International Civil Aviation Organization

Middle East Air Navigation Planning and Implementation Regional Group

Fifteenth Meeting (MIDANPIRG/15)
(Bahrain, 8 – 11 June 2015)

Agenda Item 4.2: Air Navigation Safety related issues

MID RVSM SAFETY MONITORING REPORT (SMR 2014)

(Presented by MIDRMA)

SUMMARY

This working paper details the results of the MID RVSM Safety Monitoring Report 2014 and tries to demonstrate according to the data received that the key safety objectives of the SMR in accordance with ICAO Doc 9574 were met in operational service in all the Middle East RVSM airspace except for Tripoli FIR.

Action by the meeting is at paragraph 3.

REFERENCES

- MIDANPIRG/13 Report
- MIDRMA Board/13 Report.
- MID RVSM SMR 2012/2013

1. INTRODUCTION

1.1 The Middle East Regional Monitoring Agency presents the MID RVSM Safety Monitoring Report (SMR) 2014 to the Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG) for endorsement.

1.2 The results for the SMR 2014 were calculated for 13 FIRs in the Middle East Region. Tripoli FIR was excluded from the analysis due to the non-submission of the required traffic data.

1.3 The results present evidence that 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 except for Tripoli FIR.

2. DISCUSSION

2.1 Further to the outcome of MIDANPIRG 14 meeting and according to Conclusion 14/38, it was decided that the FPL/traffic data for the period 15th January - 15th February 2014 be used for the development of the MID RVSM Safety Monitoring Report (SMR 2014), the draft version of the report was already reviewed by the ANSIG/1 meeting which was held in Cairo, Egypt 10 – 12 February 2015.

2.2 The MIDRMA is still suffering from the same problems reported in the production of previous Safety Monitoring Reports, such as:

1- Late submission of the traffic data.
2- Corrupted traffic data.
3- Missing items from the data submitted (e.g. no entry/exit flight levels or wrong type of aircraft).

2.3 The descriptions of the total traffic data collected from each MIDRMA Member State for the period 15th January 2014 until 15th February 2015 is reflected in Table 1 below. A total of **218,397** flights were gathered for all aircraft operated in the MID RVSM airspace during this period, all these flights were evaluated and processed very carefully to ensure accurate results according to the data submitted and corrected by the MIDRMA.

SN	MID States	June 2009	January 2011	Oct. 2012	Jan - Feb 2014	2012 vs.2014
1	Jeddah/Riyadh	22422	25499	30944	32351	4.55%
2	Muscat FIR	22520	28224	30357	31735	4.54%
3	Cairo FIR	19228	14270	26332	27271	3.57%
4	Bahrain FIR	24285	30099	39345	25442	-35.34%
5	Tehran FIR	10479	10638	17523	24727	41.11%
6	Emirates FIR	15868	21076	24676	24369	-1.24%
7	Baghdad FIR	0	0	10496	12694	20.94%
8	Kuwait FIR	3570	10364	13596	10666	-21.55%
9	Sana'a FIR	3490	4305	5170	5620	8.70%
10	Khartoum FIR	0	0	0	4776	-
11	Amman FIR	8554	10689	6857	4546	-33.70%
12	Damascus FIR	9774	11719	8027	4095	-48.98%
13	Beirut FIR	2949	3845	1286	105	-91.84%
14	Tripoli FIR	0	0	0	0	
	Total	143,139	170,728	214,609	218,397	-2.89%

Table 1 - MID States RVSM Traffic Data

2.4 The final conclusions of the data processing have been severely limited by the continued NIL reporting of Large Height Deviation from some Member States, this problem should be solved after the implantation of the on line reporting tool of LHD on 01st May 2014 which will encourage Member States to report their own LHD as the system will address the report automatically to the concerned state and request explanation for the fault.

2.5 **Safety Monitoring Report 2014**

2.5.1 **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 2.5×10^{-9} fatal accidents per flight hour. The 2014 value computed for technical height risk is **3.18** x $\mathbf{10^{-11}}$. This meets RVSM Safety Objective 1.
According to the technical risk values as shown in the table below from the previous SMRs, the TLS value decreased from the last SMR which is safe comparing to the ICAO TLS $\mathbf{2.5 \times 10^{-9}}$.

*Note: The calculated result measured without Tripoli FIR.

Technical Risk Values					
Year 2006	Year 2008	Year 2010	Year 2012	Year 2013	**Year 2014**
$2.17x10^{-14}$	$1.93x10^{-13}$	$3.96x10^{-15}$	5.08×10^{-14}	$6.37x10^{-12}$	**3.18** x $\mathbf{10^{-12}}$

2.5.1.1 **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 Altimetry System Error (ASE) and typical Assigned Altitude Deviation (AAD) data is estimated to be of $\mathbf{3.28 \times 10^{-9}}$. 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 $\mathbf{1.7x10^{-8}}$.

2.5.1.2 **Middle East RVSM Airspace Horizontal Overlap Frequency (HOF)**

Due to lack of radar data available for most of the congested airspace in the Middle East Region, the MIDRMA decided to calculate the HOF for all the MID RVSM airspace and not only within the congested airspace by adopting the ICAO methodology developed for this purpose and by adding this feature in the MID Risk Analysis Software (MIDRAS).

a. The calculated horizontal overlap frequency for the MID RVSM Airspace was estimated to be $\mathbf{5.04 \times 10^{-9}}$ per flight hour.

Horizontal Overlap Frequency (HOF)					
Year 2006	Year 2008	Year 2010	Year 2012	Year 2013	**Year 2014**
$6.99x10^{-3}$	$5.1x10^{-11}$	$2.88x10^{-6}$	$6.49x10^{-5}$	$4.34x\ 10^{-8}$	$\mathbf{5.04 \times 10^{-9}}$

b. This is the first time for the MIDRMA to calculate the HOF for all the MID RVSM Airspace which enables the MIDRMA continuously monitor each FIR individually and will assist any Member State to overcome any problem associated with abnormal results.

Conclusions on Technical Height-Keeping:

(i) The current computed vertical-collision risk due to technical height-keeping performance meets the ICAO TLS.
(ii) The probability of vertical-overlap estimation satisfies the ICAO global system performance specification.
(iii) The probability of vertical-overlap estimate, Pz (1000), satisfies the global system performance specification.
(iv) Most monitoring groups are complying with technical height-keeping requirements, there are, however, a few groups that do not meet all the requirements. The MIDRMA will continue to coordinate with EUR RMA when problems are identified as they arise and associated corrective actions will be taken.

