International Civil Aviation Organization

Middle East Regional Monitoring Agency Board

Fifteenth Meeting (MIDRMA Board/15)
(Muscat, Oman, 29 – 31 January 2018)

Agenda Item 4: RVSM Monitoring and related Technical Issues

MID RVSM SMR 2016

(Presented by MIDRMA)

SUMMARY

This Working Paper details the results of the airspace safety oversight for the RVSM operation within the ICAO Middle East Region and the difficulties to obtain the required Traffic Data Sample (TDS) including problems of corrupted and late receipt of these data from some MIDRMA Member States to enable the MIDRMA carry out the Safety Analysis.

Action by the meeting is at paragraph 3.

REFERENCES

- MIDANPIRG/15 Report
- MIDRMA Board/14 Report.
- MID RVSM SMR 2015
- MID RVSM SMR 2016

1. INTRODUCTION

1.1 The first draft version for the MID RVSM SMR 2016 (ver. 0.1) was calculated for 12 FIRs in the ICAO Middle East Region. Baghdad, Kuwait and Tripoli FIRs were excluded from the RVSM safety analysis due to the non-submission of the required TSD.

1.2 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 the FIRs mentioned in 1.1.

2. DISCUSSION

2.1 Since the establishment of the MIDRMA, the Board Members agreed that the MIDRMA team to issue a periodic RVSM Safety Monitoring Report once for every MIDANPIRG cycle which is a period of 18 months, the SMR required to be reviewed by a technical body to raise their comments/observations concerning the report to MIDANPIRG for their final endorsement, however the MIDRMA feels the 18 months is not suitable for the safety study compared with the continuous traffic growth and the modifications of the airway structures in the region, therefore the

MIDRMA request the support from the Board Members to change the duration of the SMR to be issued once every year and submit the reviewed reports to MIDANPIRG.

2.2 The MIDRMA propose the following draft conclusion to support the issuance of the SMR for the MID Region on annual basis:

DRAFT CONCLUSION 15/XX: MID RVSM SAFETY MONITORING REPORT CYCLE

With effect of 2018, the MIDRMA issue the MID RVSM Safety Monitoring Report on annual basis to facilitate tracking the risk trend of RVSM implantation within the ICAO Middle East Region.

2.3 Further to the outcome of MIDRMA Board/14 meeting, Khartoum, Sudan, 1-3 February 2016, agreed under Draft Conclusion 14/2 that for the development of the MID RVSM SMR 2016, the TDS required for the safety analysis must be collected from 01st September 2016 until 30th September 2016 for all traffic operating within the ICAO Middle East RVSM airspace and must be submitted to the MIDRMA not later than 31st October 2016, and it was reiterated that the required data must be submitted in the right format and in the formulated excel sheet designed for this purpose which is the only sheet recognized by the MID Risk Analysis Software (MIDRAS). Any data received in a different format, or in an excel sheet different from the one available on the MIDRMA website (www.midrma.com) will not be acceptable.

DRAFT CONCLUSION 14/2: MID RVSMSMR 2016

That,

a) the FPL/traffic data for the period 1 – 30 September 2016 be used for the development of the MID RVSM Safety Monitoring Report (SMR 2016);

b) only the appropriate Flight Data form available on the MIDRMA website (www.midrma.com) should be used for the provision of FPL/traffic data to the MIDRMA; and

c) the final version of the MID RVSM SMR 2016 be ready for presentation to and endorsement by MIDANPIRG/17.

2.4 The MIDRMA circulated a reminder email on 29th August 2016 to all focal points concerning the MIDRMA Board Draft Conclusion 14/2 to submit the required traffic data to the MIDRMA not later than 31st October 2016, although the deadline already passed, the MIDRMA continued to accept the traffic data from some Member States because they were either late to submit their data or the data was corrupted and required corrections to meet the MIDRAS format.

2.5 The MIDRMA accepted the traffic data received from Bahrain, Egypt, Jordan, Iran, Oman, Sudan, Syria and Yemen while the data received from Iraq, Kuwait was completely corrupted, and after 6 months from the deadline defined by MIDRMA Board/14 no corrected data received from these Member States which prevented the MIDRMA from constructing the Safety Monitoring Report for 2016 and present the initial results to the ATM SG/3 to review the report

Note 1: No traffic data received from Iraq, Kuwait and Libya which resulted exclusion from the RVSM safety analysis for 2016.

2.6 Compiling and correcting the traffic data and then analysing it require a lot of efforts and follow up with the focal points to ensure the highest quality results are obtained that are reliable to study the impact of RVSM implementation within the ICAO Middle East Region, regrettably after

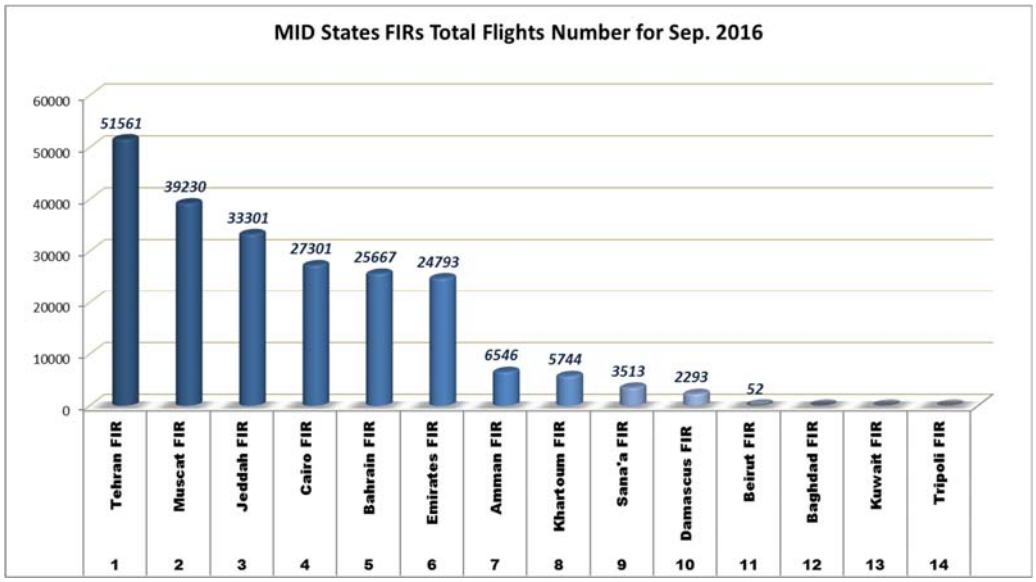
issuing seven Safety Monitoring Reports the MIDRMA continued to experience the same problems with some Member States concerning the submission of corrupted traffic data that is not usable at all for the safety analysis.

2.7 The MIDRMA appreciates the efforts put in place by all member States to provide the traffic data for the development of the SMR. The MIDRMA has issued a reminder to Member States to draw their attention before the effective date to collect the traffic data and to help the MIDRMA focal points to coordinate with the concerned units well in advance to submit the requested TDS in the right format. The MIDRMA observed that the data submitted by some Member States still not in the right format and will not satisfy the requirements for the development of the SMR. The MIDRMA believes that there could by a lack of awareness of the format required from the unit providing the data or maybe difficulties to extract the data from the archived files. Therefore the MIDRMA and through the ATM SG/3 meeting while presenting the SMR working paper requested the Member States facing difficulties to submit their TDS and need assistance to overcome these problems to contact the MIDRMA for developing a software compatible with their system to extract the TDS in the requested format, unfortunately the MIDRMA didn't receive any request from any Member State.

2.8 The description of the traffic data processed for each MIDRMA Member State by the MID Risk Analysis Software (MIDRAS) is depicted in the table below, a total of 220,001 flights were processed for the 12 FIRs, and these flights were evaluated and processed very carefully to ensure accurate results according to the data submitted.

MID States	Sep. 2016	Status
Bahrain FIR	25667	Accepted
Cairo FIR	27301	Accepted
Amman FIR	6546	Accepted
Muscat FIR	39230	Accepted
Tehran FIR	51561	Accepted
Khartoum FIR	5744	Accepted
Emirates FIR	24793	Accepted
Damascus FIR	2293	Accepted
Sana'a FIR	3513	Accepted
Jeddah FIR	33301	Accepted
Beirut FIR	52	Accepted
Baghdad FIR	-	Rejected/No TDS Submitted
Kuwait FIR	-	Rejected/No TDS Submitted
Tripoli FIR	-	No TSD Submitted
Total	220,001	11 FIRs

Status of the MID States RVSM Traffic Data for Sep. 2016



The MID RVSM safety assessment work is accomplished through the collection of the TDS related to the operations in the RVSM airspace and with the help of the MID RVSM Scrutiny Group which evaluate and validated all LHD reports received for the SMR reporting period, and because the safety parameters for the SMR were all calculated and in order to save time to present the final results to the meeting for their review, the MIDRMA decided to evaluate all the LHD reports and present the outcome to the Scrutiny Group which will convene during this meeting for their official approval.

2.9 Safety Monitoring Report 2016 (First Draft Version)

2.9.1 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 2016 value computed for technical height risk is **$6.347x10^{-11}$**,this meets RVSM Safety Objective 1.

2.9.1.1 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 ICAO TLS **2.5×10^{-9}**.

Technical Risk Values							
Year 2006	Year 2008	Year 2010	Year 2012	Year 2013	Year 2014	Year 2015*	**Year 2016***
$2.17x10^{-14}$	$1.93x10^{-13}$	$3.96x10^{-15}$	5.08 x 10^{-14}	$6.37x10^{-12}$	$3.18x10^{-12}$	3.056 x 10^{-10}	**$6.347x10^{-11}$**

*Year 2015: The calculated result measured without Sana'a and Tripoli FIRs.
*Year 2016: The calculated result measured without Kuwait, Baghdad and Tripoli FIRs.

2.9.1.2 **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 Altimetry System Error (ASE) and typical Assigned Altitude Deviation (AAD) data is estimated to be of **1.436×10^{-09}**. This value meets the Global System Performance Specification that the probability of two aircraft will lose procedural vertical separation of 1000 ft. should be no greater than **1.7×10^{-8}**.

2.9.1.3 **Middle East RVSM Airspace Horizontal Overlap Frequency (HOF):**

The estimate of the frequency of horizontal overlap is based on the number of proximate events, which is defined as the occurrence of two aircraft passing within a horizontal distance R whilst separated by the vertical separation minimum, and based on the range of different geometries and relative velocities seen across the set of proximate events, the probability that the proximity is less than a distance equal to the size of the average aircraft, given that it is within the distance R, is calculated. This probability, combined with the proximity frequency, gives the horizontal overlap frequency.

a) The calculated horizontal overlap frequency for all the MID RVSM airspace was estimated to be **6.281×10^{-9}** per flight hour.

Horizontal Overlap Frequency (HOF)							
Year 2006	Year 2008	Year 2010	Year 2012	Year 2013	Year 2014	Year 2015	Year 2016
6.99×10^{-3}	5.1×10^{-11}	2.88×10^{-6}	6.49×10^{-5}	4.34×10^{-8}	5.04×10^{-9}	3.405×10^{-9}	**6.281×10^{-9}**

*Year 2015: The calculated result measured without Sana'a and Tripoli FIRs.
*Year 2016: The calculated result measured without Kuwait, Baghdad and Tripoli FIRs.

b) The MIDRAS (MID Risk Analysis Software) measured the Horizontal Overlap Frequency (HOF) for all the Middle East RVSM airspace except for the FIRs excluded from the RVSM safety analysis.

2.9.1.4 Conclusions on Technical Vertical Collision Risk:

a. The current computed vertical-collision risk due to technical height-keeping performance meets the ICAO TLS. The calculated estimate of the Technical Vertical Collision Risk is below the Technical Target Level of safety and has moved only very slightly upwards towards the TLS 2.5×10^{-9}

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 ICAO TVE component requirements (also known as technical height-keeping group requirements).

2.9.1.5 Recommendations applicable for Safety Objective 1:

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

b) The MIDRMA shall keep the methods of calculating the technical CRM parameters and the risk due to technical height keeping errors under review;

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

2.9.2 **RVSM Safety Objective 2:**

2.9.2.1 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.

2.9.2.2 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 **6.347x10^{-11}** which meets the ICAO overall TLS of **5 x 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 2012	Year 2013	Year 2014	Year 2015*	Year 2016*
N/A	4.19x10^{-13}	6.92x10^{-12}	1.04x10^{-11}	3.63 x 10^{-11}	4.91 x 10^{-11}	7.351×10^{-10}	**6.347x10^{-11}**

*Year 2015: The calculated result measured without Sana'a and Tripoli FIRs.
*Year 2016: The calculated result measured without Kuwait, Baghdad and Tripoli FIRs.

2.9.2 .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 MID RVSM airspace, estimated from the operational and technical vertical risks, meets the ICAO overall TLS of **5 x 10^{-9}** fatal accidents per flight hour.

b) The effect of future traffic growth has also been assessed. The overall risk of collision will continue to meet the TLS at least until 2021.

2.9.2.4 Recommendations applicable to RVSM Safety Objective 2:

a) The MIDRMA shall continue to encourage States to provide Large Height Deviation Reports (LHD).

b) The MIDRMA, in coordination with concerned States, assure that incidents and violations which have direct impact on the implementation of RVSM within the MID Region are reported in a continuous basis and copy of those reports are sent to the MIDRMA in due time for operational safety assessment analysis.

2.9.3 **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.

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 height monitoring, the MIDRMA continuously update the MMR for all Member States through MIDRMA's website. Appendix-C of the SMR 2016 Version0.1 shows all operators requiring height monitoring in the MID Region.

