIF	A30B	622			1	
151	MERAJ AIR	EPSIG	A30B	622			1	
152	MERAJ AIR	EPAJH	A320	233			2	Any Two
153	MERAJ AIR	EPAJC	A320	232				
154	MERAJ AIR	EPAGB	A321	131				

Republic of Iran – Minimum Monitoring Requirements for RVSM Height Monitoring

Table 5 of 5

155	MERAJ AIR	EPAJD	B707	370C			2	Any Two
156	MERAJ AIR	EPAJE	B707	386C				
157	Saha Airlines	EPSHG	B707	3J9				
158	Saha Airlines	EPSHK	B707	3J9				
159	Saha Airlines	EPSHU	B707	3J9				
160	Saha Airlines	EPSHV	B707	3J9				
161	Taban Air	EPARA	MD80	82			2	Any Two
162	Taban Air	EPTBB	MD80	88				
163	Taban Air	EPTBC	MD80	88				
164	Taban Air	URCIX	MD80	88				
165	Taban Air	URCIY	MD80	88				
166	Taban Air	URCJK	MD80	88				
167	ZAGROS	URMUS	A320	231			1	
168	ZAGROS	EPZAA	MD80	82			2	Any Two
169	ZAGROS	EPZAB	MD80	83				
170	ZAGROS	EPZAC	MD80	83				
171	ZAGROS	EPZAD	MD80	82				
172	ZAGROS	EPZAE	MD80	82				
173	ZAGROS	EPZAF	MD80	82				
174	ZAGROS	EPZAG	MD80	82				
175	ZAGROS	EPZAM	MD80	82				
176	ZAGROS	EPZAQ	MD80	83				
	Total Number of ACFT required to be monitored						**51**	

Iraq – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
1	Iraqi Airways	YI-AQQ	B744	400	-		1	No Results
2	Iraqi Airways	YI-AQM	B767	300	-		1	No Results
Total Number of ACFT required to be monitored							2	

Jordan – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
Total Number of ACFT Required to be monitored = 0								

Kuwait – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
Total Number of ACFT Required to be monitored = 0								

Lebanon – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
1	Emerald Jets s.a.l	ODDTW	BE40	4000	10/2/2011	10/1/2013	1	***Expired***
2	Emerald Jets s.a.l	ODTSW	H25B	800XP			1	No Resluts
3	Executive Aircraft Services s.a.l	ODBOY	H25B	700B			1	No Resluts
4	Executive Aircraft Services s.a.l	ODMAS	H25B	700A			1	No Resluts
5	IBEX Air Charter	ODMAF	H25B	800XP			1	No Resluts
6	Med Airways	ODAMR	CRJ2	CL600-2B19			1	No Resluts
7	Diamond Aviation S.A.L	ODAHS	PA46	500T			1	No Results
8	Open Sky	N510SA	C510	510SA			1	No Results
9	Wings of Lebanon	ODHAJ	B737	3Q8			1	No Results
Total Number of ACFT required to be monitored							**9**	

Oman – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
Total Number of ACFT Required to be monitored = 0								

Qatar – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
Total Number of ACFT Required to be monitored = 0								