2.5.1.3 **Recommendations for Safety Objective 1**:

(i) The MIDRMA shall continue to review the contents and structure of its aircraft monitoring groups.
(ii) The MIDRMA shall use its own software (MIDRAS) to calculate the technical collision risk parameters in the next SMR.

2.5.2 **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.

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 **4.91×10^{-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.
*Note: The calculated result measured without Tripoli FIR.

Overall Risk Values					
Year 2006	Year 2008	Year 2010	Year 2012	Year 2013	**Year 2014**
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}	**4.91×10^{-11}***

2.5.2.1 Large Height Deviation (LHD) reports received from the MIDRMA Member States have been collected for the period covering from 1st September 2013 until 31st December 2014, an accurate estimation of the total risk is completely reliant on accurate reporting by States. Among the 14 FIRs/UIRs listed in Section 1.1, in the SMR, 5 FIRs have provided NIL reports for the reporting period.

2.5.2.2 A total of 29 LHD reports contributed in the risk analysis, the MIDRMA evaluated the rest of the reports filed for the period followed the Scrutiny Group meeting until 31st December 2014. The Scrutiny Group meeting noticed the same main reasons for filing LHD reports still exist from the last SMR as the extreme majority of the reports were because of the transferring units failed to coordinate their traffic to the accepting units, the participants in the Scrutiny Group meeting analysed the available LHD 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 total Altitude Deviation period gathered from the validated LHD occurrences in the MID Region airspace was = 38.33 minutes.

2.5.2.3 Conclusions on the overall vertical risk:

i) 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 MIDRVSM airspace, estimated from the operational and technical vertical risk meets the ICAO overall TLS of 5×10^{-09} fatal accidents per flight hour.

ii) Current risk-bearing situations have been identified and actions will be taken to ensure resolving all violations, information was collected during the MID RVSM Scrutiny Group meeting on 10th March 2014 in order to identify operational issues and potential mitigations.

iii) The effect of future traffic growth has also been assessed. The overall risk of collision will continue to meet the TLS at least until 2018.

2.5.2.4 Recommendations applicable to this Objective:

i) Since the operational risk is the most important factor to the overall risk, the MIDRMA will launch a new Large Height Deviation (LHD) reporting campaign by using the LHD online reporting tool which was developed by the MIDRMA in order to collect as much data as possible, also assess the increasing trend of the operational risk value and further investigate safety improvements to offset the effects.

ii) The MIDRMA will continue to improve the LHD online reporting tool and add more features to exchange data between the MIDRMA Member States, this will allow the LHD reporting rates to be updated regularly after investigated by the concerned States.

2.5.3 **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.

2.5.3.1 Conclusions and Recommendations for RVSM Safety Objective 3:

a) The MIDRMA purchased two Enhanced GMUs which will improve the monitoring capabilities and will expedite the monitoring process. and plan to conduct height monitoring during 2015 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.

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

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

d) The MIDRMA will continue to 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.

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

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

3. ACTION BY THE MEETING

3.1 The meeting is invited to review and endorse the Draft MID RVSM Safety Monitoring Report 2014 version 0.2 as at **Appendix A**.

APENDIX A

THE MID RVEM SAFETY

MONITORING REPORT 2014

MIDNAPIRG/15 - Endorsement Edition.

June 2015

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Document Characteristic

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Abstract
This document constitutes the RVSM Safety Monitoring Report for the MID RVSM Airspace for the reporting period September 2013 – December 2014 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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ACKNOWLEDGMENTS

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DOCUMENT CHANGE RECORD

VERSION NUMBER	EDITION DATE	REASON FOR CHANGE
0.1	01/02/2015	**Draft version presented to the ANSIG/1 Meeting.**
1.0	01/03/2015	**MIDANPRIG/15 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 **3.18×10^{-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 **4.91×10^{-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 **3.18×10^{-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 **4.91×10^{-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 (Except for Tripoli FIR), there is no evidence available to the RMA to state that the continued operations 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 second draft version of the Safety Monitoring Report which will cover the period from 01st September 2013 until 31st December 2014.

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 ICAO Middle East Region satisfies the safety objectives defined in Section 2 of this Report.

This draft version of the report is issued for endorsement by MIDANPIRG/15.

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**	**Khartoum**	**Muscat**	**Sana'a**	**Tehran**	**Tripoli ***

T-1: FIRs/UIRs of the Middle East RVSM Airspace/ * Tripoli FIR was excluded from the safety analysis due to lack of data.

The Data Sampling periods covered by the SMR 2014 are as displayed in the below table

Report Element	Time Period
Traffic Sample Data	15/01/2014 – 15/02/2014
Operational Errors	01/09/2013 – 31/12/2014

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 Middle East RVSM operations are acceptably safe. This claim is broken down into three main safety objectives, which represent necessary and sufficient conditions to be met for the above claim to be true. These principal safety objectives are listed in Section 2 and are discussed and assessed in Section 3,4,5 and 6 of this report.

- **Section 2** 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. Each Section contains Conclusion(s) and Recommendation(s) pertinent to the associated safety objective.
- **Section 6** summarises all the Conclusions and Recommendations raised in the previous sections together with additional Recommendations arising from on-going RMA operations.
- **Appendices**

  - **Appendix A:** Member States Traffic Data Analysis.
  - **Appendix B:** Provides Information on the MID MMR.
  - **Appendix C:** Provides Information on RVSM Minimum Monitoring Requirements (*Updated on 11/05/2015*)
  - **Appendix D:** Includes the 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. There are a number of assumptions that must be verified to satisfy the reliability of the risk assessment. The verification of these assumptions is contained in Section 3 which deals primarily with monitoring aircraft performance issues.
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, 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. It also highlights issues that should be carried forward as recommendations to be adopted for future reports.

2.2 The Collision Risk Model (CRM)

2.2.1 The risk of collision to be modelled is that due to the loss of procedural vertical separation between aircraft flying above FL 290 in a given portion of an airspace. One collision between two aircraft is counted as the occurrence of two accidents. The risk of collision depends both on the total number and types of aircraft flying in the system and the system characteristics.

2.2.2 The CRM provides an estimate of the number of accidents within an airspace system that might occur per aircraft flight hour due to aircraft collisions resulting from the loss of procedural vertical separation in an RVSM environment analysis, is expressed in terms of quantifiable parameters. In the vertical dimension the CRM can be broken down in order to separately model a single route on which aircraft are flying in the same or opposite directions at adjacent flight levels, pairs of crossing routes and combinations of individual and intersecting routes, this model is applied equivalently to vertical, lateral and longitudinal separation.