2.9.3.1 Conclusions for RVSM Safety Objective 3:

a) The MIDRMA improved its monitoring capabilities with the new Enhanced GMUs which gave the ability to respond for more height monitoring requests even from outside the Middle East Region.

b) The MIDRMA completed the Hot Spot feature in the (MIDRAS) Software and started to address the results in the SMR for information only.

c) Current risk-bearing situations have been identified by using the MIDRAS and the MID Visualization and Simulation of Air Traffic (MIDVSAT) and actions will be taken to ensure resolving all violations and information which will be collected during the MID RVSM Scrutiny Group meeting in order to identify operational issues and potential mitigations.

2.9.3.2 Recommendations for RVSM Safety Objective 3:

a) In order to overcome the difficulties facing some of the Member States to provide the necessary traffic data to the MIDRMA for the purpose of developing the SMR, the MIDRMA will develop/purchase a software to extract flight plan traffic data and convert it to the format acceptable for the MID Risk Analysis Software (MIDRAS).

b) MIDRMA will continue to enhance the (MIDRAS) Software and managed to complete phase 5 of the upgrade project added the visualization features in 4D which is under test.

c) The MIDRMA will continue to include in its work program briefings to the focal points appointed for airworthiness issues to ensure their follow up with their monitoring targets and to resolve any non-compliant RVSM approved aircraft. At the same time the MIDRMA will coordinate with the focal points appointed for ATC issues to deliver RVSM safety assessment briefing as necessary or when requested.

d) 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.

e) The MIDRMA will continue to encourage States to submit their Large Height Deviation Reports using the MIDRMA online reporting tool which has been continuously upgraded to improve the level of reporting.

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

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) review and discuss the first draft version of the MID RVSM SMR 2016 at **Appendix A**; and

b) discuss and approve the proposed Draft Conclusion in 2.2.

THE MID RVEM SAFETY MONITORING REPORT 2016

Version 0.1

MIDRMA BOARD/15

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Abstract

This document constitutes the RVSM Safety Monitoring Report for the MID RVSM Airspace for the reporting period (01st September 2016 until 31st August 2017)

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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DOCUMENT CHANGE RECORD

VERSION NUMBER	EDITION DATE	REASON FOR CHANGE
0.1	11/01/2017	Draft version for MIDRMA Board/15 Meeting.

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 **6.347×10^{-11}** 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 **5.691×10^{-10}** 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 **6.347×10^{-11}** 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 **5.691×10^{-10}** 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 and Sana'a FIRs), there is no evidence available to the RMA 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 covers the period from 01st September 2016 until 31st August 2017.

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 version of the report is issued for the ANSIG/2 Meeting.

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

***Note:** Baghdad, Kuwait and Tripoli FIRs were excluded from the safety analysis due to lack of data.*

The Data Sampling periods covered by the SMR 2016 are as displayed in the below table

Report Element	Time Period
Traffic Data Sample	01/09/2016 - 30/09/2016
Operational & Technical Errors	01/06/2016 - 31/08/2017

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:** MID States LHD Reports.
  - **Appendix C:** MID States Registered ACFT Required Monitoring.
  - **Appendix D:** MID RVSM Minimum Monitoring Requirements (MMR) Conditions
  - **Appendix E:** MIDRMA duties and responsibilities.
  - **Appendix F:** Definitions and explanations of RVSM terms.
  - **Appendix G:** MID Region RVSM Hot Spots.
  - **Appendix H:** 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 **6.347x10^{-11}** fatal accidents per flight hour, which is less than the ICAO TLS **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 **1.436x10^{-09}** 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 $P_y(0)$ 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 2016has the following to consider:

a. Due to lack of radar data available for most of the congested airspace in the Middle East Region to calculate the probability of lateral overlap $\boldsymbol{P_y(0)}$ which is fundamental for the SMR, the MIDRMA continued 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 average of the probability of lateral overlap $\boldsymbol{P_y(0)}$ for the whole MID RVSM airspace **6.281 x10^{-9}.**

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

3.2.1.2 Method Used For Calculating the Probability of Lateral Overlap ($P_y(0)$)

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

This probability density denoted by $f_y(y)$ 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:

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

Where, α is the proportion of flights flying with satellite navigation (GNSS) and $\sigma_{\text{VOR/DME}}$ 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. $\sigma_{\text{VOR/DME}} = 0.3$ NM and $\sigma_{\text{GNSS}} = 0.06123$ NM.

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

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

$$+ \alpha^2 \frac{1}{\sigma_{\text{GNSS}} \times \sqrt{\pi}} e^{-\frac{1}{4}\left(\frac{y}{\sigma_{\text{GNSS}}}\right)^2}$$

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.

Horizontal Overlap Frequency (HOF)							
Year 2006	Year 2008	Year 2010	Year 2011	Year 2012/13	Year 2014	Year 2015	Year 2016
6.99×10^{-3}	5.1×10^{-11}	2.88×10^{-6}	6.49×10^{-5}	6.49×10^{-5}	5.04×10^{-9}	3.405×10^{-9}	6.281×10^{-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 1.436×10^{-09} . 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	Year 2015	Year 2016
2.17×10^{-14}	1.93×10^{-13}	3.96×10^{-15}	5.08×10^{-14}	6.37×10^{-12}	3.18×10^{-12}	3.056×10^{-10}	6.347×10^{-11}

The Technical Risk Values

According to the technical risk values as shown in the above table the TLS values decreased, the MIDRMA issued an updated minimum monitoring requirements (MMR) for each MIDRMA member states according to the latest RVSM approvals received from all members as of December 2017, 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 Vertical Collision Risk:

a. The current computed vertical-collision risk due to technical height-keeping performance meets the ICAO TLS. The calculated estimate of the Technical Vertical Collision Risk is below the Technical Target Level of safety and has moved only very slightly upwards towards the TLS 2.5×10^{-9}

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 ICAO TVE component requirements (also known as technical height-keeping group requirements).

3.5 Recommendations for Safety Objective 1:

a. The MIDRMA shall review the content and structure of its aircraft monitoring groups.

b. The MIDRMA shall keep the methods of calculating the technical CRM parameters and the risk due to technical height keeping errors under review;

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

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 **$6.347\text{x}10^{-11}$** 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	Year 2015	Year 2016
Not calculated	4.19×10^{-13}	6.92×10^{-12}	1.04×10^{-11}	3.63×10^{-11}	4.91×10^{-11}	7.351×10^{-10}	5.691×10^{-10}

The table below represents the evaluation carried out by the MIDRMA team for assessing the LHD reports for SMR 2016 reporting period (01st June 2016 until 31st August 2016) received from each Member State:

MID FIRs	No. of Reported LHD
Bahrain	**142**
Baghdad	**105**
Amman	**11**
Tehran	**154**
Cairo	**9**
Damascus	**1**
Khartoum	**3**
Kuwait	**186**
Muscat	**261**
Jeddah	**6**
Tripoli	**-**
Emirates	**38**
Sanaa	**Nil**

MID States LHD Reports Received for the SMR 2016 Reporting Period

4.1 MID RVSM Scrutiny Group Meeting:

4.1.1 Will be updated after the group convened during MIDRMA Board/15.

Table A below presents a summary of operational risk associated with Large Height Deviation (LHD) reports by LHD category within the MID RVSM Airspace from 01st May 2016 until 31st August 2016

Code	Large Height Deviation (LHD) Category	No. of LHDs	Duration (Sec.)
A	Flight crew fails to climb or descend the aircraft as cleared	**1**	**20**
B	Flight crew climbing or descending without ATC clearance	-	
C	Incorrect operation or interpretation of airborne equipment	-	
D	ATC system loop error	**7**	**197**
E	ATC transfer of control coordination errors due to human factors	**902**	**400**
F	ATC transfer of control coordination errors due to technical issues	-	
G	Aircraft contingency leading to sudden inability to maintain level	-	
H	Airborne equip. failure and unintentional or undetected FL change	**2**	**40**
I	Turbulence or other weather related cause	**1**	**0**
J	TCAS resolution advisory and flight crew correctly responds	-	
K	TCAS resolution advisory and flight crew incorrectly responds	-	
L	An aircraft being provided with RVSM sep. is not RVSM approved	-	
M	Other	-	
	Total	**913**	**657 Sec.**

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 2021. 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 MID RVSM airspace, estimated from the operational and technical vertical risks, meets the ICAO overall TLS of **5 x 10^{-9}** fatal accidents per flight hour.

b. The effect of future traffic growth has also been assessed. The overall risk of collision will continue to meet the TLS at least until 2021.

4.3 Recommendations Applicable to Safety Objective 2 :

a. The MIDRMA shall continue to encourage States to provide Large Height Deviation Reports (LHD).

b. The MIDRMA, in coordination with concerned States, assure that incidents and violations which have direct impact on the implementation of RVSM within the MID Region are reported in a continuous basis and copy of those reports are sent to the MIDRMA in due time for operational safety assessment analysis.

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 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 for Safety Objective 3

a. The MIDRMA improved its monitoring capabilities with the new Enhanced GMUs which gave the ability to respond for more height monitoring requests even from outside the Middle East Region.

b. The MIDRMA completed the Hot Spot feature in the (MIDRAS) Software and started to address the results in the SMR.

c. Current risk-bearing situations have been identified by using the MIDRAS and the MID Visualization and Simulation of Air Traffic (MIDVSAT) and actions will be taken to ensure resolving all violations and information which will be collected during the MID RVSM Scrutiny Group meeting in order to identify operational issues and potential mitigations.

5.3 Recommendations for Safety Objective 3

a. In order to overcome the difficulties facing some of the Member States to provide the necessary traffic data to the MIDRMA for the purpose of developing the SMR, the MIDRMA will develop/purchase a software to extract flight plan traffic data and convert it to the format acceptable for the MID Risk Analysis Software (MIDRAS).

b. MIDRMA will continue to enhance the (MIDRAS) Software and managed to complete phase 3 of the upgrade project added the visualization features in 4D which is under test.

c. The MIDRMA will continue to include in its work program briefings to the focal points appointed for airworthiness issues to ensure their follow up with their monitoring targets and to resolve any non-compliant RVSM approved aircraft. At the same time the MIDRMA will coordinate with the focal points appointed for ATC issues to deliver RVSM safety assessment briefing as necessary or when requested.

d. 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.

e. The MIDRMA will continue to encourage States to submit their Large Height Deviation Reports using the MIDRMA online reporting tool which has been continuously upgraded to improve the level of reporting.

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

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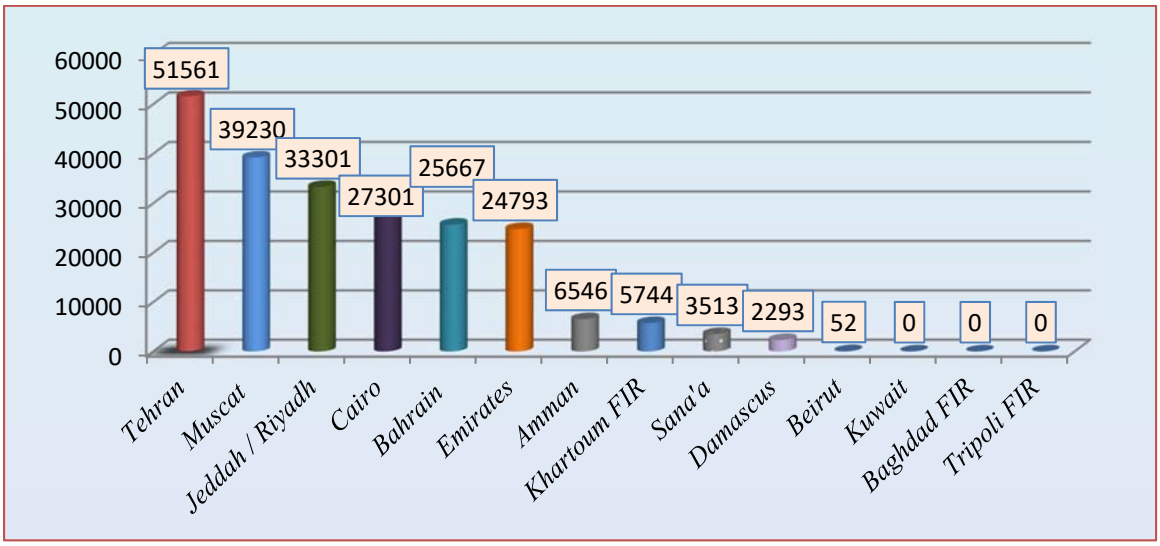
5.4 Appendix A – Member States Traffic Data Analysis:

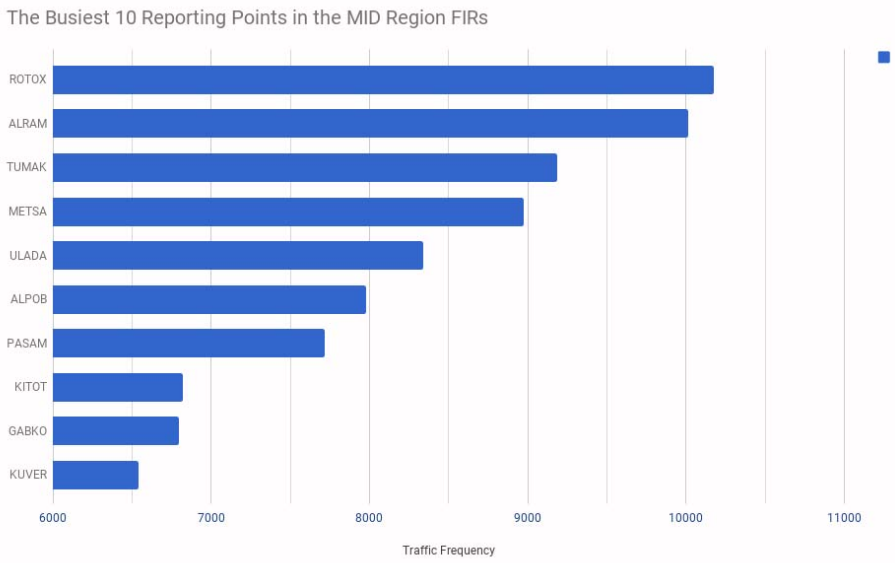
The quality of the SMR traffic data received from all State members varies from one State to another. The MIDRMA monitoring team spent a considerable time to correct the contents and fill all missing fields, the TDS which were not processed will be reviewed with the concerned focal points to update the TDS.

