



xInternational Civil Aviation Organization

MIDANPIRG/20 and RASG-MID/10 Meetings

(Muscat, Oman, 14-17 May 2023)

Agenda Item 4.2: Air Navigation Subjects of interest to RASG-MID including RVSM Operations and Monitoring

RVSM OPERATIONS AND MONITORING ACTIVITIES IN THE MID REGION

(Presented by the MIDRMA and Secretariat)

SUMMARY

This paper presents the latest developments related to RVSM operations and safety monitoring activities in the MID Region

Action by the meeting is at paragraph 3.

REFERENCES

- MIDANPIRG/19 and RASG-MID/9 Meetings Report (Riyadh, Saudi Arabia, 14-17 February 2022)
- ATM SG/8 Report (Amman, Jordan; 7 – 10 November 2022)
- MIDRMA Board/18 meeting Report (Doha, Qatar; 19 – 20 September 2022)

1. INTRODUCTION

1.1 The meeting may wish to recall the MIDANPIRG Conclusion 19/2:

MIDANPIRG CONCLUSION 19/2: MID RVSM SMR 2022

That,

- a) *States are required to provide the FPL/traffic data for the period 1 June until 30 June 2022 and LHD data for the period 1 January to 31 December 2022 to the MIDRMA before 1 August 2022, for the development of the MID RVSM Safety Monitoring Report (SMR 2022);*
- b) *Bahrain, Iran, Iraq, Kuwait, Oman, Saudi Arabia and UAE, are urged to provide the FPL/traffic data for the period 1 – 30 November and 1 – 31 December 2022 to the MIDRMA before 31 January 2023 for measuring the ICAO RVSM TLS (Technical and Overall) during the FWC 2022 event; the remaining States are strongly encouraged to provide the FPL/traffic to the MIDRMA for the same period (months of November and December 2022).*

- c) *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*
- d) *the final version of the MID RVSM SMR 2022 be ready for presentation to and endorsement by the MIDANPIRG/20 meeting.*

1.2 The meeting may wish to recall the MIDRMA Decision 18/3:

MIDRMA DECISION 18/3: NON-COMPLIANCE WITH MMR REQUIREMENTS

That, the MIDRMA present an updated report to MIDANPIRG/20 meeting with the list of States not complying with the MMR requirements for inclusion in the List of air navigation deficiencies.

1.3 The meeting may wish to recall the discussion during the MIDANPIRG/19 related to the concern regarding the increased number of LHD reports submitted by Sana'a ACC and urged the concerned States to address and resolve the issue; in coordination with the relevant Regional Offices and RMAs.

1.4 The meeting may wish to recall the C-DEC225/10 related to the establishment of Doha FIR/SSR. And its implementation plan to transit the services provisions to Doha ACC (MIDANPIRG/20 PPT/43 refers).

2. DISCUSSION

2.1 The meeting may wish to note, that the ATM SG/8 (Amman, Jordan; 7 – 10 November 2022) and the MIDRMA Board/18 (Doha, Qatar; 19 – 20 September 2022) meetings reviewed the initial results of the MID RVSM Safety Monitoring Report 2022. The final report has been developed by the MIDRMA, at **Appendix A**.

2.2 The meeting may wish to note that based on the data provided to the MIDRMA (TDS and LHDs), the Safety Objectives No. 1 and 3 continue to be met; however, the MID RVSM Airspace failed to meet Safety Objective No. 2. The value computed for the overall risk is estimated 1.724×10^{-7} , which is above the ICAO overall TLS of 5×10^{-9} . It was highlighted that the deterioration of the TLS (Safety Objective No. 2) is due mainly to an isolated incident for an aircraft operated within the MID RVSM Airspace between Sana'a and Mogadishu FIRs.

2.3 The meeting may wish to note that the MIDRMA opened a safety protocol between Sana'a and Mogadishu, in coordination with the AFI RMA (ARMA) and the relevant ICAO Regional Offices. Additionally, the meeting may wish to note the mitigation and corrective measures, included in the SMR2022, taken to avoid similar cases of non-RVSM approved Aircraft intruding the MID RVSM Airspace.