2.2.3 Three parameters used within the CRM :

a. The Vertical Overlap Probability, denoted as Pz(1 000).
b. The Lateral Overlap Probability, denoted as Py(0).
c. The aircraft Passing Frequency are the most important quantities in determining the vertical collision risk. Of these, the vertical overlap probability is the most important parameter to calculate.

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 x 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 **3.18 x 10^{-12}** fatal accidents per flight hour, which meets the ICAO TLS of **2.5 x 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 **3.28 x 10^{-9}** valid and is less than the ICAO requirement of **1.7 x 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 Calculating the Probability of Lateral Overlap ($P_y(0)$)

The probability of lateral overlap $\mathrm{P_y}(0)$ is the probability of two aircraft being in lateral overlap which are nominally flying on (adjacent flight levels of) the same route. The calculation of the Py (0) for the SMR 2014 has the following to consider:

a. Due to lack of radar data available for most of the congested airspace in the Middle East Region to calcualte the probability of lateral overlap $\boldsymbol{P_y(0)}$ which is fundamental for the SMR, the MIDRMA decided to calculate the probability of lateral overlap $\boldsymbol{P_y(0)}$ for all the MID RVSM airspace and not only the congested airspace by adopting the ICAO methodology developed for this purpose and by adding this feature in the MID Risk Analysis Software (MIDRAS).

b. The MIDRMA calculated the probability of lateral overlap $\boldsymbol{P_y(0)}$ for the whole MID RVSM airspace **5.04 x 10-9**.

c. Overall, the results are considered to be valid.

3.2.1.2 Method Used For Calculating the Probability of Lateral Overlap ($\mathbf{P_y(0)}$)

To compute the probability of lateral overlap$\mathrm{P_y(0)}$, the probability density of the lateral distance $\mathrm{Y_{12}}$ between the two aircrafts flying with lateral deviations $\mathrm{Y_1}$ and $\mathrm{Y_2}$ from the nominal route i.e. $\mathrm{Y_{12} = Y_1 - Y_2}$ is computed.

This probability density denoted by $\mathrm{f_y(y)}$ is dependent on the type of navigation equipment being used in the airspace under consideration. The ground-based navigation infrastructure in the MIDRMA Region consists of NDBs and VOR/DMEs. However, more and more aircraft have started to use satellite-based navigation (GNSS).

This is calculated by taking the proportion of time that an airplane is flying using satellite navigation (GNSS) versus radio navigation (VOR/DME). By representing the probability of an aircraft being in a specific lateral position by a normal distribution, the following equation is found:

$$f_y(y) = (1-\alpha)\frac{1}{\sigma_{\mathrm{VOR/DME}} \times \sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{y}{\sigma_{\mathrm{VOR/DME}}}\right)^2} + \alpha \frac{1}{\sigma_{\mathrm{GNSS}} \times \sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{y}{\sigma_{\mathrm{GNSS}}}\right)^2}$$

Where, α is the proportion of flights flying with satellite navigation (GNSS) and $\sigma_{\mathrm{VOR/DME}}$ and σ_{GNSS} are the standard deviations for radio and satellite navigation, respectively. For MIDRAM region it is assumed that 75% of flights (α =0.75) are using GNSS and 23% of flights are using VOR/DME for navigation.

Following the RVSM global system performance specification, the standard deviation for VOR/DME navigation is taken as 0.3 NM and a standard deviation of 0.06123 NM will be used for the GNSS. i.e. $\sigma_{\mathrm{VOR/DME}} = 0.3$ NM and $\sigma_{\mathrm{GNSS}} = 0.06123$ NM.

With this probability distribution function for one aircraft, the function for two aircraft can be found by convoluting the two together;

$$f_{y_{1,2}}(y) = (1-\alpha)^2 \frac{1}{\sigma_{\mathrm{VOR/DME}} \times 2\sqrt{\pi}} e^{-\frac{1}{4}\left(\frac{y}{\sigma_{\mathrm{VOR/DME}}}\right)^2} + 2\alpha(1-\alpha)\frac{1}{\sqrt{\sigma_{\mathrm{VOR/DME}}^2 + \sigma_{\mathrm{GNSS}}^2} \times \sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{y}{\sqrt{\sigma_{\mathrm{VOR/DME}}^2 + \sigma_{\mathrm{GNSS}}^2}}\right)^2}$$
$$+ \alpha^2 \frac{1}{\sigma_{\mathrm{GNSS}} \times \sqrt{\pi}} e^{-\frac{1}{4}\left(\frac{y}{\sigma_{\mathrm{GNSS}}}\right)^2}$$

This function then allows the probability of lateral overlap to be calculated as:

$$P_y(0) \approx 2\lambda_y f_{y_{1,2}}(0)$$

Where λ_y is the average wingspan of the aircraft within the region.

Frequency of Horizontal Overlap					
Year 2006	**Year 2008**	**Year 2010**	**Year 2011**	**Year 2012/13**	**Year 2014**
6.99×10^{-3}	**5.1×10^{-11}**	**2.88×10^{-6}**	**6.49×10^{-5}**	**6.49×10^{-5}**	**5.04×10^{-9}**

The Frequency of HOF Values

3.2.2 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 **3.28×10^{-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**	**Year 2012/13**	**Year 2014**
2.17×10^{-14}	**1.93×10^{-13}**	**3.96×10^{-15}**	**5.08×10^{-14}**	**6.37×10^{-12}**	**3.18×10^{-12}**

The Technical Risk values

According to the technical risk values as shown in the above table the TLS values is continuously increasing, the MIDRMA issued an updated minimum monitoring requirements (MMR) for each MIDRMA member states according to the latest RVSM approvals received from all members valid until May 2014, these tables are available in Appendix B.

Note: The MIDRMA is continuously updating the MMR for all Member States, all members are required to check their MMR through the MIDRMA website (www.midrma.com).

3.4 Conclusions on Technical Height-Keeping:

a. The current computed vertical-collision risk due to technical height-keeping performance meets the ICAO TLS.

b. The probability of vertical-overlap estimation satisfies the ICAO global system performance specification.

c. The probability of vertical-overlap estimate, Pz (1000), satisfies the global system performance specification.

d. Most monitoring groups are complying with technical height-keeping requirements, there are, however, a few groups that do not meet all the requirements. The MIDRMA will continue to coordinate with EUR RMA when problems are identified as they arise and associated corrective actions will be taken.

3.5 Recommendations for Safety Objective 1:

a. The MIDRMA shall continue to review the contents and structure of its aircraft monitoring groups.

b. The MIDRMA shall use its own software (MIDRAS) to calculate the technical collision risk parameters in the next SMR.