MIDRMA SMRs - RVSM TRAFFIC DATA

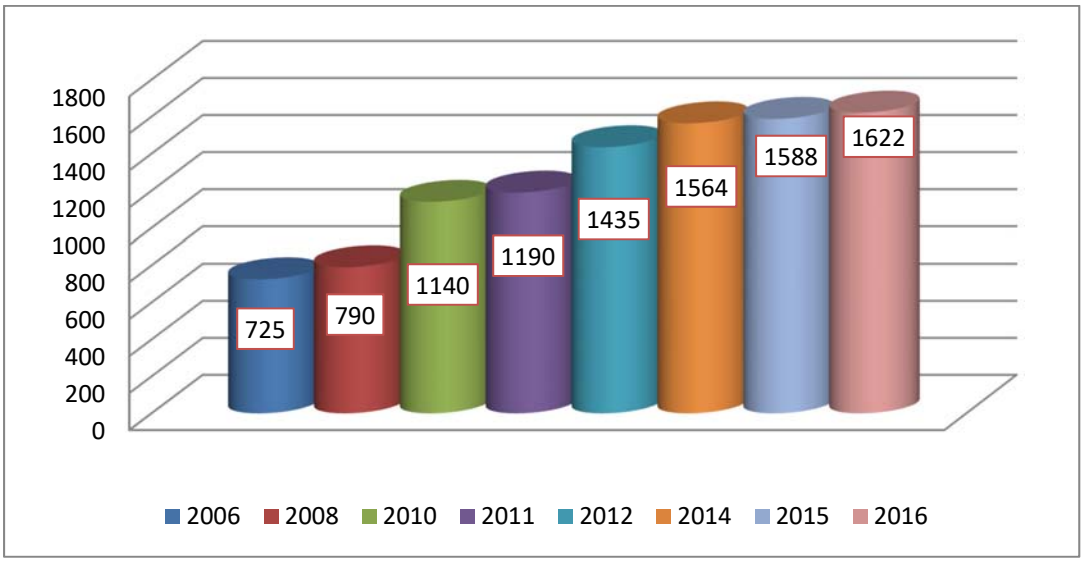
SN	MID States	Jun. 2009	Jan. 2011	Oct. 2012	Jan - Feb 2014	Sep. 2015	Sep. 2016
1	Jeddah/Riyadh	22422	25499	30944	32351	40250	**33301**
2	Muscat FIR	22520	28224	30357	31735	37079	**39230**
3	Cairo FIR	19228	14270	26332	27271	29054	**27301**
4	Bahrain FIR	24285	30099	39345	25442	25592	**25667**
5	Tehran FIR	10479	10638	17523	24727	39185	**51561**
6	Emirates FIR	15868	21076	24676	24369	25623	**24793**
7	Baghdad FIR	0	0	10496	12694	3296	**0**
8	Kuwait FIR	3570	10364	13596	10666	6023	**0**
9	Sana'a FIR	3490	4305	5170	5620	0	**3513**
10	Khartoum FIR	0	0	0	4776	6297	**5744**
11	Amman FIR	8554	10689	6857	4546	4731	**6546**
12	Damascus FIR	9774	11719	8027	4095	1911	**2293**
13	Beirut FIR	2949	3845	1286	105	47	**52**
14	Tripoli FIR	0	0	0	0	0	**0**
	Total	143,139	170,728	214,609	208,397	219,088	220,001



MID States RVSM Traffic Data for SMR 2016 *(September 2016)*



The Busiest 10 Reporting Points in the MID Region FIRs (*September 2016)*



MID States RVSM Approvals Since Year 2006 (Increased by 123.7% since year 2006

5.5 Appendix B – MID States LHD REPORTS

Bahrain LHDs

LHD Reports Bahrain / Bahrain

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
January	TUMAK							
December	LONOS							

LHD Reports Bahrain / Emirates

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	ALPOB		1					
	TUMAK		1					
September	TUMAK	1						
	ORMID		1					

LHD Reports Bahrain / Jeddah

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	LADNA		2					
September	DAROR		3					
March	LADNA		1					
June	NARMI		1					
October	LADNA		1					
	DAROR		1					
January	LADNA		1					

LHD Reports Bahrain / Kuwait								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	LONOS		5	1				
September	LONOS		2	4				
	RABAP		1					
	KUVER			1				
October	LONOS		2	1				
	RABAP		2					
November	RABAP		1					
	LONOS		1					
December	LONOS		5	3				
	RABAP		1					
January	LONOS		4	5				
	RABAP		1	1				
February	LONOS		1	7				
	RABAP			1				
March	RABAP		1					
	LONOS		1	1				
April	LONOS		7	2				
	RABAP		4					
July	LONOS		1					
May	RABAP		1					

LHD Reports Bahrain / Riyadh								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	DAROR	1	2	1				
September	DAROR		6	9				
	NARMI			3				
	ULIKA		1					
December	DAROR			1				
	NARMI		2	1				
January	DAROR		1	1				
February	NARMI		1	1				
	DAROR		3					
March	NARMI			1				
	DAROR		2	1				
June	NARMI		1					
	DAROR			1				
October	DAROR		2					
	NARMI		1					
November	DAROR		1					
	NARMI		1					
April	DAROR		2					
	NARMI		1					
July	DAROR		1					
	NARMI		1					

LHD Reports Bahrain / Tehran								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	MIDSI		2					
	KUVER		6	4				
September	KUVER		9	7				
October	ALSER			1				
	KUVER		6					
November	KUVER		2	2				
December	KUVER		12	4				
	MIDSI							
January	KUVER		17	1				
	DAROR			1				
February	KUVER		14	2				
March	KUVER		5	2				
April	KUVER		24	10				
May	KUVER		3					
June	KUVER		1					
	MIDSI		1					
July	KUVER		2					

Cairo LHDs

LHD Reports Cairo / Athens								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
May	SALUN		1					
November	SALUN			2				

LHD Reports Cairo / Baghdad								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
October	METSA		1					

LHD Reports Cairo / Cairo								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
October	METSA		2					

LHD Reports Cairo / Jeddah								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
November	PASAM		3					
December	KITOT		1					
	PASAM		4					
January	PASAM		2					
	KITOT		2					
May	GIBAL		1					
	KITOT		1					

LHD Reports Cairo / Khartoum								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
May	NUBAR		1	1				

December	NUBAR							
November	ATMUL		2					
	NUBAR		1					

LHD Reports Cairo / Nicosia

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
November	RASDA		2	1				
April	RASDA		1					

LHD Reports Cairo / Riyadh

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	KITOT							
November	KITOT		3					
December	PASAM		5					
	GIBAL		1					
January	GIBAL		1					
	PASAM		1					
	KITOT		1					
August	PASAM		1	1				
	KITOT		2					

Tehran LHDs

LHD Reports Tehran / Baghdad

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
July	PAXAT		4					

LHD Reports Tehran / Bahrain

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
December	RAGAS		1					
May	RAGAS		1					
	ROTOX		1					
June	RAGAS		2					
	ROTOX		1					
March	RAGAS		2					
July	RAGAS		1					
August	ROTOX			1				

LHD Reports Tehran / Emirates

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	GABKO		3					
March	GABKO		2					
May	GABKO		1					

LHD Reports Tehran / Kabul

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others

November	SOKAM		2					
	CHARN		1					
June	SOKAM		2					
July	SOKAM		5					
August	SOKAM		6					

LHD Reports Tehran / Karachi

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
March	JIWNI		1					
	KEBUD			1				
	ASVIB		1					
	DERBO		1					
October	KEBUD			1				
	JIWAN		1	4				
	ASVIB			2				
November	JIWAN			1				
June	JIWAN			1				
	ASVIB		1	1				
	DERBO		1					
August	ASVIB			4				

LHD Reports Tehran / Kuwait

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	NANPI							
	TULAX		5					
April	TULAX		5					
	NANPI		10					
May	TULAX		1					

	NANPI		1					
August	NANPI		1	1				
March	NANPI		26					
	TULAX		28					
	PATIR		1					
June	NANPI		6					
	TULAX		9					
July	NANPI		5					
	TULAX		4					
November	TULAX		5					

LHD Reports Tehran / Muscat

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	DENDA			1				
March	DENDA			1				
May	DENDA			2				
June	DENDA		2					
	IMLOT		3					
	ULDUN		2					
July	MESPO		5	1				
	NANPI			1				
	IMLOT		1					
September	ULDUN		1					
October	JIWAN			1				
November	ULDUN		1					
	IMLOT		1					

LHD Reports Tehran / Turkmenbashi								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
December	SAVEH							

Baghdad LHDs

LHD Reports Baghdad / Ankara								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
December	KABAN		1					
August	NINVA		1					
	RATVO		2	1				
October	NINVA		1					
	RATVO		3					
June	RATVO		7					
September	RATVO		1					

LHD Reports Baghdad / Baghdad								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
July	LATSI		1					
	TASMI		1					

LHD Reports Baghdad / Damascus								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others

December	MODIK		1					
May	MODIK		2					
June	MODIK		4					
July	MODIK		7					
September	MODIK		5					
October	MODIK		2					

LHD Reports Baghdad / Jeddah								
Months	**Reporting Points**	**Late Estimate**	**No Estimate**	**No Level Revision**	**Violation of LOA**	**No Time Revision**	**Unknown TFC at Wrong Level**	**Others**
September	MURIB		1					
April	MURIB		1					
May	MURIB		3					

LHD Reports Baghdad / Kuwait								
Months	**Reporting Points**	**Late Estimate**	**No Estimate**	**No Level Revision**	**Violation of LOA**	**No Time Revision**	**Unknown TFC at Wrong Level**	**Others**
August	TASMI		17					
September	TASMI		8					
	SIDAD		5					
October	TASMI		19					
	RATVO		1					
May	TASMI		13					
June	TASMI		10					
July	LATSI		4					
	TASMI		10					
November	TASMI		2					

December	TASMI		3					
January	TASMI		2					
	LATSI		1					
March	TASMI		1					
April	TASMI		11					

LHD Reports Baghdad / Riyadh

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	MURIB		1					

LHD Reports Baghdad / Tehran

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
October	RAGET		3					
May	PAXAT			1				
July	TASMI		1					

Amman LHDs

LHD Reports Amman / Baghdad

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	PASIP		2					
March	PASIP		1					
August	PASIP		4					
June	PASIP		1					
July	PASIP		1					

LHD Reports Amman / Cairo								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	METSA		2	1				
September	METSA		1					
March	METSA		2					
July	METSA			2				
December	ULINA		1	1				

LHD Reports Amman / Damascus								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	ZELAF		1					
March	ZELAF		1					

LHD Reports Amman / Jeddah								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	GIBET		2					

LHD Reports Amman / Riyadh								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	GIBET		2					
	SODAR		1					
	OTILA		1					

Riyadh LHDs

LHD Reports Riyadh / Amman

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
January	DEESA							
	RASLI		1					

LHD Reports Riyadh / Bahrain

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
July	ULADA			1				
August	ULADA		1					
September	ULADA		3					

LHD Reports Riyadh / Cairo

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
December	PASAM		1					

LHD Reports Riyadh / Kuwait

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	DEKOB			1				

LHD Reports Riyadh / Riyadh

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
July	ULADA		1					

Jeddah LHDs

LHD Reports Jeddah / Bahrain

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	ULADA		1					

LHD Reports Jeddah / Cairo

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
November	PASAM						1	
December	SILKA		3					
	DASPA		1					

LHD Reports Jeddah / Kuwait

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
December	DERKO		1					

LHD Reports Jeddah / Muscat

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
December	TOKRA		1					

Kuwait LHDs

LHD Reports Kuwait / Baghdad

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	SIDAD		30	1				
August	SIDAD		40	1				
October	SIDAD		26	3				
November	SIDAD		28	1				
December	SIDAD		16	1				
January	SIDAD		13	1				
February	SIDAD		40					
March	SIDAD		17					
June	SIDAD		8					
July	SIDAD		46					

LHD Reports Kuwait / Bahrain

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
December	DAVUS		1	1				
August	DAVUS		1					

October	DAVUS			1				
March	SIDAD		1					
July	DAVUS		2					

LHD Reports Kuwait / Jeddah

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	DERKO		18					
October	DERKO		9					
	WAFRA							
November	DERKO		15					
	SIDAD		1					
December	DERKO		10					
January	DERKO		3					
February	DERKO		2					
March	DERKO		6					
June	DERKO		11					
July	DERKO		21					
	HFRRR		1					
August	DERKO		7					

LHD Reports Kuwait / Riyadh

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
June	COPPI		1					

September	DERKO			1				

LHD Reports Kuwait / Tehran

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	TULAX		1					
	DERKO		1					
August	TULAX		3					
	SIDAD		1					
February	TULAX		1					

Muscat LHDs

LHD Reports Muscat / Emirates

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
October	LABRI		2					
	LALDO		1					
December	LALDO		1					
	LABRI			1				
May	TARDI			1				
	LALDO		1					
July	LABRI		2					
	LALDO		1					
August	TARDI		3					
November	LALDO		1					
	TONVO			1				
	TARDI	1		1				
March	LALDO		1					
April	TONVO		2					

September	LALDO		2					
	TONVO			1				

LHD Reports Muscat / Jeddah

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
November	TOKRA		11	2				
	GOBRO		1					
December	TOKRA		1	3				
January	GOBRO		1					
July	GOBRO		1	1				
	TOKRA		1					
August	TOKRA		2	4				
	GOBRO		1					
October	TOKRA		18	2				
	GOBRO		4					
February	TOKRA		2	6				
March	TOKRA		4	1				
	GOBRO		1					
April	TOKRA		8	1				
May	TOKRA		1	3				
September	TOKRA		7	8				
	GOBRO		1	1				