2.4 The meeting may wish to note that the first coordination meeting was organized by the ICAO ESAF and MID Officers in Cairo, attended by ARMA and MIDRMA, and all the relevant State near the Horn of Africa, to discuss the increased number of LHD reports filed by Sana'a ACC against its neighbouring FIRs. LHD awareness campaign has been launched including granting access to the AFI State to enable them to monitor and submit LHD reports.

2.5 The meeting may wish to note that Beirut and Tripoli FIRs were excluded from the RVSM safety analysis due to non-provision of data. And Kuwait FIR was excluded due to corrupted provided data.

Note: Libya has not yet signed the MoU to join the MIDRMA.

2.6 Additionally, the MIDRMA reported to the ATM SG/8, that Syria continued to file Large Height Deviation Reports (LHDs), accordingly, the deficiency reported against Syria related to the unsatisfactory reporting of LHDs was proposed to be removed.

2.7 The meeting may wish to note the increased number of RVSM-Approved Aircraft operations without meeting the minimum RVSM monitoring requirements, due to non-technical limitation; including the OFAC license to monitor the Syrian and Iranian Registered Aircraft.

2.8 The meeting may wish to note the completion of monitoring of all Iranian registered aircraft (before the OFAC license expired) and the improvement of the percentage of the Egyptian, Libyan and Sudanese registered aircraft.

2.9 The meeting may wish to note WP/24, jointly represented by IATA and FAA; on the subject of MID Region Large height deviations – Horn of Africa.

2.10 Based on all the above, the meeting is invited to agree to the following Draft Conclusions:

MIDANPIRG DRAFT CONCLUSION 20/XX: MID RVSM SMR 2022

*That, the MID RVSM Safety Monitoring Report (SMR) 2022 at Appendix A, is endorsed.*²

2.11 Additionally, the meeting is invited to agree to the following Draft Conclusions, emanating from the MIDRMA Board/18 meeting:

DRAFT CONCLUSION 18/1: MID RVSM SMR 2023

That,

in order to support the MIDRMA in the timely development of the MID RVSM Safety Monitoring Report (SMR 2023):

- a) *States are required to provide the MIDRMA with:*
- *the FPL/traffic data for the period 1 – 30 June 2023 before 1 August 2023, and*
 - *LHD data for the period 1 January to 31 December 2023.*
- b) *only the appropriate “Traffic Data Sample” 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 2023 be ready for presentation to and endorsement by the MIDANPIRG/21 meeting.*

And

DRAFT CONCLUSION 18/2: LACK OF HEIGHT MONITORING OF SYRIAN RVSM APPROVED AIRCRAFT

That,

- a) *ICAO MID Office to contact the Syrian Civil Aviation Authority and address the issue of lack of height Monitoring of their RVSM approved aircraft; and*
- b) *MIDRMA to circulate the status of the Syrian RVSM approved aircraft to all member States to advise all ATCUs regarding the status of the Syrian RVSM approved aircraft within their RVSM Airspace.*

2.12 The meeting may wish to recall the discussion during the MIDRMA Board/18 meeting, based on PPT presented by UAE, related to the need for the MIDRMA to continue their efforts related to the awareness and training activities on RVSM safety monitoring with regional events (seminars, webinars, etc.) and individual activities targeting specific States/Focal Points. Accordingly, the board meeting requested the MIDRMA to update its 2023 work programme to elevate awareness and promote compliance culture within the Region and individual member States.

2.13 Based on the above, the Board meeting agreed to the following Draft Conclusions, emanating from the MIDRMA Board/18 meeting:

DRAFT CONCLUSION 18/3: AWARENESS AND TRAINING ON RVSM SAFETY ASSESSMENT

That, with a view to raise the awareness related to the requirements for sustained RVSM safety monitoring activities and improve the knowledge of the States’ regulators, MIDRMA Focal Points, ATC and Air Operators personnel:

- a) *the MIDRMA include in its work programme regular missions to the Member States, during which briefings on the MIDRMA activities and RVSM safety monitoring requirements be provided to concerned personnel;*

- b) *for improved effectiveness, the MIDRMA visit to a State be conducted, to the extent possible, back-to-back with the GMU height monitoring mission(s) related to the air operator(s) based in this State; and*
- c) *MIDRMA to issue on regular basis flyers and newsletters addressing trending and emerging challenges related to RVSM safety monitoring.*