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 objective of this Section is to set out the arguments and evidence that 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 **4.91 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

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) 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.

Overall Risk Values					
Year 2006	**Year 2008**	**Year 2010**	**Year 2011**	**Year 2012/13**	**Year 2014**
Not calculated	4.19×10^{-13}	6.92×10^{-12}	1.04×10^{-11}	**3.63×10^{-11}**	**4.91×10^{-11}**

The following Tables present the status of provision of LHDs and RVSM Approvals by States for the period September 2013 – December 2014.

MID States LHDs & RVSM Approvals status report for year 2013

	Months					Sep		Oct		Nov		Dec	
	2013	CFR	RVSM	CFR	RVSM	LHD	RVSM	LHD	RVSM	LHD	RVSM	LHD	RVSM
1	Bahrain					√	-	-	√	√	√	√	-
2	Egypt					-	-	-	√	-	-	√	√
3	Iran					-	-	-	-	-	-	√	-
4	Iraq					√	√	-	√	-	√	-	√
5	Jordan					-	-	-	-	-	√	-	√
6	Kuwait					√	√	√	√	√	√	√	√
7	Lebanon					-	-	-	-	-	-	-	-
8	Oman					-	-	√	-	√	√	-	-
9	Qatar					N/A	√	N/A	√	N/A	√	N/A	√
10	Saudi					-	√	-	√	-	√	-	-
11	Syria					-	√	-	√	√	√	√	√
12	UAE					-	√	-	√	-	√	√	√
13	Yemen					√	√	√	√	√	√	-	√

MID States LHDs & RVSM Approvals status report for year 2014 (1/2)

										On Line LHD System (Report)			
	Months	Jan		Feb		MAR		Apr		May		Jun	
	2014	LHD	RVSM	LHD	RVSM	LHD	RVSM	LHD	RVSM	LHD	RVSM	LHD	RVSM
1	Bahrain	√	-	√	√	√	√	√	-	√	√	√	√
2	Egypt	-	√	-	-	√	-	-	√	√	-	√	√
3	Iran	√	-	√	√	√	√	√	-	-	√	-	-
4	Iraq	-	√	-	√	-	-	√	√	-	-	-	√
5	Jordan	-	√	√	√	√	-	√	-	√	-	√	√
6	Kuwait	√	√	-	-	-	√	-	√	-	√	-	√
7	Lebanon	-	√	-	-	-	-	√	√	√	√	√	-
8	Oman	-	-	√	-	√	-	√	-	√	-	√	√
9	Qatar	N/A	√	N/A	√	N/A	√	N/A	√	N/A	-	N/A	√
10	Saudi	-	-	-	-	-	√	√	√	√	-	√	-
11	Syria	√	√	-	-	-	√	√	√	-	√	-	√
12	UAE	-	√	√	√	√	√	√	√	√	-	√	√
13	Yemen	-	√	√	√	-	-	-	-	-	-	-	-
14	Sudan	-	-	-	-	-	-	-	-	√	-	√	√
15	Libya	-	-	-	-	-	-	-	-	-	-	-	-

MID States LHDs & RVSM Approvals status report for year 2014 (2/2)

On Line LHD System (Report)													
	Months	July		Aug		Sep		Oct		Nov		Dec	
	2014	LHD	RVSM	LHD	RVSM	LHD	RVSM	LHD	RVSM	LHD	RVSM	LHD	RVSM
1	Bahrain	√	√	√	√	√	√	√	√	√	-	√	√
2	Egypt	√	√	-	√	-	-	-	√	-	√	-	√
3	Iran	-	-	-	-	-	-	-	-	-	-	-	-
4	Iraq	-	-	-	√	-	-	-	-	-	-	-	-
5	Jordan	√	√	√	-	√	-	√	√	√	√	√	-
6	Kuwait	-	√	-	√	-	-	-	-	-	-	-	√
7	Lebanon	√	-	√	-	√	-	√	-	√	-	√	-
8	Oman	√	√	√	√	√	√	√	-	-	√	√	√
9	Qatar	N/A	√	N/A	√	N/A	√	N/A	√	N/A	√	N/A	√
10	Saudi	√	-	√	-	√	√	√	-	√	-	-	-
11	Syria	-	√	-	√	-	-	-	-	-	-	-	√
12	UAE	√	√	√	√	√	√	√	√	√	√	-	√
13	Yemen	-	-	-	-	-	-	-	-	-	-	-	-
14	Sudan	√	-	√	-	-	-	√	-	√	-	√	-
15	Libya	-	-	-	-	-	-	-	-	-	-	-	-

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 2018. With the current uncertainty over traffic growth this issue will be revisited when the Middle East economic conditions return to more normal growth.

4.3 Conclusions on the overall vertical risk:

a. 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 MIDRVSM airspace, estimated from the operational and technical vertical risk meets the ICAO overall TLS of 5 x 10-09 fatal. accidents per flight hour.

b. Current risk-bearing situations have been identified and actions will be taken to ensure resolving all violations, information was collected during the MID RVSM Scrutiny Group meeting on 10th March 2014 in order to identify operational issues and potential mitigations.

c. The effect of future traffic growth has also been assessed. The overall risk of collision will continue to meet the TLS at least until 2018.

4.3 Recommendations Applicable to Safety Objective 2 :

a. Since the operational risk is the most important factor to the overall risk, the MIDRMA will launch a new Large Height Deviation (LHD) reporting campaign by using the LHD online reporting tool which was developed by the MIDRMA in order to collect as much data as possible, also assess the increasing trend of the operational risk value and further investigate safety improvements to offset the effects.

b. The MIDRMA will continue to improve the LHD online reporting tool and add more features to exchange data between the MIDRMA Member States, this will allow the LHD reporting rates to be updated regularly after investigated by the concerned States.

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 and Recommendations Applicable for Safety Objective 3

a. The MIDRMA purchased two Enhanced GMUs which will improve the monitoring capabilities and will expedite the monitoring process and will plan to conduct height monitoring during 2015 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.

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

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

d. The MIDRMA will continue to 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.