LHD Reports Muscat / Karachi								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
October	ALPOR		1					
	TAPDO		11	5				
	DENDA			1				
November	TAPDO		5	10				
December	TAPDO		2	5				
May	TAPDO		3	2				
July	TAPDO		1					
February	TAPDO		2	1				
March	TAPDO			4				
	IMLOT			1				
April	TAPDO		2	7				
August	TAPDO		1	1				
September	TAPDO		3	2				

LHD Reports Muscat / Mumbai								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
October	LOTAV		2	2				
	RASKI		2					
	KITAL		2	1				
	TOTOX			1				
	ASPUX		1					
	REXOD		2					

November	PARAR		1	2				
	REXOD		1					
	TOTOX		1					
	LOTAV		1					
January	KITAL			1				
	RASKI			1				
	PARAR			1				
March	TOTOX		1	1				
	RASKI		1	2				
	LOTAV		1					
	ASPUX		1					
	PARAR	1						
July	PARAR		2	1				
	LOTAV		1	1				
	TOTOX		2					
	KITAL	1	1					
	RASKI		1	1				
August	TOTOX		2					
	RASKI			1				
	LOTAV		1					
	PARAR		1	1				
December	RASKI		1	5				
	LOTAV		1					
	TOTOX		1					
	KITAL		1					
February	TOTOX		1					
	RASKI			1				
April	RASKI			2				
	LOTAV			1				
September	RASKI			2				
	KIVEL		1					
	LOTAV		1					
	KITAL		1	1				

	TOTOX		3					
	PARAR		2					

LHD Reports Muscat / Muscat

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
January	PARAR			1				

LHD Reports Muscat / Sana'a

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
November	IMKAD		3	1				
	KIVEL			1				
December	IMKAD		2	1				
March	KIVEL			2				
	IMKAD			2				
May	KIVEL			1				
July	IMKAD		1					
August	IMKAD		1					
September	IMKAD		1					
October	IMKAD		1					
	KIVEL		1					

LHD Reports Muscat / Tehran

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
May	DENDA		4	5				
	IMLOT		4	5				

September	DENDA		14	3				
	MESPO		7	2				
	ULDUN		20	6				
	IMLOT		1	2				
October	DENDA	1	7	3				
	MESPO		6	10				
	ULDUN		24	5				
	IMLOT		3	2				
	TOKRA		1					
November	MESPO		10	8				
	DENDA	1	8	5				
	IMLOT		4	2				
	ULDUN	1	18	7				
December	DENDA		5	2				
	IMLOT		3	1				
	MESPO		1					
January	IMLOT		2					
	DENDA		3					
April	IMLOT		3	9				
	DENDA		1	2				
March	DENDA		1	4				
	LALDO		2					
	IMLOT		5	4				
	TAPDO			1				
	MESPO		1					
June	MESPO		2					
	IMLOT		1					
July	IMLOT		1					
	DENDA		3	1				
	MESPO		1					
August	IMLOT		1	2				
	MESPO		2	8				
	DENDA		4	2				

	ULDUN		2	2				
	RASKI		1					
February	DENDA		2	7				
	IMLOT			4				
	MESPO		1	2				

Khartoum LHDs

LHD Reports Khartoum / Addis Abeba

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
May	AVONO		1					

LHD Reports Khartoum / Cairo

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
November	NUBAR		2					
December	NUBAR		9					

LHD Reports Khartoum / Jeddah

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
February	KAROX		3					

LHD Reports Khartoum / Nairobi

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
March	EPLAS		1					

Emirates LHDs

LHD Reports Emirates / Bahrain

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	ORSIS			1				
	RESAR		1					
September	DEGSO		1					
January	RESAR			1				
February	TOSNA		1					
June	RESAR			1				
May	OVONA		1					

LHD Reports Emirates / Emirates

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
July	MEMBI			1				
August	KAPUM			1				
December	KIPOD			1				
	TOMSO			1				
February	ALPOB			1				
	ITITA			1				
April	DANOK			1				
May	BOXAK			1				
	DESDI			1				
	MENSA		1					
June	EMAGO			1				
	ALPEK			1				
	ITROK			1				

LHD Reports Emirates / Jeddah								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
December	KITAP			1				
January	KITAP		1	1				
	ALPEK		1					
November	KITAP		1					
February	ALPEK		1					
March	KITAP	1						
May	KITAP		1					
August	TANSU			1				
	ALPEK		1	1				

LHD Reports Emirates / Muscat								
Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
August	MENSA		2					
	SODEX		1					
September	MENSA		3	2				
	LALDO		2	1				
November	ITRAX		1					
	SODEX			1				
	LUDID		1	1				
December	ITRAX		1	1				
	MENSA		1	2				
	SOLUD			1				
	LALDO		1					

	LUDID		1					
January	SODEX			2				
	MENSA		1	1				
	LUDID			2				
February	MENSA		2	1				
	SODEX		1	1				
March	MENSA		1	1				
	SODEX			1				
April	ITRAX		2					
	MENSA		1					
	KITAP		1					
June	SOLUD		1					
May	MENSA		2					

LHD Reports Emirates / Tehran

Months	Reporting Points	Late Estimate	No Estimate	No Level Revision	Violation of LOA	No Time Revision	Unknown TFC at Wrong Level	Others
September	ORSAR		1	1				
	SIRII		1					
October	PATAT		1					
January	ORSAR		1	1				
	NALTA			1				
February	SIRII			1				
March	SIRII			2				
November	PATAT		1					
August	DAPER			1				

5.6 Appendix C – MID States Registered ACFT Required Monitoring

The tables below reflect the Minimum Monitoring Requirements (MMR) for each MIDRMA Member State as of December 2017.

Bahrain

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
BFW	A9CBDF	RJ85	RJ85	AVRO	894011	20/11/2014	20/11/2016
BFW	A9CAWL	RJ1H	RJ100	AVRO	894042	22/01/2016	22/01/2018
BFW	A9CISA	B738	800	B737NX	894081	02/11/2015	02/11/2017
Aircraft need to be monitored = 3							

Egypt

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
AMV	SUGBK	B735	566	B737CL	01001B	N/A	N/A
EAF	SUBTV	FA7X	FA7X	FA7X	0101D1	N/A	N/A
EAF	SUBGU	GLF3	GIII	GLF3	01006E	02/04/2010	02/04/2012
EAF	SUBTU	FA7X	FA7X	FA7X	0101D0	N/A	N/A
LMU	SUGBJ	B735	566	B737CL	01001A	04/08/2015	04/08/2017
MSR	SUGBS	B772	266	B772	01002A	01/02/2011	01/02/2013
MSR	SUGBR	B772	266	B772	10029	01/05/2015	01/05/2017
MSR	SUGGG	A342	212	A340	10024	26/09/2014	26/09/2016
RBG	SUAAD	A320	214	A320	0101CD	N/A	N/A
SME	SUSMG	BE30	B350	BE30	10155	30/09/2013	30/09/2015
SMM	SUSMM	GLF4	GIV	GLF4	0101CC	N/A	N/A
Aircraft need to be monitored = 11							

Iran

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
ATR	EPTTC	A320	231	A320	hx735283	N/A	N/A
CPN	EPCPZ	MD83	83	MD80	hx730E1A	N/A	N/A
CPN	EPCPX	MD83	83	MD80	hx730E18	27/02/2016	27/02/2018
IRA	EPIDG	F100		F100	hx732487	02/11/2003	02/11/2005

IRA	EPICF	A30B	203	A30B	hx732466	N/A	N/A
IRB	EPMDF	MD83	83	MD80	hx733486	N/A	N/A
IRC	EPAPO	B734	4H6	B737CL	hx73060F	27/02/2016	27/02/2018
IRG	EPSUS	F100		F100	hx734EB3	N/A	N/A
IRM	EPMNE	B743	3B3	B747CL	hx7335C5	N/A	N/A
IRM	EPMNU	A306	605	A306	hx7335D5	N/A	N/A
IRM	EPMNT	A306	603	A306	hx7335D4	N/A	N/A
IZG	EPZGB	A321		A320	hx7368E2	N/A	N/A
IZG	EPZAK	MD83	83	MD80	hx73682B	N/A	N/A
PYA	EPPUS	IL76	TD	IL76	hx7342B3	29/02/2016	01/03/2018
PYA	EPPUL	IL76	TD	IL76	hx7342AC	05/03/2016	05/03/2018
PYA	EPLDC	E145		E135-145	hx733083	N/A	N/A
PYA	EPLDA	E145		E135-145	hx733081	N/A	N/A
PYA	EPPUB	CL60		CL604	hx7342A2	N/A	N/A
QSM	EPFQX	RJ1H	RJ100	AVRO	hx731A38	N/A	N/A
QSM	EPFQJ	F100		F100	hx731A2A	01/03/2016	01/03/2018
TBM	EPTBG	RJ85	RJ85	AVRO	hx735047	N/A	N/A
TBM	EPTBJ	B734	400	B737CL	hx73504A	N/A	N/A
TBZ	EPTAC	A320	231	A320	hx735023	N/A	N/A
Aircraft need to be monitored = 23							

Iraq

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
Aircraft need to be monitored = 0							

Jordan

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
AWS	JYAWD	H25B	800XP	H25B-800	7406E4	N/A	N/A
JAV	JYJAU	A320	212	A320	742835	05/10/2014	05/10/2016
JAV	JYJAT	A320	211	A320	742834	13/10/2015	13/10/2017
RFJ	JYRFF	B734	4K5	B737CL	7448C6	07/04/2014	07/04/2016
RFJ	JYJRG	A320	212	A320	742A47	06/04/2014	06/04/2016
Aircraft need to be monitored = 5							

Kuwait

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
KAC	9KADE	B744	469C	B744-10	706010	01/11/2017	01/11/2019
NL	9KPBD	A310	308	A310-GE	70600A	N/A	N/A
Aircraft need to be monitored = 2							

Lebanon

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
EFB	ODMAF	H25B	800XP	H25B-800	748039	04/12/2015	04/12/2017
EFB	ODDTW	BE40	BE40	BE40	748033	25/11/2015	25/11/2017
EFB	ODTAL	CRJ2	CL600	CARJ	748035	04/08/2015	04/08/2017
Aircraft need to be monitored = 3							

Libya

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
AAW	5AONF	A332	200	A330	18041	N/A	N/A
AAW	5AONH	A332	200	A330	18043	N/A	N/A
AAW	5AONO	A332	214	A320	18070	N/A	N/A
AAW	5AONC	A319	111	A320	18034	N/A	N/A
AMB	5ADRL	C56X	560XL	C56X	18039	N/A	N/A
BRQ	5ADMH	B737	8GK	B737NX	18020	N/A	N/A
BRQ	5ADMG	B737	800	B737NX	01801F	N/A	N/A
EACS	5AONE	A342	213	A340	18021	N/A	N/A
GHT	5AWAT	A320	211	A320	18083	N/A	N/A
LAA	5ALAE	CRJ9	2D24	CRJ9	18046	N/A	N/A
LAA	5ALAD	CRJ9	2D24	CRJ9	18045	N/A	N/A
LAA	5ALAU	A332	202	A330	18085	N/A	N/A
LAA	5ALAT	A332	200	A330	1807F	N/A	N/A
LAA	5ALAQ	A320	214	A320	1807A	N/A	N/A
LAA	5ADLZ	A306	622R	A306	18026	N/A	N/A
LAA	5ALAK	A320	214	A320	1806B	N/A	N/A
LAA	5ADLY	A306	622R	A306	18025	N/A	N/A
LWA	5AWLB	A319	112	A319	18087	N/A	N/A

LWA	5AWLA	A319	100	A319	18086	N/A	N/A
MOT	5AUAC	GL5T	BD700	BD700	01804E	N/A	N/A
MOT	5AUAB	GL5T	BD700	BD700	01803C	N/A	N/A
MOT	5AUAD	CRJ2	CL65	CARJ	18055	N/A	N/A
MOT	5AUAA	CL30	BD100	BD100	18030	N/A	N/A
Aircraft need to be monitored = 23							

Oman

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
SMA	A4OOVB	A320	214	A320	70C0F4	N/A	N/A
SMA	A4OOVA	A320	214	A320	70C0F3	N/A	N/A
Aircraft need to be monitored = 2							

Qatar

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
MIL	80202	C17	C17A	C17	hx06A249	27/11/2015	27/11/2017
MIL	140009	C17	C17A	C17	hx06A27C	N/A	N/A
QTR	A7BGA	B748	8F	B748	hx06A2C8	N/A	N/A
QTR	A7BGB	B748	8F	B748	hx06A2C9	N/A	N/A
Aircraft need to be monitored = 4							

KSA

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
Privat-KSA	HZBRQ1	B350	B300	BE30	hx710025	27/01/2016	27/01/2018
SPD	HZSK13	E55P	PHENOM 300	E55P	hx71011A	N/A	N/A
SVA	HZ103	GLF4	G-IV	GLF4	hx71038B	11/02/2016	11/02/2018
SVA	HZ135	C550	550	C550-II	hx710395	04/10/2015	04/10/2017
Aircraft need to be monitored = 4							

Sudan

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
AAJ	STMRA	B737	500	B737NX	507983	N/A	N/A
BDR	STBDE	IL76	76TD	IL76	07C01F	N/A	N/A
BDR	STBDN	IL76	76TD	IL76	07C03C	N/A	N/A
KTV	STDAC	IL76	76TD	IL76	07C054	N/A	N/A
N/A	STEWX	IL76	76TD	IL76	07C024	N/A	N/A
NOV	STNVC	CRJ2	2B19	CARJ	07C03E	N/A	N/A
NOV	STNVD	CRJ2	2B19	CARJ	07C04D	N/A	N/A
NOV	STNVG	B737	58-E	B737NX	07C04E	N/A	N/A
SUD	STMKW	A320	214	A320	07C058	N/A	N/A
SUD	STATB	A306	622	A306	07C026	N/A	N/A
SUD	STATA	A306	622	A306	07C022	N/A	N/A
Aircraft need to be monitored = 11							