Saudi Arabia – Minimum Monitoring Requirements for RVSM Height

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
1	Aeromedical Evacuation	HZMS5B	GLF5	G-V			1	
2	Aeromedical Evacuation	HZMS1B	LJ60	XR			1	
3	Al-Anwa Est.	HZAB1	L101	385-3			1	
4	Al-Atheer Est.	HZATR	B739	900			1	
5	ARABASCO	N918TT	BE40	400XP			1	
6	ARABASCO	HZHHT	GFL3	G-III			1	
7	ARABASCO	HZRC3	GLF3	1159A			1	
8	Arabian Jets	HZPM2	BE40	400A			1	
9	Arabian Jets	HZPM3	BE40	400A			1	
10	Aviation Horizons	HZNGN	LJ60	XR			1	
11	Najd Aviation	HZKME1	C560	560XLS			1	
12	NasJet	HZ103S	B737	900			1	No Results
13	NasJet	N797HT	F2TH	DA-2000	30/04/2011	29/04/2013	1	Expired
14	NasJet	N609LS	F2TH	DA-2000LX	08/11/2011	07/11/2013	1	
15	NasJet	HZKSRD	H25B	HS-125			1	
16	NasJet	N752NS	H25B	HS-125	13/12/2011	12/12/2013	1	
17	NasJet	HZKSRC	H25B	HS-125	28/09/2010	27/09/2012	2	Any Two
18	NasJet	N828NS	H25B	HS-125	05/07/2010	04/07/2012		
19	NasJet	N829NS	H25B	HS-125	15/11/2010	14/11/2012		
20	National Air Services	HZ105	H25B	800B	13/07/2011	12/07/2013	2	Any tTwo
21	National Air Services	HZ109	H25B	800B				
22	National Air Services	HZ110	H25B	800B				
23	Olayan Finance co.	HZOFC5	F900	900			1	
24	Royal Fleet	HZHMIA	B743	3G1			2	Any Two
25	Royal Fleet	HZHM1B	B74S	SP	11/02/2012	10/02/2014		
26	Royal Fleet	HZHM1C	B744	468				
27	Royal Fleet	HZHM1	B744	468	22/10/2011	21/10/2013		
28	Saudi Arabian Airlines	HZAIK	B743	300	31/07/2011	30/07/2013	2	Any Two
29	Saudi Arabian Airlines	HZAIL	B743	300	30/07/2011	29/07/2013		
30	Saudi Arabian Airlines	HZAIM	B743	300				
31	Saudi Arabian Airlines	HZAIN	B743	300	01/07/2011	30/06/2013		
32	Saudi Arabian Airlines	HZAIP	B743	300	30/07/2011	29/07/2013		
33	Saudi Arabian Airlines	HZAIQ	B743	300				
34	Saudi Arabian Airlines	HZAIR	B743	300				
35	Saudi Arabian Airlines	HZAIS	B743	300				
36	Saudi Arabian Airlines	HZAIV	B747	400	21/12/2010	20/12/2012		
37	Saudi Arabian Airlines	HZAIW	B747	400	24/07/2011	23/07/2013		
38	Saudi Arabian Airlines	HZAIX	B747	400	06/09/2011	05/09/2013		
39	Saudi Arabian Airlines	HZAIY	B747	400	31/07/2011	30/07/2013		
40	SNAS Aviation	HZSNA	B727	264	16/06/2009	16/06/2011	2	Any Two
41	SNAS Aviation	HZSNC	B727	230	28/08/2011	27/08/2013		
42	SNAS Aviation	HZSNF	B727	277				
43	Veteran Aviation	EK74798	B742	281B			1	
44	Veteran Aviation	EK74799	B742	281B			1	
Total Number of ACFT required to be monitored							29	

Syria – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
Total Number of ACFT Required to be monitored = 0								

UAE – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
1	Emerald Jets s.a.l	ODDTW	BE40	4000	10/2/2011	10/1/2013	1	***Expired***
2	Emerald Jets s.a.l	ODTSW	H25B	800XP			1	No Resluts
3	Executive Aircraft Services s.a.l	ODBOY	H25B	700B			1	No Resluts
4	Executive Aircraft Services s.a.l	ODMAS	H25B	700A			1	No Resluts
5	IBEX Air Charter	ODMAF	H25B	800XP			1	No Resluts
6	Med Airways	ODAMR	CRJ2	CL600-2B19			1	No Resluts
7	Diamond Aviation S.A.L	ODAHS	PA46	500T			1	No Results
8	Open Sky	N510SA	C510	510SA			1	No Results
9	Wings of Lebanon	ODHAJ	B737	3Q8			1	No Results
Total Number of ACFT required to be monitored							**9**	

Yemen – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Reg.	ACFT Type	ACFT Series	Monitoring Date	Compliant Expire Date	Required Monitoring	Remarks
1	Yemen Airways	7OADR	A310	300			2	Any Two
2	Yemen Airways	7OADV	A310	300				
3	Yemen Airways	7OADW	A310	300				
4	Yemen Airways	7OAFA	A320	200			1	
5	Yemen Airways	7OAFB	A320	200			1	
6	Felix Airways	7OFAA	CRJ7	700			1	
7	Felix Airways	7OFAB	CRJ7	700			1	
Total Number of ACFT required to be monitored							6	

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6.3 Appendix C - RVSM MINIMUM MONITORING REQUIREMENTS (Updated on 29/06/2010)

1. UPDATE OF MONITORING REQUIREMENTS TABLE AND WEBSITE. As significant data is obtained, monitoring requirements for specific aircraft types may change. When Table 1 below, is updated, The MIDRMA will advise all State members. The updated table will be posted on the MIDRMA website.

