



International Civil Aviation Organization

MIDANPIRG ATM/AIM/SAR Sub-Group

**Thirteenth Meeting (ATM/AIM/SAR SG/13)
(Cairo, Egypt, 30 September – 3 October 2013)**

Agenda Item 5: RVSM Operations and Monitoring Activities in the MID Region

MID RVSM SMR 2012-2013

(Presented by MIDRMA)

SUMMARY

This working paper details the results of the MID RVSM Safety Monitoring Report (SMR) 2012-2013 and tries to demonstrate according to the data used that the key safety objectives of the SMR in accordance with ICAO Doc 9574 were met in operational service.

Action by the meeting is at paragraph 3.

REFERENCES

- MIDANPIRG/13 Report
- MIDRMA Board/12 Report
- MSG 3 Report
- SMR 2012-2013

1. INTRODUCTION

1.1 The Middle East Regional Monitoring Agency (MIDRMA) presents the MID RVSM Safety Monitoring Report (SMR) 2012-2013 to the ATM/SAR/AIM SG/13 meeting for review. Furthermore, the revised report will be presented to the Fourteenth meeting of the Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG/14) for endorsement.

1.2 The report presents 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.

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

2. DISCUSSION

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

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

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

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

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

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

MID States RVSM Traffic Data used for the SMRs

2.5 Safety Monitoring Report 2013 Results:

2.5.1 RVSM Safety Objective 1:

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

The 2013 value computed for technical height risk is 6.37×10^{-12} . This meets RVSM Safety Objective 1.

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

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

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

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

MIDRMA Member States TLS 2013

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

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

2.5.1.5 MID States Minimum Monitoring Requirement (MMR)

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

No	MID STATES	RVSM ACFTs	ACFT MMR
1	Bahrain	52	0
2	Jordan	56	0
3	Kuwait	36	0
4	Oman	34	0
5	Syria	6	0
6	Qatar	148	2
7	Iraq	24	4
8	Egypt	128	6
9	Yemen	10	6
10	Lebanon	37	9
11	UAE	441	11
12	KSA	262	21
13	Iran	178	30
	TOTAL	1412	89

2.5.1.6 Pz(1000) compliance

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

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

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

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

Horizontal Overlap Frequency (HOF)				
Year 2006	Year 2008	Year 2010	Year 2012	Year 2013
6.99x10 ⁻³	5.1x10 ⁻¹¹	2.88x10 ⁻⁶	6.49x10 ⁻⁵	4.34 x 10⁻⁸

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

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

2.5.2 RVSM Safety Objective 2:

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

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

Overall Risk Values				
Year 2006	Year 2008	Year 2010	Year 2012	Year 2013
Not calculated due to the absence of suitable information on atypical errors	4.19x10 ⁻¹³	6.92x10 ⁻¹²	1.04x10 ⁻¹¹	3.63 x 10⁻¹¹

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

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

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

2.5.3 RVSM Safety Objective 3

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

2.5.3.1 Conclusions for RVSM Safety Objective 3:

- a. Current risk-bearing situations have been identified and actions will be taken to ensure resolving all violations and information was collected during the MID RVSM Scrutiny Group meeting on 16th December 2012 in order to identify operational issues and potential mitigations.
- b. The MIDRMA will include in its work program training activity and briefings on RVSM safety assessment requirements to raise the awareness of ATC, RVSM approval Authorities and Air Operators personnel.

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

2.6 Conclusions and Recommendations

- 2.6.1 The 2013 value computed for technical height risk is 6.37×10^{-12} , this value meets the ICAO Target Level of Safety (TLS) of 2.5×10^{-9} fatal accidents per flight hour.
- 2.6.2 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 3.63×10^{-11} which meets the ICAO overall TLS of 5×10^{-9} fatal accidents per flight hour.
- 2.6.3 The value of the probability of vertical overlap $P_z(1000)$, based on the actual observed ASE and typical AAD data is estimated to be of 5.26×10^{-9} . This value meets the Global System Performance Specification that the probability of two aircraft will lose procedural vertical separation of 1000ft should be no greater than 1.7×10^{-8} .
- 2.6.4 The MIDRMA will continue to conduct height monitoring during 2013/2014 for all airline operators registered in the Middle East Region to achieve the performance target for height monitoring of 95% from the total number of the RVSM approved aircraft in the Region.

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- 2.6.5 The MIDRMA shall carry out continuous survey and investigation on the number and causes of non-approved aircraft operating in the MID RVSM airspace.
- 2.6.6 The MIDRMA shall continue to cooperate with the Member States required to submit their radar data and arrange for RADAC upgrade to include their radar data format.
- 2.6.7 The MIDRMA will continue to encourage States to provide Large Height Deviation Reports.
- 2.6.8 The MIDRMA will continue to enhance the MID VCR Software and shall include hot spot and other visualization features in phase 2 of the software project.
- 2.6.9 Current risk-bearing situations have been identified and actions will be taken to ensure resolving all violations and information were collected during the MID RVSM Scrutiny Group meeting on 16th December 2012 in order to identify operational issues and potential mitigations.
- 2.6.10 The MIDRMA will include in its work program training activity and briefings on RVSM safety assessment requirements to raise the awareness of ATC, RVSM approval Authorities and Air Operators personnel.

3. ACTION BY THE MEETING

- 3.1 The meeting is invited to:
 - a) note the contents of this working paper;
 - b) review and discuss the MID RVSM SMR 2012-2013 results, conclusions and recommendation in 2.6; and
 - c) endorse the MID RVSM SMR 2012-2013 results.

- END -