Syria

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
SAW	YKBAB	A320	211	A320	778822	N/A	N/A
SAW	YKBAA	A320	212	A320	778821	N/A	N/A
SYR	YKAYB	T134	B	T134	778721	N/A	N/A
SYR	YKATD	IL76	T	IL76	778684	N/A	N/A
SYR	YKAYE	T134	B	T134	778725	N/A	N/A
Aircraft need to be monitored = 5							

UAE

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
CON	A6CAG	GLT5		BD700	hx8964BA	N/A	N/A
GSH	A6ASG	P180		P180	hx8964CB	N/A	N/A
GSH	A6ASM	LJ60		LJ60	hx8964D8	N/A	N/A
GSH	A6VGG	LJ60		LJ60	hx8964D7	N/A	N/A
RJD	A6RRA	E135	BJ	E135-145	hx89634B	25/08/2015	25/08/2017
UAE	A6DWC	E55P		E55P	hx8964F3	N/A	N/A
UAF	UAE1208	P180		P180	hx89602B	N/A	N/A
UAF	UAE1207	P180		P180	hx89602A	N/A	N/A
UAF	UAE1302	A332	MRTT	A330	hx896C3C	N/A	N/A
Aircraft need to be monitored = 9							

Yemen

Operator	Registration	ICAO Type	Series	Monitoring Group	Hex Mode S	Last Monitoring Date	Complaint Expiry Date
IGA	7OYMN	B74S		B74S	89001	25/07/2013	25/07/2015
IGA	7OADT	A332	200	A330	89000B	22/03/2015	22/03/2017
IGA	7OAFB	A320	200	A320	890021	21/03/2015	21/03/2017
IGA	7OAFA	A320	200	A320	890020	24/02/2015	24/02/2017
IGA	7OADW	A310	300	A310-GE	89001D	N/A	N/A
IGA	7OADV	A310	300	A310-GE	89001C	N/A	N/A
IGA	7OFAB	CRJ7		CRJ7	890012	N/A	N/A
IGA	7OFAA	CRJ7		CRJ7	890011	N/A	N/A
Aircraft need to be monitored = 8							

Total Aircraft need to be monitored = 113

Note: The MIDRMA raised their serious concern to the MIDRMA Board and to the ICAO MID office about the Libyan aircraft which are operating within the RVSM airspace in MID, Europe and the AFI regions and requested a decision to be taken concerning these non RVSM approved aircraft.

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5.7 Appendix D - MID RVSM Minimum Monitoring Requirements (MMR) Conditions

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, email will be circulated by MIDRMA to the States concerned. The updated table is always available in MIDRMA website www.midrma.com .

2. **On-Line Minimum Monitoring Requirement**. The MMR for each MIDRMA Member State is published and always updated in the MMR section of MIDRMA website based in the latest RVSM approval list received, the Airworthiness Authority responsible for issuing RVSM approvals required to continuously monitor and comply with their MMR in the MIDRMA website.

3. **Initial Monitoring**. All operators that operate or intend to operate in airspace where RVSM is applied are required to participate in the RVSM monitoring program. Table 1 establishes requirements for initial monitoring associated with the RVSM approval process. In their application to the appropriate State authority for RVSM approval, operators must show a plan for meeting the applicable initial monitoring requirements.

4. **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.

5. **Applicability of Monitoring from Other Regions**. Monitoring data obtained in conjunction with RVSM monitoring programs from other regions can be used to meet regional monitoring requirements. The RMAs, which are responsible for administering the monitoring program, 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.

6. **Monitoring Prior to the Issue of RVSM Operational Approval.** Operators must submit monitoring plans to the responsible CAA and to MIDRMA to show how they intend to meet the requirements specified in Table1, Monitoring will be carried out in accordance with this table.Temporary RVSM approval (valid for a certain period of time) can be issued under the responsibility of the concerned authority to allow the operator conduct height monitoring prior to issuing the RVSM operational approval as per ICAO Annex 6 Part 1.

7. **Aircraft Groups Not Listed in Table 1**. Contact the RMA 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 monitoring requirements.

8. **Table of Monitoring Groups.** Table 2 shows the aircraft types and series that are grouped together for operator monitoring purposes.

9. **Table of Non-Group Aircraft:** Table 3 shows the aircraft types and series that are Non-Group aircraft (i.e., Not certified under group approval requirements) for monitoring purposes.

10. **Trailing Cone Data**. ASE estimations developed using Trailing Cone data collected during RVSM certification flights can be used to fulfil monitoring requirements. It must be documented, however, that aircraft RVSM systems were in the approved RVSM configuration for the flight.

11.

12. **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 must complete monitoring in accordance with the attached table.

13. **Follow-on Monitoring**. Monitoring is an on-going program that will continue after the RVSM approval process. Long term minimum monitoring requirements are established in the Annex 6 to the Convention on International Civil Aviation. On a regional basis, a programme shall be instituted for monitoring the height-keeping performance of aircraft operating in RVSM airspace in order to ensure that continued application of this vertical separation minimum meets regional safety objectives.

Table 1: MONITORING REQUIREMENTS TABLE (Civilian)

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE

Monitoring prior to the issue of RVSM approval is not a requirement

CATEGORY		GROUP DESCRIPTOR	MINIMUM MONITORING REQUIREMENTS
1	GROUP APPROVED: AIRCRAFT WHICH DEMONSTRATE LONG TERM CONFIDENCE IN COMPLYING WITH RVSM MASPS	A124, A30B, 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, GL5T, GLF4, GLF5, H25B-800, J328, LJ40, LJ45, LJ60, MD10, MD11, MD80, MD90, PC12, PRM1, T154	Operators of aircraft types contained in this category shall have a minimum of 2 airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring. Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each group in the fleet. In the event that an operator has a single airframe from a Group, then that aircraft shall be monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring.

2	GROUP APPROVED: AIRCRAFT WHICH HAVE YET TO DEMONSTRATE CONFIDENCE IN LONG TERM PERFORMANCE	A148, A158, A350, AC90, AC95, AJ27, AN72, ASTR, ASTR-SPX, B701, B703, B731, B732, B744-LCF, B748, B787, BCS1, BE20, BE30, C25C, C441, C500, C550-B, C550-II, C550-SII, CRJ10, D328, DC85, DC86-87, DC91, DC93, DC94, DC95, E120, E45X, EA50, E545-550, 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, P180 II, PC24, PAY4, SB20, SBR1, SBR2, SU95, T134, T204, T334, TBM, WW24, YK42	Operators of aircraft types contained in this category shall have a minimum of 60% of airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring, (the number of airframes to be monitored shall be rounded up to the nearest whole integer). Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each Group in the fleet.
3	NON-GROUP: RESERVED FOR AIRCRAFT WHICH ARE PRESENTED FOR RVSM APPROVAL ON AN INDIVIDUAL BASIS (i.e. NON-GROUP APPROVED AIRCRAFT)	A225, AN12, AN26, B190, B462, B463, B74S-SOFIA, BA11, BE9L, GSPN, H25A, L29A, M-55, PAY3, R721, R722, SJ30, STAR	Operators of aircraft types contained in this category shall have 100% of airframes monitored every 2 years or 1,000 flight hours., whichever is longer calculated from the date of the last successful height monitoring.

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

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
A124	A124	AN-124 RUSLAN	
A148	A148	AN-148	
A158	A158	AN-158	
A30B	A30B	A300	
A306	A306	A300	
A310-GE	A310	A310	
A310-PW	A310	A310	
A318	A318	A318	
A320	A319 A320 A321	A319 A320 A321	
A330	A332 A333	A330 A330	
A340	A342 A343	A340 A340	
A345	A345	A340	
A346	A346	A340	
A350	A358 A359	A350-800 A350-900	
A380	A388	A380	
A3ST	A3ST	A300	600R ST BELUGA
AC90	AC90	COMMANDER 690 COMMANDER 840 COMMANDER 900	
AC95	AC95	AERO COMMANDER 695	
AJ27	AJ27	COMAC ARJ-21-700	
AN72	AN72	ANTONOV AN-72 ANTONOV AN-74	
ASTR	ASTR	1125 ASTRA	s/n 1-78, except 73
ASTR-SPX	ASTR	1125 ASTR SPX, G100	s/n 73, 79-145 s/n > 145
AVRO	RJ1H RJ70 RJ85	RJ100 Avroliner RJ70 Avroliner RJ85 Avroliner	
B701	B701	B707	
B703	B703	B707	
B712	B712	B717	
B727	B721 B722	B727 B727	
B731	B731	B737	
B732	B732	B737	

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
B737CL	B733 B734 B735	B737-300 B737-400 B737-500	
B737NX	B736 B737 B738 B739	B737-600 B737-700 B737-800 B737-900	 B737-700 including the BBJ B737-800 including the BBJ2
B737C	B737	B737-700	
B747CL	B741 B742 B743	B747-100 B747-200 B747-300	
B74S	B74S B74R	B747SP B747SR	
B744-5	B744 B74D	B747-400	5 inch Probes up to s/n 25350
B744-10	B744 B74D	B747-400	10 inch Probes from s/n 25351
B744-LCF	BLCF	B747-400	
B748	B748	B747-8	
B752	B752	B757-200	
B753	B753	B757-300	
B767	B762 B763	B767-200 B767-300	
B764	B764	B767-400	
B772	B772 B77L B77L	B777-200 B777-F B777-200LR	
B773	B773 B77W	B777-300 B777-300ER	
B787	B788 B789	B787-8 B787-9	
BCS1	BCS1 BCS3	BOMBARDIER C-SERIES CS100 BOMBARDIER C-SERIES CS300	
BD100	CL30 CL35	CHALLENGER 300 CHALLENGER 350	 Begins at s/n 20501
BE20	BE20	200 KINGAIR	
BE30	BE30 B350	B300 SUPER KINGAIR B300 SUPER KINGAIR 350	
BE40	BE40	BEECHJET 400 BEECHJET 400A BEECHJET 400XP HAWKER 400XP	
C441	C441	CONQUEST II	
C500	C500 C500 C501	500 CITATION 500 CITATION I 501 CITATION I SINGLE PILOT	

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
C510	C510	MUSTANG	
C525	C525	525 CITATIONJET 525 CITATIONJET 1 525 CITATIONJET PLUS C525-M2	
C25A	C25A	525A CITATIONJET II	
C25B	C25B	CITATIONJET III 525B CITATIONJET III	
C25C	C25C	525C CITATIONJET IV	
C550-B	C550	550 CITATION BRAVO	s/n 550-0801 and on
C550-II	C550 C551	550 CITATION II 551 CITATION II SINGLE PILOT	s/n 550-0001 to 550-0800
C550-SII	C550	S550 CITATION SUPER II	s/n starts with "S"
C560	C560	560 CITATION V 560 CITATION V ULTRA 560 CITATION V ENCORE	
C56X	C56X	560 CITATION EXCEL 560 CITATION XLS	
C650	C650	650 CITATION III 650 CITATION VI 650 CITATION VII	
C680	C680	680 CITATION SOVEREIGN 680-A LATITUDE	 "A" in s/n
C750	C750	750 CITATION X	
CARJ	CRJ1 CRJ2 CRJ2 CRJ2	CRJ-100 CRJ-200 CHALLENGER 800 CHALLENGER 850	
CRJ7	CRJ7	CRJ-700	
CRJ9	CRJ9	CRJ-900	
CRJ10	CRJX	CRJ-1000	
CL600	CL60	CL-600 CL-601	s/n < 5000
CL604	CL60	CL-604 CL-601-3A CL-601-3R	s/n 5000-5700 s/n 5001-5134 s/n 5135-5300
CL605	CL60	CL-605	s/n > 5700
DC10	DC10	DC-10	
D328	D328	328 TURBOPROP	
DC85	DC85	DC-8	
DC86-87	DC86 DC87	DC-8 DC-8	
DC91	DC91	DC-9	
DC93	DC93	DC-9	
DC94	DC94	DC-9	
DC95	DC95	DC-9	

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
E120	E120	EMB-120 Brasilia	
E135-145	E135 E145 E35L	EMB-135 EMB-145 EMB-135BJ Legacy 600/650	
E45X	E45X	EMB-145 XR	
E170-190	E170 E170 E75S E190 E190	EMB-170 EMB-175 ERJ-170-200 (short wing) EMB-190 EMB-195	
E50P	E50P	PHENOM 100	
E545-550	E545 E550	EMB-545 Legacy 450 EMB-550 Legacy 500	
E55P	E55P	PHENOM 300	
EA50	EA50	ECLIPSE	
F100	F100	FOKKER 100	
F2TH	F2TH	FALCON 2000 FALCON 2000-EX FALSON 2000LX	
F70	F70	FOKKER 70	
F900	F900	FALCON 900 FALCON 900DX FALCON 900EX FALCON 900LX	
FA10	FA10	FALCON 10	
FA20	FA20	FALCON 20 FALCON 200	
FA50	FA50	FALCON 50 FALCON 50EX	
FA7X	FA7X FA8X	FALCON 7X FALCON 8X	
G150	G150	G150	
G280	G250 G280	G250 G280	
GALX	GALX	1126 GALAXY G200	
GLEX	GLEX	GLOBAL EXPRESS CLASSIC GLEX GLOBAL XRS GLOBAL 6000 BD-700-1A10	EXPRESS s/n > 9158 s/n > 9431, and 9313 and 9381
GL5T	GL5T	GLOBAL 5000 GLOBAL 5000-GVFD BD-700-1A11	 s/n > 9434, and 9386 and 9401
GLF2	GLF2	GULFSTREAM II (G-1159)	
GLF2B	GLF2	GULFSTREAM IIB (G-1159B)	
GLF3	GLF3	GULFSTREAM III (G-1159A)	