2. MONITORING PROGRAM. All operators that operate or intend to operate in the Middle East Region airspace where RVSM is applied are required to participate in the regional RVSM monitoring programme. Table 1 addresses requirements for monitoring the height-keeping performance of aircraft in order to meet regional safety objectives. In their application to the appropriate State authority for RVSM approval, operators must show a plan for meeting the applicable monitoring requirements. Initial monitoring should be completed as soon as possible but not later than 6 months after the issue of RVSM approval, the State of Registry that had issued an RVSM approval to an operator would be required to establish a requirement which ensures that a minimum of two aeroplanes of each aircraft type grouping of the operator have their height-keeping performance monitored, at least once every two years or within intervals of 1000 flight hours per aeroplane, whichever period is longer.

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 programmes from other Regions can be used to meet regional monitoring requirements. The RMAs, which are responsible for administering the monitoring programme, have access to monitoring data from other Regions and will coordinate with States and operators to inform them on the status of individual operator monitoring requirements.

5. MONITORING PRIOR TO THE ISSUE OF RVSM OPERATIONAL APPROVAL IS NOT A REQUIREMENT. Operators should submit monitoring plans to the responsible civil aviation authority and to the MIDRMA that show how they intend to meet the requirements specified in Table1. Monitoring will be carried out in accordance with this table.

6. AIRCRAFT GROUPS NOT LISTED IN TABLE 1. Contact the MIDRMA for clarification if an aircraft group is not listed in Table 1 or for clarification of other monitoring related issues. An aircraft group not listed in Table 1 will probably be subject to Category 2 or Category 3 monitoring requirements.

7. TABLE OF MONITORING GROUPS. Table 2 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 table, the new airframes are not required to be monitored. If an operator adds new RVSM compliant airframes of an aircraft type for which it has NOT previously received RVSM operational approval, then the operator should complete monitoring in accordance with the attached table.

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE NOTE: MONITORING PRIOR TO THE ISSUE OF RVSM APPROVAL IS **NOT** A REQUIREMENT			
CATEGORY		**AIRCRAFT GROUP**	**MINIMUM OPERATOR MONITORING FOR EACH AIRCRAFT GROUP**
1	GROUP APPROVED: DATA INDICATES COMPLIANCE WITH THE RVSM MASPS	A124, A300, A306, A310-GE, A310-PW, A318, A320, A330, A340, A345, A346, A3ST, AVRO, B712, B727, B737CL, B737C, B737NX, B747CL, B74S, B744-5, B744-10, B752, B753, B767, B764, B772, B773, BD100, CL600, CL604, CL605, C17, C525, C560, C56X, C650, C680, C750, CARJ, CRJ7, CRJ9, DC10, E135-145, E170-190, F100, F900, FA10, GALX, GLEX, GLF4, GLF5, H25B-800, J328, KC135, LJ40, LJ45, LJ60, MD10, MD11, MD80, MD90, PRM1, T154	Two airframes from each fleet of an operator to be monitored
2	GROUP APPROVED: INSUFFICIENT DATA ON APPROVED AIRCRAFT	Other group aircraft other than those listed above including: A148, A380, AC95, AN72, ASTR, ASTR-SPX, B701, B703, B703-E3, B731, B732, BD700, BE20, BE30, BE40, B744-LCF, B748, C130, C500, C25A, C25B, C25C, C441, C5, C510, C550-552, C550-B, C550-II, C550-SII, D328, DC85, DC86-87, DC93, DC95, E120, E50P, EA50, F2TH, F70, FA20, FA50, FA7X, G150, GLF2, GLF2B, GLF3, H25B-700, H25B-750, H25C, HA4T, IL62, IL76, IL86, IL96, L101, L29B-2, L29B-731, LJ31, LJ35-36, LJ55, MU30, P180, PC12, SB20, SBR1, SBR2, T134, T204, T334, TBM, WW24, YK42	60% of airframes (round up if fractional) from each fleet of an operator **or** individual monitoring
3	Non-Group	Non-group approved aircraft	100% of aircraft shall be monitored