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

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

6 Conclusions and Recommendations

a. The current computed vertical-collision risk due to technical height-keeping performance meets the ICAO TLS.

b. The probability of vertical-overlap estimation satisfies the ICAO global system performance specification.

c. The probability of vertical-overlap estimate, Pz (1000), satisfies the global system performance specification.

d. Most monitoring groups are complying with technical height-keeping requirements, there are, however, a few groups that do not meet all the requirements. The MIDRMA will continue to coordinate with EUR RMA when problems are identified as they arise and associated corrective actions will be taken.

e. The MIDRMA shall continue to review the contents and structure of its aircraft monitoring groups.

f. The MIDRMA shall use its own software (MIDRAS) to calculate the technical collision risk parameters in the next SMR.

g. 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 MIDRVSM airspace, estimated from the operational and technical vertical risk meets the ICAO overall TLS of 5 x 10-09 fatal. accidents per flight hour.

h. Current risk-bearing situations have been identified and actions will be taken to ensure resolving all violations, information was collected during the MID RVSM Scrutiny Group meeting on 10th March 2014 in order to identify operational issues and potential mitigations.

i. The effect of future traffic growth has also been assessed. The overall risk of collision will continue to meet the TLS at least until 2018.

j. Since the operational risk is the most important factor to the overall risk, the MIDRMA will launch a new Large Height Deviation (LHD) reporting campaign by using the LHD online reporting tool which was developed by the MIDRMA in order to collect as much data as possible, also assess the increasing trend of the operational risk value and further investigate safety improvements to offset the effects.

k. The MIDRMA will continue to improve the LHD online reporting tool and add more features to exchange data between the MIDRMA Member States, this will allow the LHD reporting rates to be updated regularly after investigated by the concerned State

l. The MIDRMA purchased two Enhanced GMUs which will improve the monitoring capabilities and will expedite the monitoring process. and plan to conduct height monitoring during 2015 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.

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

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

o. The MIDRMA will continue to 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.

p. The MIDRMA will continue to 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 MID RVSM Scrutiny Group convened on 10th March 2014 in Bahrain during the MIDRMA Board 13 Meeting (09-12 March 2014) and chaired by the MIDRMA and attended by representatives from 7 Member States (Bahrain, Egypt, Iran, Saudi Arabia, Sudan, Oman and Yemen) , also participated by Airworthiness Inspectors from Bahrain and Qatar and monitored by representatives from Euro RMA, the developer of the MIDRAS Software from the University of New South Wales in Canberra-Australia and the ICAO MID Office.

The MIDRMA Board decided to include in its work programme the agenda of the MID RVSM Scrutiny Group to improve its efficiency and to facilitate the implementation of its outcome and to ensure States involved in contributing large height deviation reports that adverse trends can be identified 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 September 2013 until 08th March 2014. The MIDRMA validated and endorsed the rest of the reports received from 09th March 2014 until 31st December 2014.

The lack of reporting Large Height Deviations and Coordination Failures by some of the MIDRMA Member States was addressed again during this meeting, also the continuous filing of "NIL LHDs" especially by FIRs with high volume of traffic continued for the fifth consecutive SMRs which has a negative effect on the computed Targets Level of Safety. The MIDRMA reported to the meeting concerning the overall reporting of LHDs is not acceptable and must be improved.

In response to the request made by MIDRMA Board 12 meeting to develop an online reporting tool for the submission of LHD reports and to improve the level of reporting by States, the MIDRMA announced during this meeting the availability of this system in the MIDRMA website and provided the necessary training and the instructions manual for all Member States to start for the submission of LHD reports via this tool.

The MIDRMA reported to the meeting that with effect of 01st May 2014 will not accept any more the old format of Coordination Failure Reports (CFRs) and Altitude Deviation Reports (ADRs) as the online LHD reporting tool will be the only recognised and approved method for reporting LHD and all Member States are NOT required to send CFRs or ADRs anymore.

A total of **29** LHD reports contributed in the risk analysis, the MIDRMA evaluated the rest of the reports filed for the period followed the Scrutiny Group meeting until 31st December 2014. The meeting noticed the same main reasons for filing the LHD reports still exist from the last SMR as the extreme majority of the reports were because of the transferring units failed to coordinate their traffic to the accepting units, the participants analysed the LHD reports filed during that period 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 total Altitude Deviation period gathered from the validated LHD occurrences in the MID Region airspace = **38.33 minutes**.

The following observations were addressed and discussed during the meeting:

a. During this reporting period, Bahrain submitted LHD reports to the MIDRMA related to all the neighbouring FIRs, the Scrutiny Group noticed the extreme majority of these reports were concentrated at waypoints RABAP and LONOS (FIR boundary points with Kuwait) and NARMI, LADNA, DAROR and ULIKA (FIR Boundary Points with Jeddah & Riyadh FIR), also some other reports at the boundary points with Emirates and Tehran FIRs.

   Note 1: The MIDRMA noticed the LHD reports started to build up at waypoint KUVER (Bahrain/Tehran FIR boundary Waypoint), both ATC units are required to act immediately and review the reasons for these occurrences to ensure safe RVSM operations always exist.

   Note 2: The number of LHD reports at the Bahrain FIR boundary points with Kuwait and Jeddah/Riyadh FIRs found to be the highest in the ICAO Middle East Region (Jeddah & Riyadh ATCUs reported after investigated these LHD reports that some reports are NOT Valid) Bahrain ATC must make sure before filing any LHD report that the occurrence is valid and meets the conditions for filing the LHD Report.

   Note 3 :The MIDRMA excluded all the non-relevant reports and validated the occurrences which has direct impact to the RVSM operations as most of these occurrences were observed and rectified by the controllers working in Bahrain ACC well in advance, but that does not mean the situation is safe all the time. All concerned ATC Units involved in these LHD reports are required to take all necessary measures to rectify the problems at these waypoints and must work with each other to eliminate or reduce these errors as soon as possible. The MIDRMA consider the level of reporting LHD by Bahrain is Satisfactory.

b. The LHD reports received from Egypt were very few , the sudden decrease in the number of LHD reports submitted by Egypt were discussed during the meeting and Egypt MIDRMA Board Member promised to address this issue to the concerned ATC Authority to improve the level of reporting , but despite several attempts to remind the concerned focal point to submit the required reports, the MIDRMA didn't see any improvement at all, therefore the MIDRMA consider the level of reporting LHD by Egypt is Unsatisfactory.

c. The Scrutiny Group evaluated the reports received from the I.R. of Iran and found most the reports were related to Kabul ATCU at position CHARAN, also there were a few at SOKAM and PIRAN, the meeting noticed a good improvement concerning the reports filed at position DENDA related to Muscat ATCU comparing to the last reporting period although there were very few reported from Muscat ATCU side at the same position.

   Note 1: The MIDRMA didn't receive any LHD reports related to Baghdad ATCU from Tehran, this conclude the problems addressed between the two ATCUs in the last Scrutiny Group meeting have been resolved.