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
GLF4	GLF4	GULFSTREAM IV (G-1159C) G300 G350 G400 G450	
GLF5	GLF5	GULFSTREAM V (G-1159D) G500 G550	
GLF6	GLF6	G650	
H25B-700	H25B	BAE 125 / HS125	
H25B-750	H25B	HAWKER 750	
H25B-800	H25B	BAE 125 / HS125 HAWKER 800XP HAWKER 800XPI HAWKER 800 HAWKER 850XP HAWKER 900XP HAWKER 950XP	
H25C	H25C	HAWKER 1000	
HA4T	HA4T	HAWKER 4000	
HDJT	HDJT	HONDAJET HA-420	
IL62	IL62	ILYUSHIN-62	
IL76	IL76	ILYUSHIN-76	
IL86	IL86	ILYUSHIN-86	
IL96	IL96	ILYUSHIN-96	
J328	J328	328JET	
L101	L101	L-1011 TRISTAR	
L29B-2	L29B	L-1329 JETSTAR 2	
L29B-731	L29B	L-1329 JETSTAR 731	
LJ23	LJ23	LEARJET 23	
LJ24	LJ24	LEARJET 24	
LJ25	LJ25	LEARJET 25	
LJ28	LJ28	LEARJET 28 LEARJET 29	
LJ31	LJ31	LEARJET 31	
LJ35-36	LJ35	LEARJET 35, 35A LEARJET 36, 36A	
LJ40	LJ40 LJ70	LEARJET 40 LEARJET 70	Begins at s/n 2001 Begins at s/n 2134
LJ45	LJ45 LJ75	LEARJET 45 LEARJET 75	 Begins at s/n 456
LJ55	LJ55	LEARJET 55	
LJ60	LJ60	LEARJET 60	
MD10	MD10	MD-10	
MD11	MD11	MD-11	

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
MD80	MD81 MD82 MD83 MD87 MD88	MD-80 MD-80 MD-80 MD-80 MD-80	
MD90	MD90	MD-90	
MU30	MU30	MU-300 DIAMOND	1A
P180	P180	P-180 AVANTI	s/n < 1105 but not 1002
P180 II	P180 II	P-180 AVANTI II	s/n > 1104 and also 1002
PAY4	PAY4	PA-42 Cheyenne 400	1000 CHEYENNE
PC12	PC12	PC-12	
PC24	PC24	PC-24	
PRM1	PRM1	PREMIER 1	
SB20	SB20	SAAB 2000	
SBR1	SBR1	SABRELINER 40 SABRELINER 60 SABRELINER 65	
SBR2	SBR2	SABRELINER 80	
SU95	SU95	SUKHOI SUPERJET 100-95	
T134	T134	TU-134	
T154	T154	TU-154	
T204	T204	TU-204 TU-214 TU-224 TU-234	
T334	T334	TU-334	
TBM	TBM7 TBM8 TBM9	TBM-700 TBM-850 TBM-900	 Begins at s/n 1000
WW24	WW24	1124 WESTWIND	
YK42	YK42	Yakovlev YAK-42 Yakovlev YAK-40	

Table 3: Non-GROUP AIRCRAFT (i.e., Not certified under group approval requirements) (Civilian)

Non-Group Descriptor	A/C ICAO	Manufacturer Type	Additional Defining Criteria
A225	A225	ANTONOV AN-225	Non-Group
AN12	AN12	ANTONOV AN-12	Non-Group
AN26	AN26	ANTONOV AN-26	Non-Group
B190	B190	BEECH 1900	Non-Group
B462	B462	BAe-146-200	Non-Group
B463	B463	BAe-146-300	Non-Group
B74S-SOFIA	B74S	NASA B74SP with Sofia telescope	Non-Group: N747NA (s/n 21441)
BA11	BA11	BAC-111	Non-Group
BE9L	BE9L	King Air Model 90 except F90 and F90-1	Non-Group
GSPN	GSPN	GROB G-180 SPn Utility Jet	Non-Group
H25A	H25A	HS125-400, -600	Non-Group
L29A	L29A	L-1329 JETSTAR 6/8	Non-Group
M-55	M55	Myasischev M-55 Geophysica	Non-Group
PAY3	PAY3	PIPER Cheyenne 3	Non-Group
R721	R721	B-727-100: Re-engined	Non-Group
R722	R722	B-727-200: Re-engined	Non-Group
SJ30	SJ30	SWEARINGEN SJ-30	Non-Group
STAR	STAR	BEECH 2000 STARSHIP	Non-Group

Table 1: MONITORING REQUIREMENTS TABLE (Military)

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE Monitoring prior to the issue of RVSM approval is not a requirement			
CATEGORY		GROUP DESCRIPTOR	MINIMUM MONITORING REQUIREMENTS
1	GROUP APPROVED: AIRCRAFT WHICH DEMONSTRATE LONG TERM CONFIDENCE IN COMPLYING WITH RVSM MASPS	C17, C130J, KC135	Operators of aircraft types contained in this category shall have a minimum of 2 airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring. Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each group in the fleet. In the event that an operator has a single airframe from a Group, then that aircraft shall be monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring.
2	GROUP APPROVED: AIRCRAFT WHICH HAVE YET TO DEMONSTRATE CONFIDENCE IN LONG TERM PERFORMANCE	A400, E3, C5, C130, C550-552, P8	Operators of aircraft types contained in this category shall have a minimum of 60% of airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring. (the number of airframes to be monitored shall be rounded up to the nearest whole integer). Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each Group in the fleet.

3	NON-GROUP: RESERVED FOR AIRCRAFT WHICH ARE PRESENTED FOR RVSM APPROVAL ON AN INDIVIDUAL BASIS (i.e. NON-GROUP APPROVED AIRCRAFT)	Aircraft types for which no generic compliance method exists: GLF5-AEW, GLEX-ASTOR	Operators of aircraft types contained in this category shall have 100% of airframes monitored every 2 years or 1.000 flight hours., whichever is longer calculated from the date of the last successful height monitoring.
		Aircraft types for which the compliance method is not known: A30B-M, A310-M, A332-M, ASTR-M, B737-AWACS, C12, C21, C32, C40, C550-B-M, C550-M, C35, C9, CL60-M, E135-M, E4, E6, E8, FA10-M, FA20-M, FA50-M, GLF3-M, GLF4-M, C37, IL76-M, KC10, KC-390, KC46, P180-M, R135, VC25	

5.8 Appendix E – 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.

5.9 Appendix F – 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)

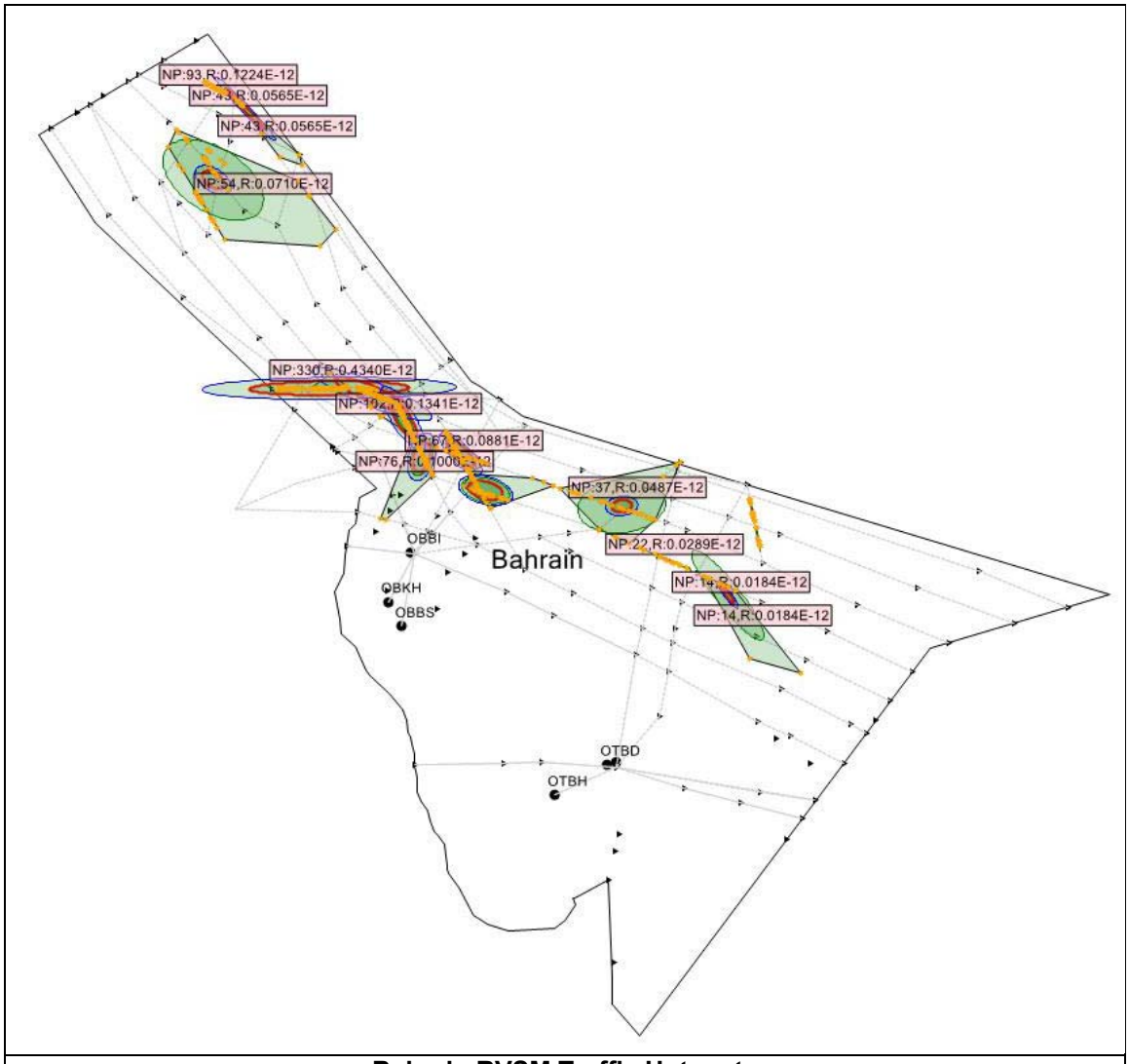
The vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level). TVE can be split into two components, altimetry system error (ASE) and flight technical error (FTE). TVE=ASE + FTE.

Vertical-collision risk

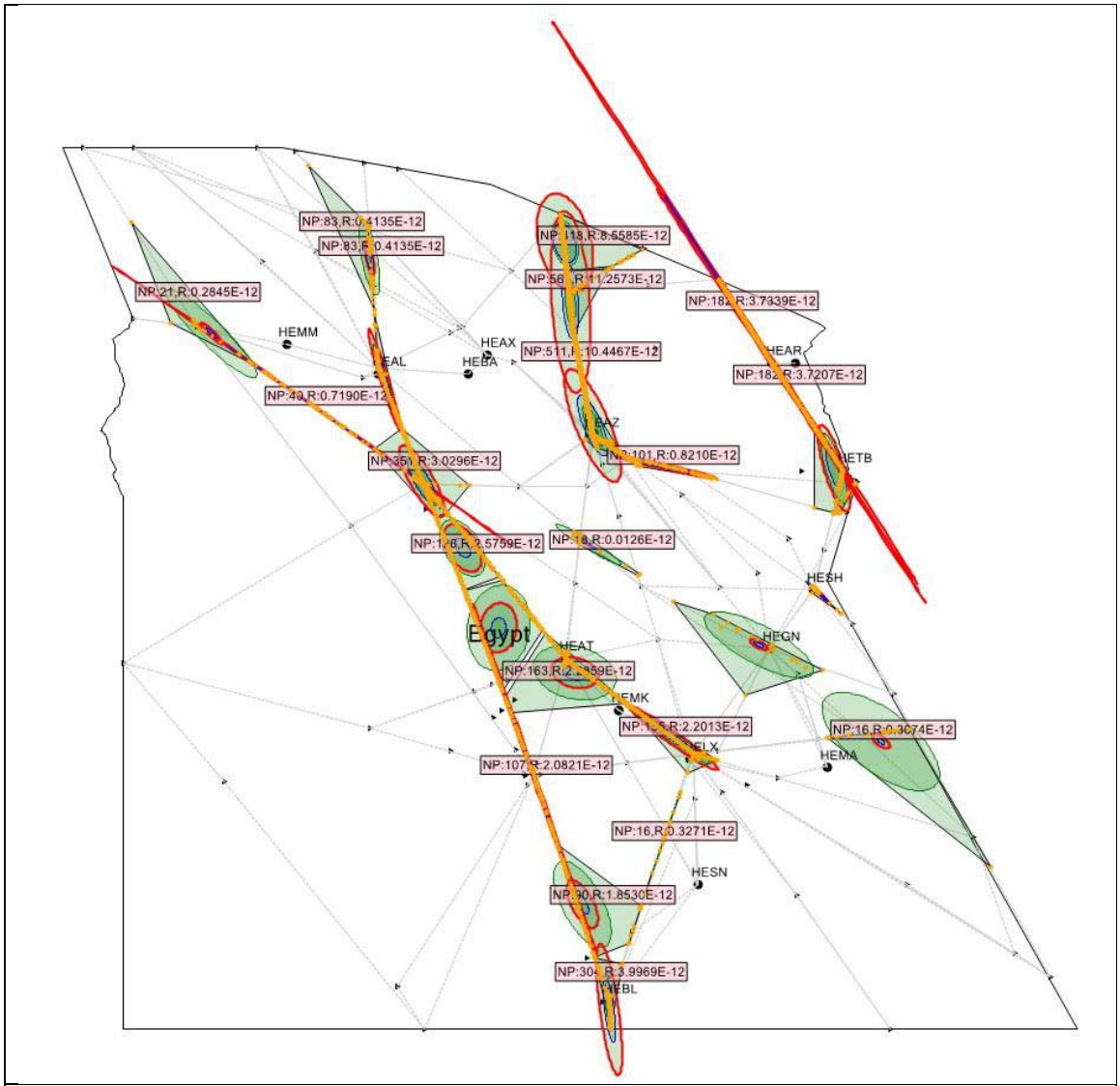
That expected number of mid-air aircraft accidents in a prescribed volume of airspace for a specific number of flight hours due to loss of planned vertical separation. Note: one collision is considered to produce two accidents.