Table 1: MONITORING REQUIREMENTS TABLE

Table 2: MONITORING GROUPS FOR AIRCRAFT CERTIFIED UNDER GROUP APPROVAL REQUIREMENTS

Monitoring Group	A/C ICAO	A/C Type	A/C Series
A124	A124	AN-124 RUSLAN	ALL SERIES
A148	A148	AN-148	100
A300	A30B	A300	B2-100, B2-200, B4-100, B4-100F, B4-120, B4-200, B4-200F, B4-220, B4-220F, C4-200
A306	A306	A300	600, 600F, 600R, 620, 620R, 620RF
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 A330	200, 220, 240 300, 320, 340
A340	A342 A343	A340 A340	210 310
A345	A345	A340	500, 540
A346	A346	A340	600, 640
A380	A388	A380	800, 840, 860
A3ST	A3ST	A300	600R ST BELUGA
AC95	AC95	AERO COMMANDER 695	A
AN72	AN72	AN-72 AN-74	ALL SERIES
ASTR	ASTR	1125 ASTRA	ALL SERIES
ASTR-SPX	ASTR	1125 ASTR SPX, G100	ALL SERIES
AVRO	RJ1H RJ70 RJ85	AVRO AVRO AVRO	RJ100 RJ70 RJ85
B701	B701	B707	100, 120B
B703	B703	B707	320, 320B, 320C
B703-E3	B703	B707	E-3
B712	B712	B717	200
B727	B721 B722	B727 B727	100, 100C, 100F,100QF 200, 200F
B731	B731	B737	100
B732	B732	B737	200, 200C
B737CL	B733 B734 B735	B737 B737 B737	300 400 500