And

DRAFT CONCLUSION 18/4: MID RVSM SAFETY ASSESSMENT SEMINAR

That, with a view to raise the awareness related to the requirements for sustained RVSM safety monitoring and improve the knowledge of all involved parties, in particular with respect to the Vertical Collision Risk Methodology and Altimetry System Errors, the MIDRMA, in coordination with ICAO, organize a MID RVSM Safety Assessment Seminar, in 2023.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) endorse the Draft Conclusions in para 2.9 and 2.11 above;
- b) urge Libya to join the MIDRMA by signing the MoU to be included in the SMR analysis;
- c) encourage the States to continue providing the required data to the MIDRMA to be included in the annual SMR analysis, and review the related list of deficiencies; and
- d) invite the MIDRMA to continue coordination, monitoring and reporting on the following subjects:
 - i. the safety protocol between Sana'a and Mogadishu; and
 - ii. the obtaining/renewal of the OFAC licence for the usage of eGMU for the Syrian and Iranian registered aircraft with the support of the FAA.



MID RVSM SAFETY MONITORING REPORT 2022 (SMR 2022)

Prepared by

Middle East Regional Monitoring Agency (MIDRMA)



MID RVSM SAFETY MONITORING REPORT 2022 (SMR 2022)

Prepared by the Middle East Regional Monitoring Agency (MIDRMA)

SUMMARY

The aim of the MID RVSM Safety Monitoring Report 2022 is to provide airspace safety review of the MID RVSM airspace and to highlight by means of arguments and supporting evidence that the implementation of RVSM in the ICAO Middle East Region is acceptably safe.

In addition, the MID RVSM SMR 2022 includes the MMR for all MIDRMA Member States and an assessment made of the non-RVSM approved aircraft that have been observed to operate within the ICAO Middle East RVSM airspace under MIDRMA supervision.

1. Executive Summary

1.1 The Middle East Regional Monitoring Agency (MIDRMA) issues the MID RVSM Safety Monitoring Report (SMR) on an annual basis, with endorsement from the Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG). The report aims to present evidence that all safety objectives outlined in the MID RVSM Safety Policy, in accordance with ICAO Doc 9574 (2nd Edition), continue to be met in operational services. However, for the SMR in 2022, MIDRMA faced difficulties in receiving usable Traffic Data Samples (TDS) from some member states, which prevented their inclusion due to corrupted Traffic Data Samples (TDS).

1.2 The results calculated for the MID RVSM SMR 2022 provide evidence that, based on the data and methods used, Safety Objectives 1 and 3 have been met. However, the MID RVSM airspace failed to meet Safety Objective No. 2 due to an isolated event that resulted in a high operational error period, causing the overall risk value to exceed the ICAO TLS.

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 the technical height risk is estimated 7.23×10^{-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 the overall risk is estimated 1.204×10^{-7} this is above the ICAO overall TLS.

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.

Middle East RVSM Airspace Estimated Annual Flying Hours = (2,161,356) Average Aircraft Speed = 441.36 kts			
Risk Type	Risk Estimation	ICAO TLS	Remarks
Technical Risk	7.23×10^{-11}	2.5×10^{-9}	Below ICAO TLS
Overall Risk	1.204×10^{-7}	5×10^{-9}	Above ICAO TLS

Conclusions:

- a. The estimated risk of collision associated with aircraft height- keeping performance is 7.23×10^{-11} and meets the ICAO TLS of 2.5×10^{-9} fatal accidents per flight hour (RVSM Safety Objective1).
- b. 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 1.204×10^{-7} this value is above the ICAO overall TLS of 5×10^{-9} fatal accidents per flight hour (RVSM Safety Objective 2).
- c. Although safety objective No 2 was not met for SMR 2022 due to an isolated event by none-RVSM approved aircraft which resulted long operational error period , based on currently-available information (Except for Tripoli, Kuwait and Beirut FIRs), there is no evidence available to MIDRMA that the continued operations of RVSM adversely affects the overall vertical risk of collision other than the violation of Non-RVSM approved aircraft to the MID RVSM airspace which is under continuous monitoring and review by MIDRMA.