5.10 Appendix G – MID REGION RVSM HOT SPOTS

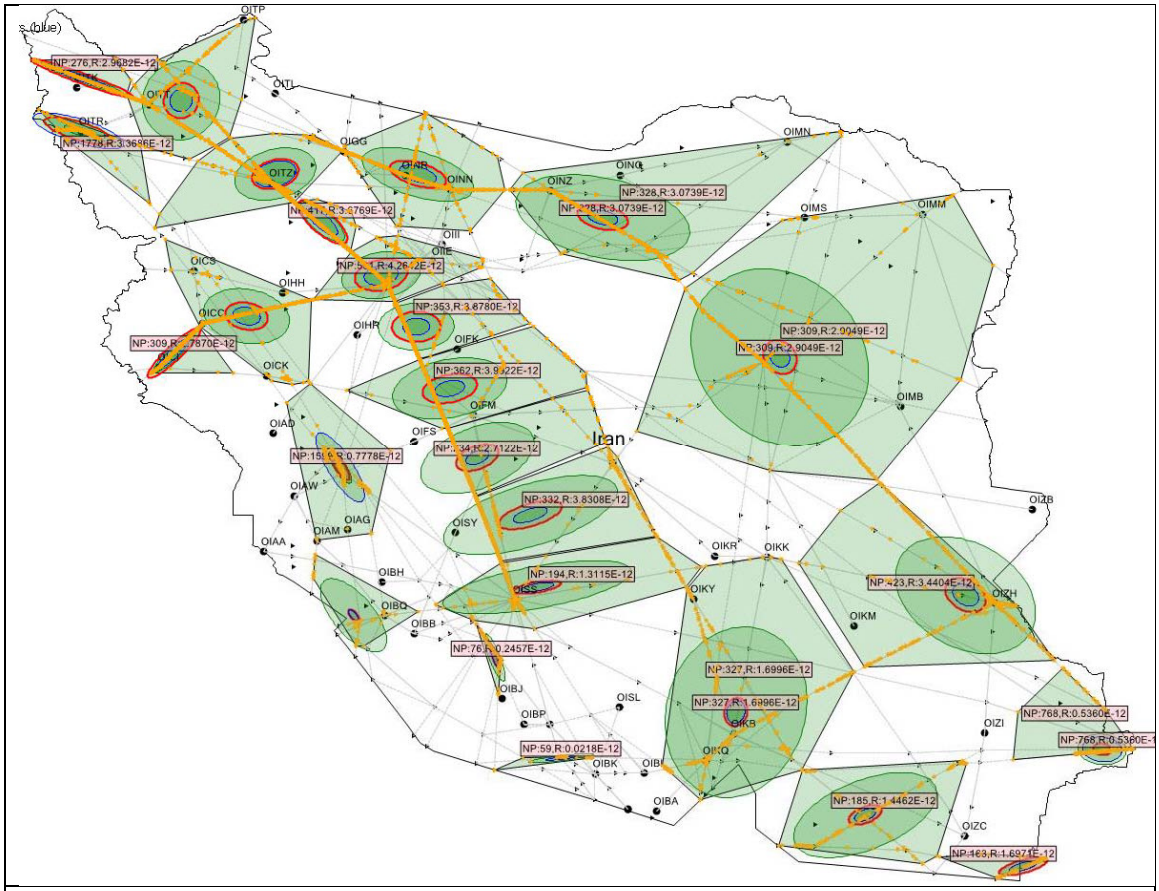
FOR INFORMATION ONLY: This appendix contained the **SMR 2016** hot spots for some MIDRMA Member State as generated by the MID Risk Analysis Software (MIDRAS).