   Note 2: The MIDRMA received LHD reports through MAAR (Monitoring Agency for Asia Region) filed by Kabul ATCU related to Tehran ATCU and MAAR raised their serious concern in the number of LHD occurrences near position GADER,

which is a transfer of control point between Tehran and Kabul ACCs. The frequency seems to have increased quite a lot in 2014 and immediate action and

necessary measures must be taken by both ATCUs to ensure safe RVSM operations exist all the time.

Note 3: Since May 2014, the MIDRMA didn't receive any LHD report from I.R. of Iran focal point, therefore the MIDRMA consider the level of reporting LHD by Iran is Unsatisfactory.

d. During this reporting period, the MIDRMA received LHD reports from Jeddah & Riyadh ATCUs but not related to all their neighbouring FIRs, half of these reports were filed at position KITOT which is the transfer of control point with Cairo ATCU. The same problems exist at this point since last meeting, these occurrences are critical for RVSM operations due to the close proximity to NWB which is a converging point west of KITOT inside Cairo FIR. The traffic converging at same flight levels transferred by Cairo to Jeddah at KITOT without prior coordination or approval from Jeddah ATCU can cause serious incidents. The MIDRMA consider the level of reporting LHD by Saudi Arabia is Satisfactory.

Note 1: Jeddah addressed several safety issues required to be considered by the concerned ATCU to improve safety in handling traffic within their RVSM airspace:

LADNA: This is a transfer control point with Bahrain ATC, located on AWY UN318 which serves traffic landing Qatar airports, this WP can gets very busy especially during peak hours as Bahrain ATC accept FL 310 only at this point and FL 290 by prior approval.

KITOT: This is a transfer control point on AWY UN697 with Cairo ATC where the accepting ATCU accept one westbound flight level from Jeddah ATC which can put the controllers in Jeddah at tremendous pressure during peak hours to regulate traffic at this point.

MIPOL: This is a transfer control point on AWY G660 (used for eastbound TFC only) this point located 82 NM west of Jeddah VOR, the proximity of this point to OEJN is causing serious problems to Jeddah ATC for traffic transferred at this point landing OEJN as Khartoum ATC use FL330 ONLY, this is a very high level for landing OEJN especially during periods with strong tail wind, Khartoum ATC required to consider another flight levels to facilitate traffic landing OEJN without any difficulties.

e. Sudan MIDRMA Board member attended the Scrutiny Group meeting for the first time and because there were no reports filed during the meeting the group was unable to discuss any issues related to Khartoum FIR, the MIDRMA would like to confirm that the level of reporting LHD by Sudan focal point is Satisfactory.

f. Yemen filed LHD reports for the month of February 2014 ONLY and nothing has been received from March until December 2014. The filed reports were concentrated at position NADKI north of Sanaa FIR which is the transfer control point with Jeddah ATCU, the meeting discussed these occurrences of traffic entering Sanaa FIR without coordination with the presence of representatives from Jeddah ATC, this kind of coordination failures can cause risk to other known traffic under their control within the RVSM airspace .

Note 1 : Yemen MIDRMA focal point stopped sending LHD reports since Feb 2014, despite the reminders sent for submitting the required data each month, the MIDRMA didn't receive any response from the concerned focal point, therefore the level of reporting LHD by Yemen LHD found to be Unsatisfactory.

g. Oman regularly submits LHD reports on time and the MIDRMA never experienced any difficulties for obtaining the required data from the MIDRMA focal point. The LHD reports received from Oman were distributed mainly at DENDA (transfer control point with Tehran ATCU) and at position TAPDO (transfer control point with Karachi ATCU), the meeting noticed the number of reports filed at DENDA reduced a lot comparing to the last reporting period, Oman focal point reported the same problems still exist but not in the same volume as Muscat ATC still working very hard to reduce the LHD occurrences. The level of reporting LHD by Oman is Satisfactory.

h. The Scrutiny Group could not evaluate all the reports submitted by the Member States which didn't attend the meeting (Iraq, Lebanon, Jordan, Libya, Syria, UAE and Kuwait) , the MIDRMA followed the same evaluation mechanism during this meeting for the reported 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.

Note 1: The level of reporting LHD by Iraq is Unsatisfactory.

Note 2: The level of reporting LHD by Lebanon, Jordan, Syria and UAE is Satisfactory.

Note 3: The MIDRMA reported to the meeting that the LHD reports received from UAE found to be the best in the ICAO Middle East region in terms of quality, regularity and reasons for filing these reports.

Note 4: Kuwait reports received from Sep 2013 until Jan 2014 related to Bahrain, Jeddah/Riyadh and Tehran FIRs filed by Kuwait were discussed and validated. Kuwait also filed reports related to Baghdad FIR and most of these reports were concentrated at position SIDAD, the Scrutiny Group was unable to comment in the situation because both MIDRMA board members did not attend the meeting. The level of reporting LHD by Kuwait is Unsatisfactory.

Note 5: Libya was excluded from the safety analysis

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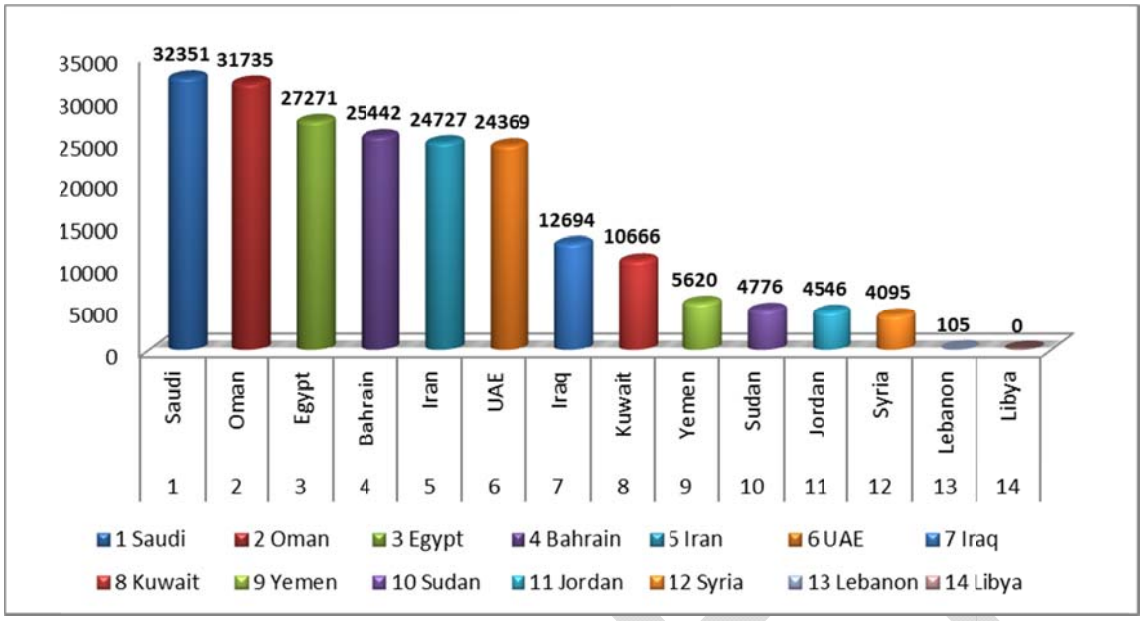
6.1 Appendix A – Member States Traffic Data Analysis:

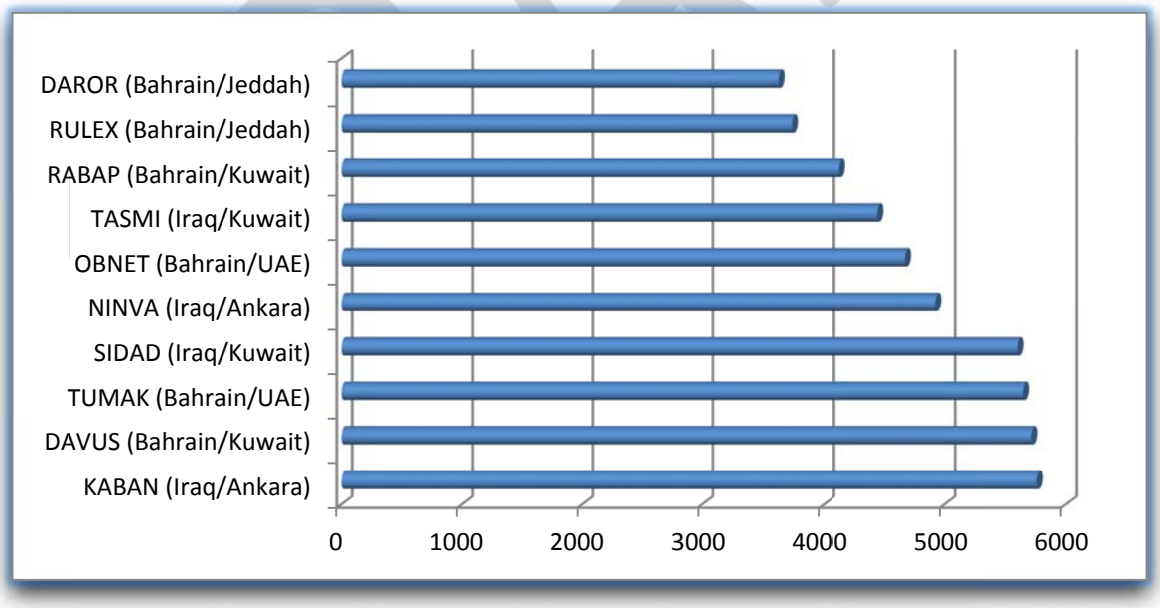
The quality of the SMR traffic data received from all State members varies from one State to another. The MIDRMA monitoring team spent a considerable time to correct the contents and fill all missing fields,

MID States RVSM Traffic Data used for the SMRs

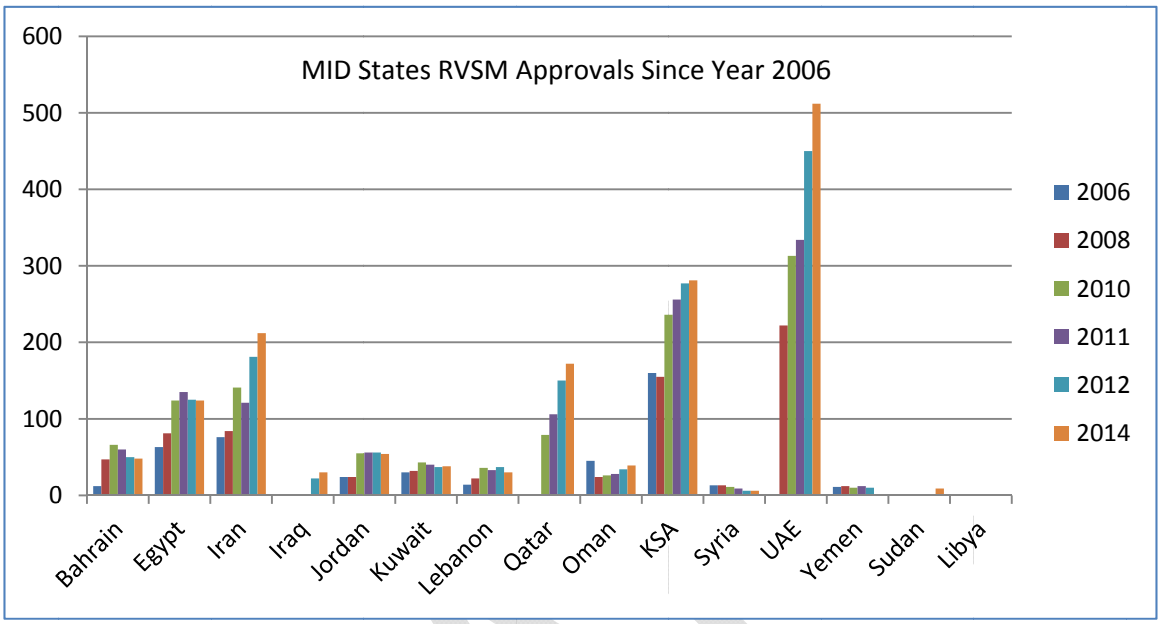
SN	MID States	Jun. 2009	Jan. 2011	Oct. 2012	Jan - Feb 2014	2012 vs.2014
1	Jeddah/Riyadh	22422	25499	30944	32351	4.55%
2	Muscat FIR	22520	28224	30357	31735	4.54%
3	Cairo FIR	19228	14270	26332	27271	3.57%
4	Bahrain FIR	24285	30099	39345	25442	-35.34%
5	Tehran FIR	10479	10638	17523	24727	41.11%
6	Emirates FIR	15868	21076	24676	24369	-1.24%
7	Baghdad FIR	0	0	10496	12694	20.94%
8	Kuwait FIR	3570	10364	13596	10666	-21.55%
9	Sana'a FIR	3490	4305	5170	5620	8.70%
10	Khartoum FIR	0	0	0	4776	
11	Amman FIR	8554	10689	6857	4546	-33.70%
12	Damascus FIR	9774	11719	8027	4095	-48.98%
13	Beirut FIR	2949	3845	1286	105	-91.84%
14	Tripoli FIR	0	0	0	0	
	Total	143,139	170,728	214,609	28,397	-2.89%