Monitoring Group	A/C ICAO	A/C Type	A/C Series
B737NX	B736 B737 B738 B739	B737 B737 B737 B737	600 700, BBJ 800, BBJ2 900
B737C	B737	B737	700C
B747CL	B741 B742 B743	B747 B747 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 up to SN 25350)
B744-10	B744	B747	400, 400D, 400F (With 10 inch Probes from SN 25351)
B744-LCF	B744	B747	LCF
B748	B748	B747	8F, 81
B752	B752	B757	200, 200PF, 200SF
B753	B753	B757	300
B767	B762 B763	B767 B767	200, 200EM, 200ER, 200ERM, 300, 300ER, 300ERF
B764	B764	B767	400ER
B772	B772	B777	200, 200ER, 200LR, 200LRF
B773	B773	B777	300, 300ER
BD100	CL30	CHALLENGER 300	ALL SERIES
BD700	GL5T	GLOBAL 5000	ALL SERIES
BE20	BE20	200 KINGAIR	ALL SERIES
BE30	BE30	B300 SUPER KINGAIR B300 SUPER KINGAIR 350	ALL SERIES
BE40	BE40	BEECHJET 400 BEECHJET 400A BEECHJET 400XP HAWKER 400XP	ALL SERIES
C130	C130	HERCULES	H, J
C17	C17	C-17 GLOBEMASTER 3	ALL SERIES
C441	C441	CONQUEST II	ALL SERIES
C5	C5	C5	ALL SERIES
C500	C500	500 CITATION 500 CITATION I 501 CITATION I SINGLE PILOT	ALL SERIES
C510	C510	MUSTANG	ALL SERIES
C525	C525	525 CITATIONJET 525 CITATIONJET I 525 CITATIONJET PLUS	ALL SERIES
C25A	C25A	525A CITATIONJET II	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
C25B	C25B	CITATIONJET III 525B CITATIONJET III	ALL SERIES
C25C	C25C	525C CITATIONJET IV	ALL SERIES
C550-552	C550	552 CITATION II (USN)	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 ENCORE	ALL SERIES
C56X	C56X	560 CITATION EXCEL	ALL SERIES
C650	C650	650 CITATION III 650 CITATION VI 650 CITATION VII	ALL SERIES
C680	C680	680 CITATION SOVEREIGN	
C750	C750	750 CITATION X	ALL SERIES
CARJ	CRJ1 CRJ2 CRJ2 CRJ2	REGIONALJET REGIONALJET CHALLENGER 800 CHALLENGER 850	100, 100ER, 200, 200ER, 200LR ALL SERIES ALL SERIES
CRJ7	CRJ7	REGIONALJET	700, 700ER, 700LR
CRJ9	CRJ9	REGIONALJET	900, 900ER, 900LR
CL600	CL60	CL-600 CL-601	CL-600-ALL SERIES CL-601- ALL SERIES,
CL604	CL60	CL-604	CL-604- ALL SERIES
CL605	CL60	CL-605	CL-605- ALL SERIES
DC10	DC10	DC-10	10, 10F, 15, 30, 30F, 40, 40F
D328	D328	328 TURBOPROP	100
DC85	DC85	DC-8	50, 50F
DC86-87	DC86 DC87	DC-8 DC-8	61, 62, 63 71, 72, 73
DC93	DC93	DC-9	30, 30F
DC95	DC95	DC-9	51
E135-145	E135 E145	EMB-135 EMB-145	ALL SERIES
E170-190	E170 E170 E190 E190	EMB-170 EMB-175 EMB-190 EMB-195	ALL SERIES
E120	E120	EMB-120 BRASILIA	ALL SERIES
E50P	W50P	PHENOM 100	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
EA50	EA50	ECLIPSE	ALL SERIES
F100	F100	FOKKER 100	ALL SERIES
F2TH	F2TH	FALCON 2000 FALCON 2000-EX FALSON 2000LX	ALL SERIES
F70	F70	FOKKER 70	ALL SERIES
F900	F900	FALCON 900 FALCON 900DX 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
FA7X	FA7X	FALCON 7X	ALL SERIES
G150	G150	G150	ALL SERIES
GALX	GALX	1126 GALAXY G200	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) G300 G350 G400 G450	ALL SERIES
GLF5	GLF5	GULFSTREAM V (G-1159D) G500 G550	ALL SERIES
H25B-700	H25B	BAE 125 / HS125	700A, 700B
H25B-750	H25B	HAWKER 750	ALL SERIES
H25B-800	H25B	BAE 125 / HS125 HAWKER 800XP HAWKER 800XPI HAWKER 800 HAWKER 850XP HAWKER 900XP HAWKER 950XP	800A, 800B ALL SERIES
H25C	H25C	HAWKER 1000	ALL SERIES
HA4T	HA4T	HAWKER 4000	ALL SERIES
IL62	IL62	ILYUSHIN-62	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
IL76	IL76	ILYUSHU-76	ALL SERIES
IL86	IL86	ILYUSHIN-86	ALL SERIES
IL96	IL96	ILYUSHIN-96	ALL SERIES
J328	J328	328JET	ALL SERIES
KC135	B703	KC-135	ALL SERIES
L101	L101	L-1011 TRISTAR	ALL SERIES
L29B-2	L29B	L-1329 JETSTAR 2	ALL SERIES
L29B-731	L29B	L-1329 JETSTAR 731	ALL SERIES
LJ31	LJ31	LEARJET 31	ALL SERIES
LJ35-36	LJ35 LJ36	LEARJET 35 LEARJET 36	ALL SERIES ALL SERIES
LJ40	LJ40	LEARJET 40	ALL SERIES
LJ45	LJ45	LEARJET 45	ALL SERIES
LJ55	LJ55	LEARJET 55	ALL SERIES
LJ60	LJ60	LEARJET 60	ALL SERIES
MD10	MD10	MD-10	ALL SERIES
MD11	MD11	MD-11	COMBI, ER, FREIGHTER, PASSENGER
MD80	MD81 MD82 MD83 MD87 MD88	MD-80 MD-80 MD-80 MD-80 MD-80	81 82 83 87 88
MD90	MD90	MD-90	30, 30ER
MU30	MU30	MU-300 DIAMOND	1A
P180	P180	P-180 AVANTI	ALL SERIES
PC12	PC12	PC-12	ALL SERIES
PRM1	PRM1	PREMIER 1	ALL SERIES
SB20	SB20	SAAB 2000	ALL SERIES
SBR1	SBR1	SABRELINER 40 SABRELINER 60 SABRELINER 65	ALL SERIES
SBR2	SBR2	SABRELINER 80	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, 214, C
T334	T334	TU-334	ALL SERIES
TBM	TBM7 TBM8	TBM-700 TBM-850	ALL SERIES
WW24	WW24	1124 WESTWIND	ALL SERIES
YK42	YK42	YAK-42	ALL SERIES

6.4 Appendix D – MIDRMA Duties and Responsibilities

The Middle East Regional Monitoring Agency (MIDRMA) has the following duties and responsibilities:

1- To establish and maintain a central registry of State RVSM approvals of operators and aircraft using the Middle East Region airspace where RVSM is applied.