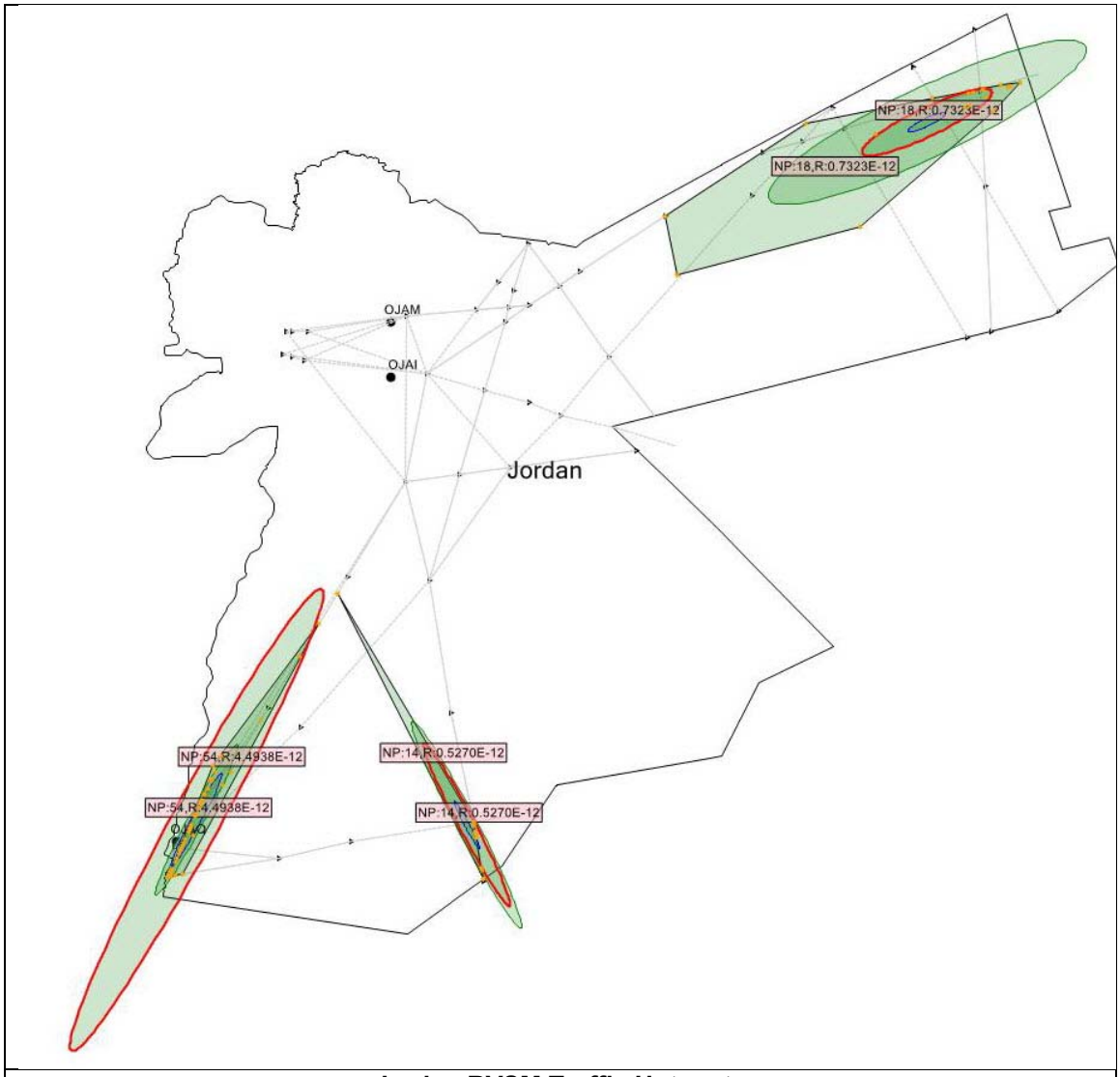
Bahrain RVSM Traffic Hotspots



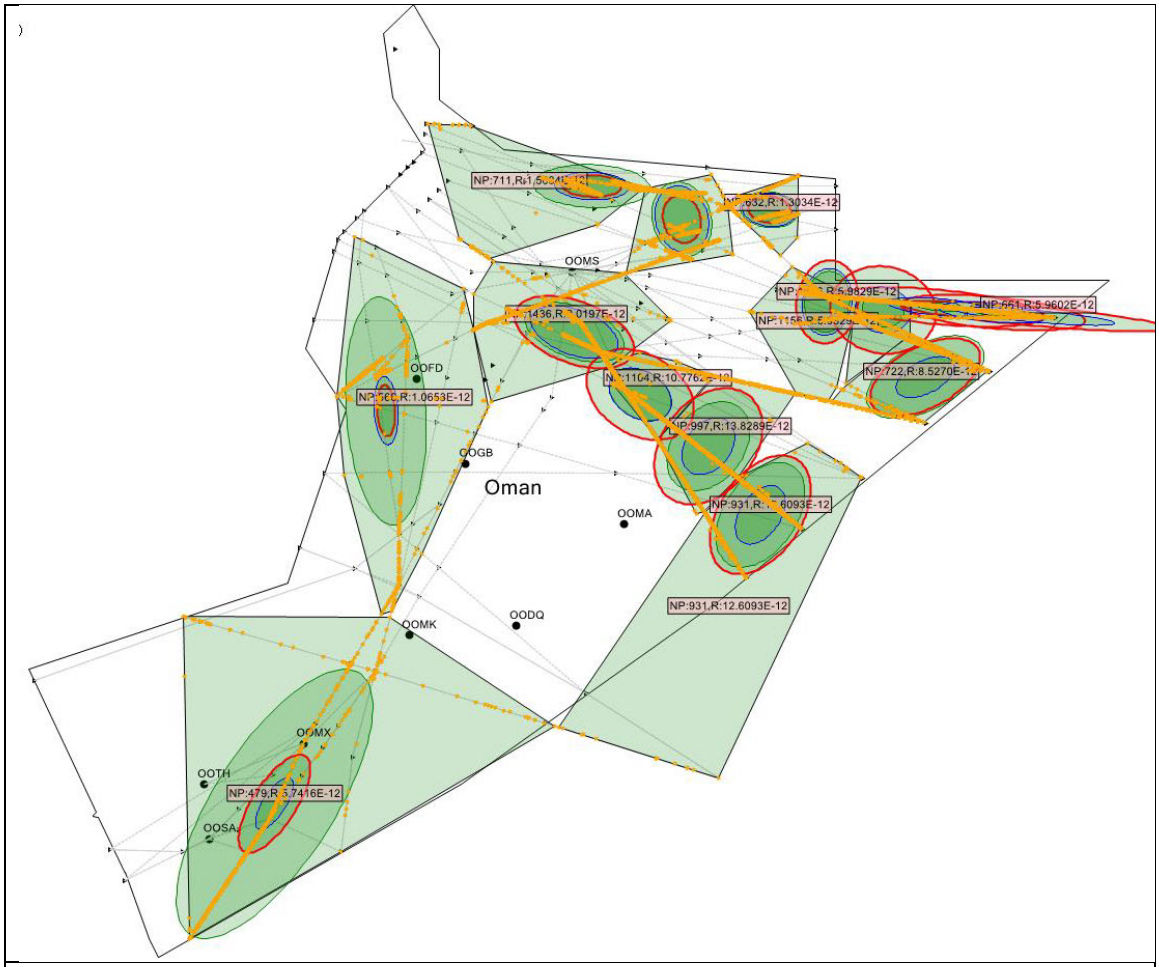
Egypt RVSM Traffic Hotspots



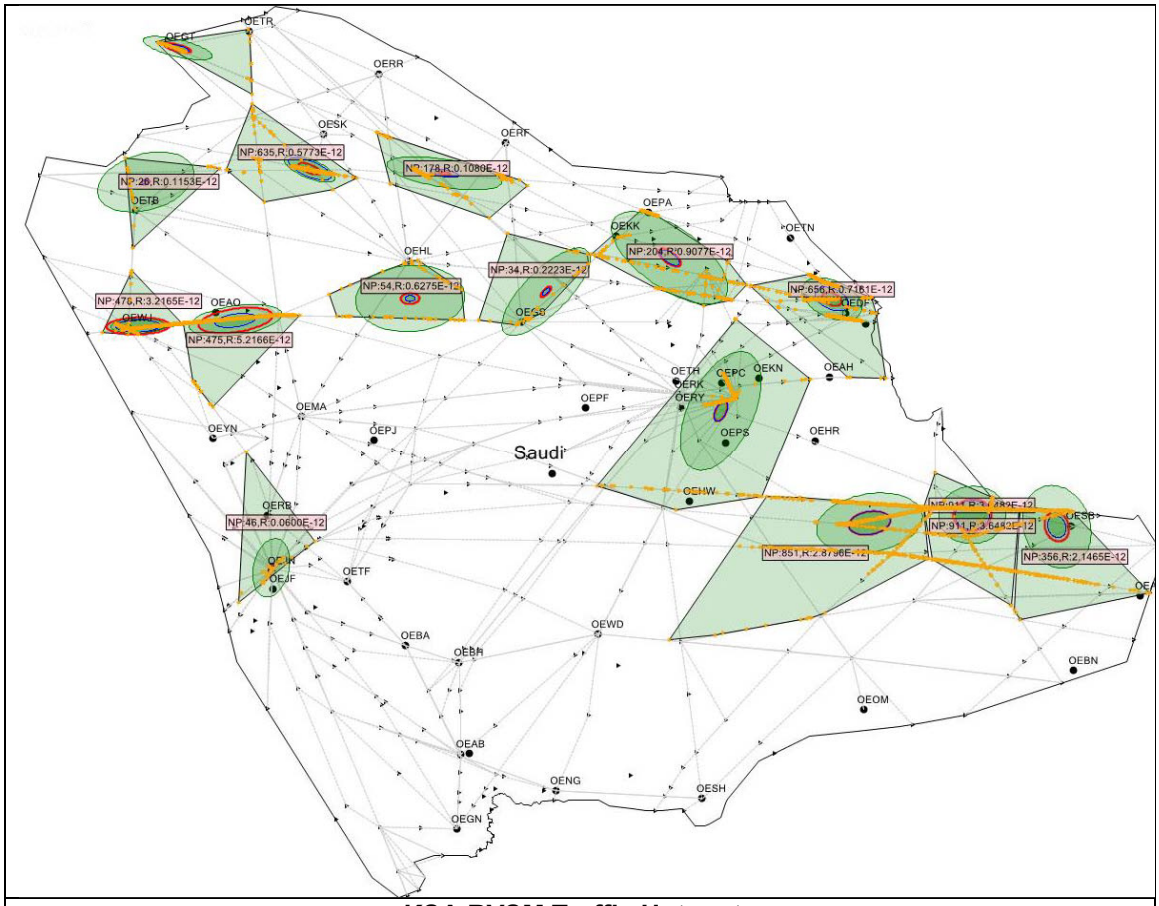
Iran RVSM Traffic Hotspots



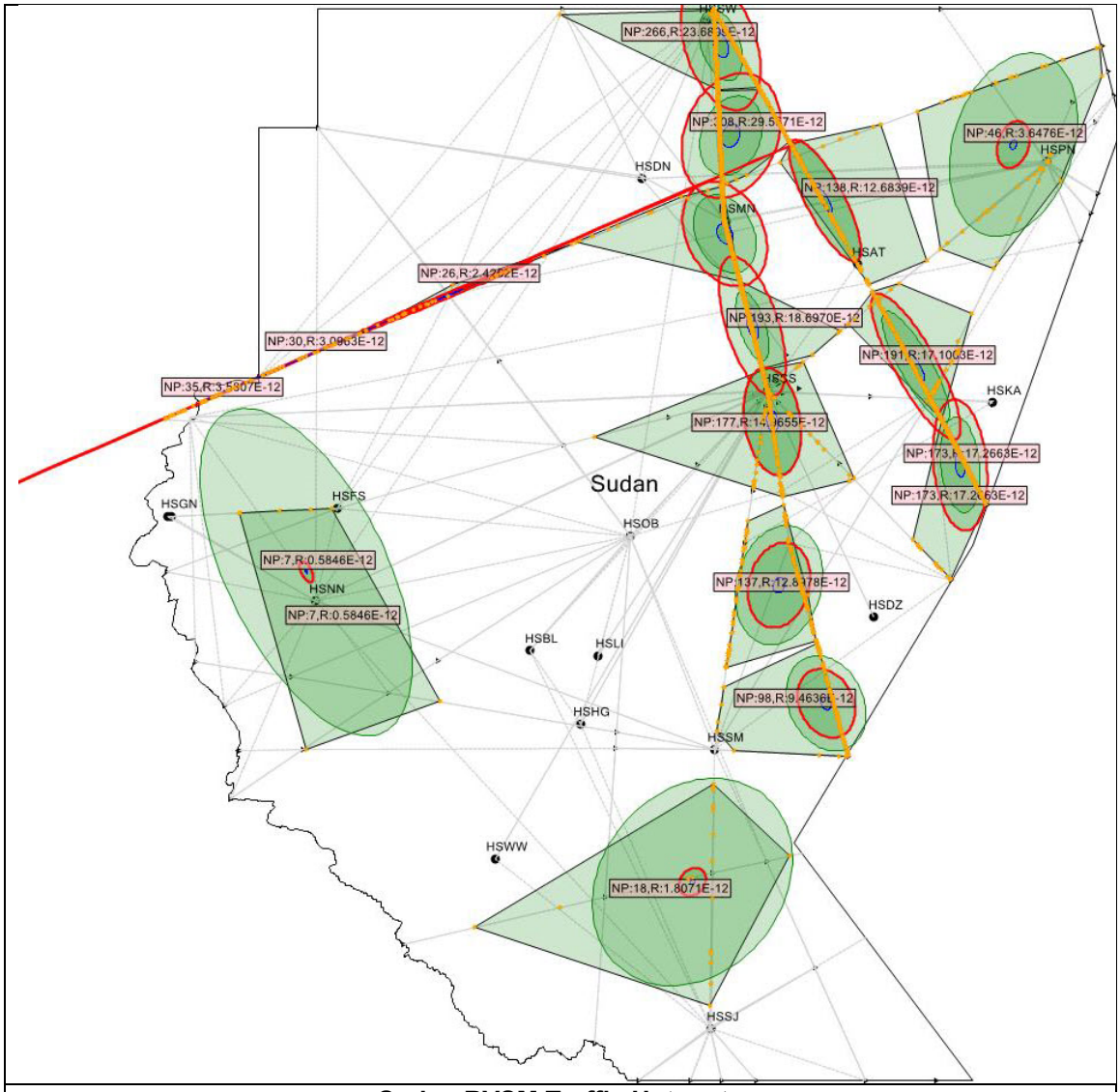
Jordan RVSM Traffic Hotspots



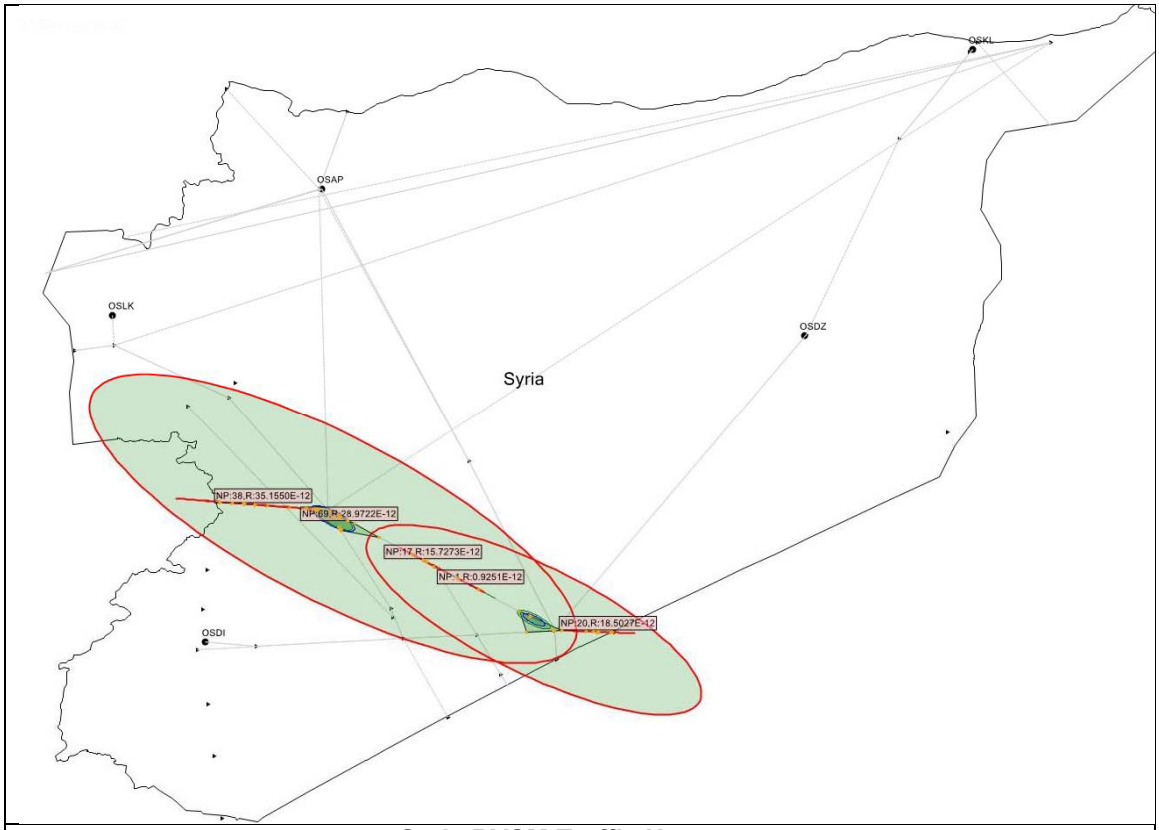
OMAN RVSM Traffic Data Hotspots



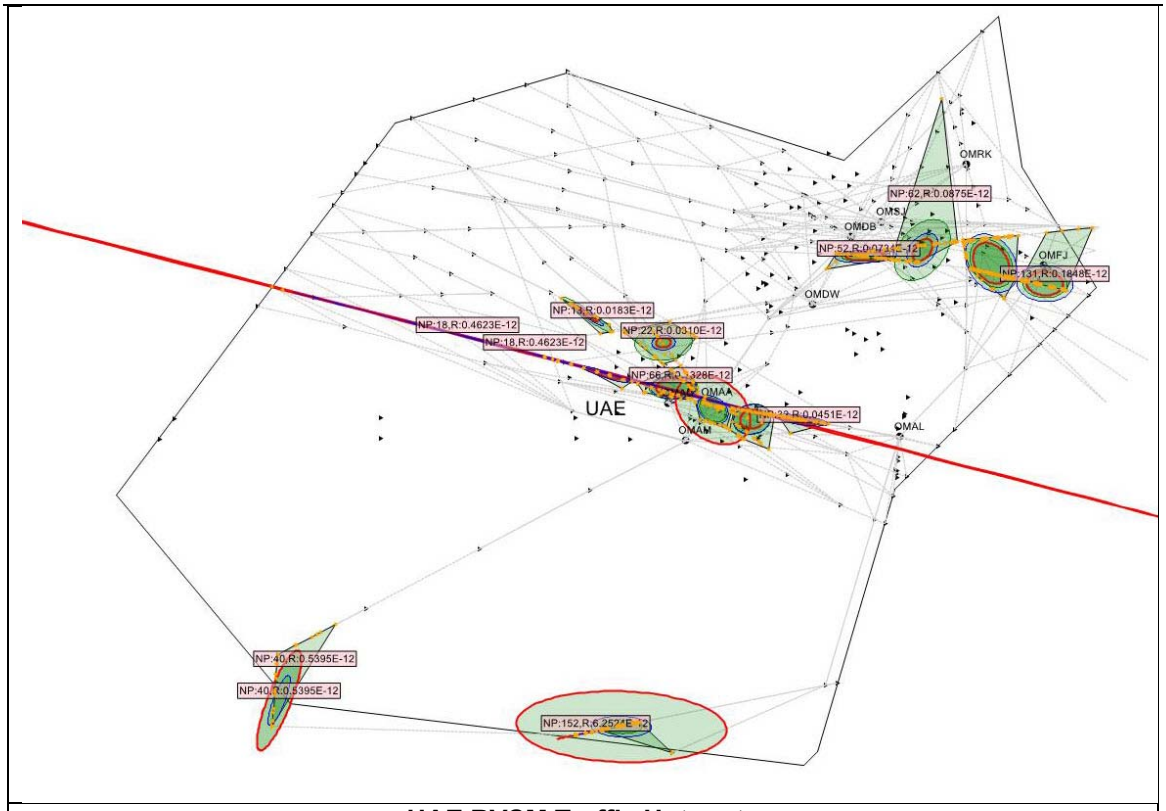
KSA RVSM Traffic Hotspots



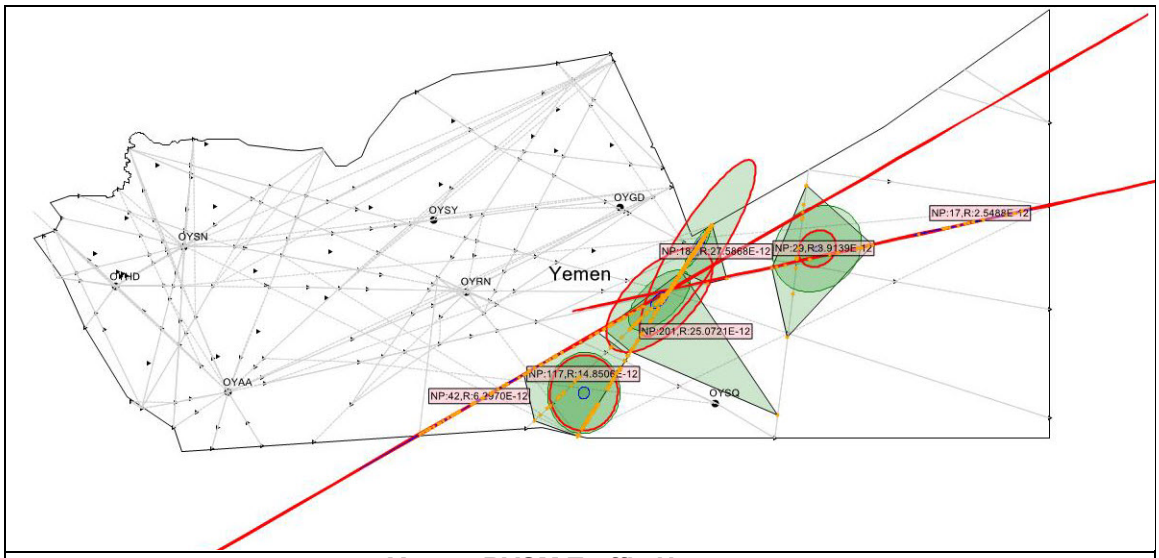
Sudan RVSM Traffic Hotspots



Syria RVSM Traffic Hotspots



UAE RVSM Traffic Hotspots



Yemen RVSM Traffic Hotspots

5.11 Appendix H – 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
EGMU	Enhanced 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 -