MID States FIRs Total Flights Number for SMR 2014 *(15 Jan. Till 15 Feb)*



The Busiest 10 Reporting Points in the MID Region FIRs (*15 Jan. Till 15 Feb)*



MID States RVSM Approvals Since Year 2006

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 Type	Required Monitoring
	Fully Compliant		

Egypt – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	ALEXANDRIA AIRLINES	B733	1
2	AVIATOR	B735	1
3	CAIRO AVIATION	T204	2
4	EGYPTAIR AIRLINES	A342	2
5	EGYPTIAN AIR FORCE	GLF3	1
6	FLYEGYPT	B738	1
TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED			**8**

Republic of Iran – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	ATA AIR	A320	2
2	ATRAK AIR	A320	2
3	C.A.O	F2TH	1
4	Caspian Airlines	MD80	2
5	Iran Air	A30B	2
6	Iran Air	A320	1
7	Iran Air	B722	2
8	Iran Air	B742	2
9	Iran Air	F100	2
10	Iran Airtour	MD80	1
11	Iran Aseman Airlines	A320	2
12	Iran Aseman Airlines	B722	2
13	Iran Aseman Airlines	F100	2
14	Iranian Air Transport Company	F100	1
15	Kish Air	F100	2
16	Mahan Air	A30B	2
17	Mahan Air	A310	2
18	Mahan Air	A343	2
19	Mahan Air	B744	2
20	MERAJ AIR	A30B	2
21	MERAJ AIR	A320	1
22	Pouya Air	IL76	2
23	QESHM AIR	A306	2
24	QESHM AIR	A320	2
25	QESHM AIR	F100	1
26	Taban Air	MD80	1
27	ZAGROS	A320	2
28	ZAGROS	MD80	1
TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED			48

Iraq – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	Al-Naser Airlines	B732	1
2	Zagros Jet	A321	1
	TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED		**2**

Jordan - Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	Jordan Aviation	B762	1
2	Petra Airlines	A320	1
	TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED		**2**

Kuwait - Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	KUWAIT AIRWAYS	GLF6	1
	TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED		**1**

Lebanon - Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	Emerald Jets s.a.l	CL60	1
2	IBEX Air Charter	H25B	1
	TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED		**2**

Oman – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
Fully Compliant			

Qatar – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
Fully Compliant			

Saudi Arabia - Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	Aeromedical Evacuation	GLF5	1
2	Air Asia	A332	1
3	AIR ATLANTA ICELANDIC	A332	1
4	ALMUSA CO	E135	1
5	Alpha Star Aviation Services	A342	1
6	Aviation Horizon Ltd.	CL60	1
7	Aviation Knights	GLF3	1
8	Eagle Express	B744	2
9	GLAMOR AVIATION	LJ60	1
10	Najd Aviation	C560	1
11	NAS 91	C550	2
12	Pullmantur Air	B744	1
13	Royal Fleet	B743	1
14	Salem Aviation	C525	1
15	Saudi Arabia Airlines	B748	1
16	Saudi Arabian Airlines	B74S	1
17	Saudi Arabian Airlines	E170	2
18	SPA-EM	F900	1
TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED			**21**

Syria – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
Fully Compliant			

Yemen – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	Yemen Airways	A310	2
2	Felix Airways	CRJ7	2
TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED			4

UAE – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	Al Jaber Aviation	H25B	1
2	DC Aviation Al Futtaim LLC	GL5T	1
3	Eastern Skyjets	B733	2
4	Empire Aviation	CL60	1
5	Etihad	B789	2
6	Global Jet	B733	2
7	Royal Jet	GL5T	1
TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED			10

Sudan – Minimum Monitoring Requirements for RVSM Height Monitoring

Seq.#	Operator	ACFT Type	Required Monitoring
1	Air Sudan	A300	2
2	Air Sudan	A320	1
3	Air Sudan	E135	2
4	Nova Airline	CRJ2	2
5	Bard Airline	IL76	2
TOTAL NUMBER OF ACFT REQUIRED TO BE MONITORED			**9**

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6.3 Appendix C - RVSM MINIMUM MONITORING REQUIREMENTS (Updated on June 2014)

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, A380, A3ST, AVRO, B712, B727, B737C, B737CL, B737NX, B747CL, B74S, B744-5, B744-10, B752, B753, B764, B767, B772, B773, BD100, BE40, C25A, **C25B**, C510, C525, C560, C56X, C650, C680, C750, CARJ, CL600, CL604, CL605, CRJ7, CRJ9, DC10, E135-145, E170-190, E50P, E55P, F100, F900, FA7X, GALX, GLEX, GLF4, GLF5, H25B-800, J328, 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, A158, **A350**, AC90, AC95, **AJ27**, AN72, ASTR, ASTR-SPX, B701, B703, B731, B732, B744-LCF, B748, B787, **BCS1**, BD700, BE20, BE30, C25C, C441, C500, C550-B, C550-II, C550-SII, CRJ10, D328, DC85, DC86-87, DC91, DC93, DC94 DC95, **E120**, E45X, EA50, F2TH, F70, FA10, FA20, FA50, G150, G280, GLF2, GLF2B, GLF3, GLF6, H25B-700, H25B-750, H25C, HA4T, **HDJT**, IL62, IL76, IL86, IL96, L101, L29B-2, L29B-731, LJ23, LJ24, LJ25, LJ28, LJ31, LJ35-36, LJ55, MU30, P180, PAY4, PC12, SB20, SBR1, SBR2, **SU95**, 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	Aircraft types for which no generic compliance method exists: A225, AN12, AN26, B190, B462, B463, B720, B74S-SOFIA, BA11, BE9L, GSPN, H25A, L29A, PAY3, R721, R722, SJ30, STAR	100% of aircraft shall be monitored

Table 1: MONITORING REQUIREMENTS TABLE (Civilian)

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
C25B	C25B	CITATIONJET III	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C Series
		525B CITATIONJET III	
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
EA50	EA50	ECLIPSE	ALL SERIES
F100	F100	FOKKER 100	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C 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
IL76	IL76	ILYUSHU-76	ALL SERIES
IL86	IL86	ILYUSHIN-86	ALL SERIES
IL96	IL96	ILYUSHIN-96	ALL SERIES

Monitoring Group	A/C ICAO	A/C Type	A/C 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
MIDRAS	MID Risk Analysis Software
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

- END -