2- To initiate checks of the "approval status" of aircraft operating in the relevant RVSM airspace, identify non-approved operators and aircraft using RVSM airspace and notify the appropriate State of Registry/State of the Operator and other RMAs, accordingly.

3- To establish and maintain a database containing the results of height keeping performance monitoring and all altitude deviations of 300 ft or more within Middle East Region airspace, and to include in the database the results of MID RMA requests to operators and States for information explaining the causes of observed large height deviations.

4- Provide timely information on changes of monitoring status of aircraft type classifications to State Authorities and operators.

5- To assume overall responsibility for assessing compliance of operators and aircraft with RVSM height keeping performance requirements in conjunction with RVSM introduction in the Middle East Region.

6- To facilitate the transfer of approval data to and from other RVSM Regional Monitoring Agencies.

7- To establish and maintain a database containing the results of navigation error monitoring.

8- To conduct safety analysis for RVSM operations in the MID Region and prepare RVSM Safety Monitoring Reports (SMR) as instructed by MIDANPIRG and the MID RMA Board.

9- To conduct readiness and safety assessments to aid decision-making in preparation for RVSM implementation in those FIRs where RVSM is not yet implemented.

10- To carry out post-implementation safety assessments, as appropriate.

11- Based on information provided by States related to planned changes to the ATS routes structure, advise States and MIDANPIRG on the effects of such changes on the safe RVSM operations in the MID Region.

12- To liaise with other Regional Monitoring Agencies and organizations to harmonise implementation strategies.

6.5 Appendix E – Definitions and Explanations of RVSM Terms

Note: The following definitions are taken from ICAO Document 9574 (2nd Edition) **[1]** - Manual on Implementation of a 300m (1000ft) vertical separation minimum between FL290 and FL410 inclusive.

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.

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-keeping Performance

The observed performance of an aircraft with respect to adherence to cleared flight level.

Probability of vertical overlap (Pz(1000))

The probability that two aircraft nominally separated by the vertical separation minimum are in fact within a distance of λz of each other, i.e. in vertical overlap. This probability can be calculated from the distribution of total vertical error.

Target level of safety

A generic term representing the level of risk which is considered acceptable in particular circumstances.

Technical height-keeping performance (or error)

That part of the height-keeping performance (or error) which is attributable to the combination of ASE and autopilot performance in the vertical dimension.

Total vertical error (TVE)

The vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level). TVE can be split into two components, altimetry system error (ASE) and flight technical error (FTE). TVE=ASE + FTE.

Vertical-collision risk

That 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 vertical separation. Note: one collision is considered to produce two accidents.

6.6 Appendix F – Abbreviations

AAD	Assigned altitude deviation
ACAS	Airborne collision avoidance system
ACC	Area control center
AD	Altitude deviation
ADR	Altitude deviation report
ASE	Altimetry system error
ATC	Air traffic control
ATM	Air traffic management
ATS	Air traffic services
CAA	Civil aviation authority
CFL	Cleared flight level
CFR	Coordination failure report
CRA	Collision risk assessment
CRM	Collision risk model
DE	Double exponential density
FIR	Flight information region
FL	Flight level
FPL	Flight plan
FTE	Flight technical error
GAT	General air traffic
GDE	Gaussian double exponential density
GMU	GPS height-monitoring unit
GPS	Global positioning system
HMU	Height-monitoring unit
HOF	Horizontal overlap frequency
ICAO	International Civil Aviation Organization
JAA	Joint Aviation Authorities
LHD	Large height deviations
MASPS	Minimum aircraft system performance specification
MMR	Minimum Monitoring Requirement
MTCD	Medium term conflict detection
OAT	Operational air traffic
OLDI	On-line data interchange
OVR	Overall vertical risk
PISC	Pre-implementation safety case
PSSA	Preliminary system safety assessment
RMA	Regional Monitoring Agency
RVSM	Reduced vertical separation minimum

SMR	Safety Monitoring Report
TCAS	Traffic Alert and Collision Avoidance System
TLS	Target level of safety
TVE	Total vertical error
TVR	Technical vertical risk
UAC	Upper Area Control Center
UIR	Upper Flight Information Region
VSM	Vertical Separation Minimum