1.3 Considerations on the Safety Objectives for MID RVSM SMRs

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 ~~is~~ are a number of assumptions that must be verified to ensure the reliability of the risk assessment. Verifying these assumptions deals primarily with monitoring of aircraft performance issues.

- 2- 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 compliant with RVSM technical requirements using a common compliance method. Monitoring group analysis is necessary to verify that the Minimum Aviation System Performance Standards (MASPS) for that group are valid. Aircraft that are made compliant with RVSM technical requirements on an individual basis are termed non-group.
- 3- RVSM Safety Objective 2, dealing with overall risk, takes into account the technical risk together with the risk from all other causes. In practice, this relates to human factors and the assessment of this parameter relies on adequate reporting of Large Height Deviation (LHD) Reports and the correct interpretation of events for input for CRM analysis.
- 4- RVSM Safety Objective 3 requires the RMA to monitor long-term trends and to identify potential future safety issues. This involves comparing the level of incidents that pose a risk for the current reporting period and highlighting any issues that should be carried forward as recommendations for future reports.

2 Scope:

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

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

FIRs/UIRs of the Middle East RVSM Airspace

*Note: Beirut and Tripoli FIRs excluded from the RVSM safety analysis due to lack of data. And Kuwait FIR was excluded due corrupted TDS.

2.1 The data sampling periods covered by SMR 2022 are displayed in the table below:

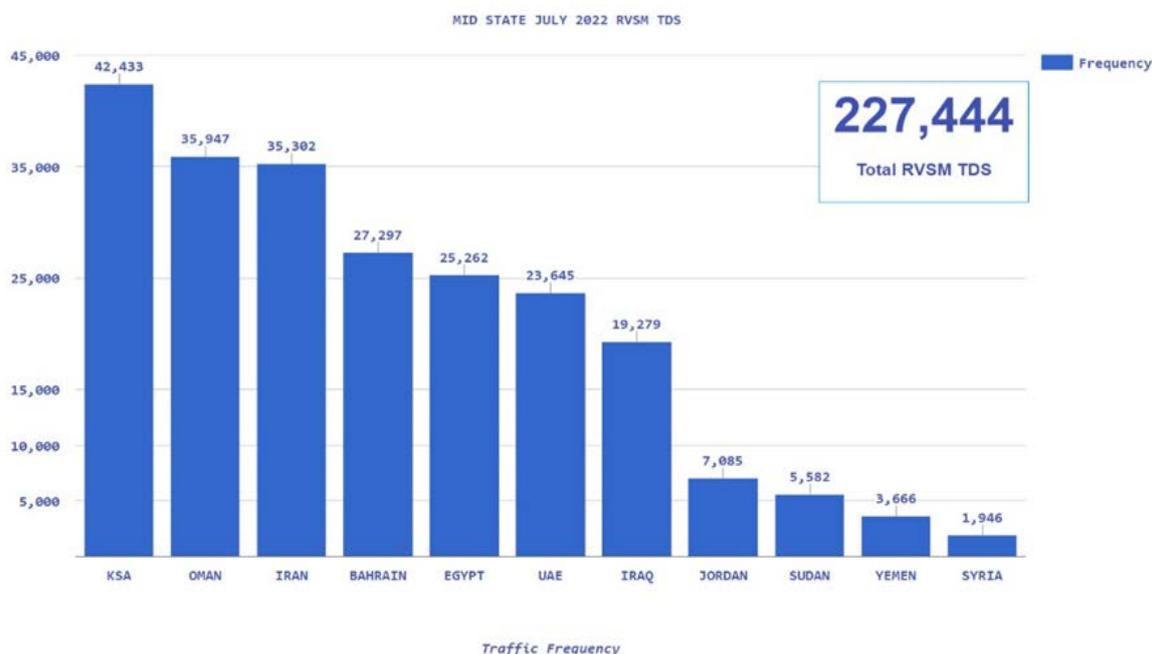
Report Elements	Time Period
Traffic Data Sample	01/06/2022 - 30/06/2022
Operational & Technical Errors	01/01/2022 - 31/12/2022

2.1.1 The descriptions of the traffic data collected from each MIDRMA Member State are depicted in table below:

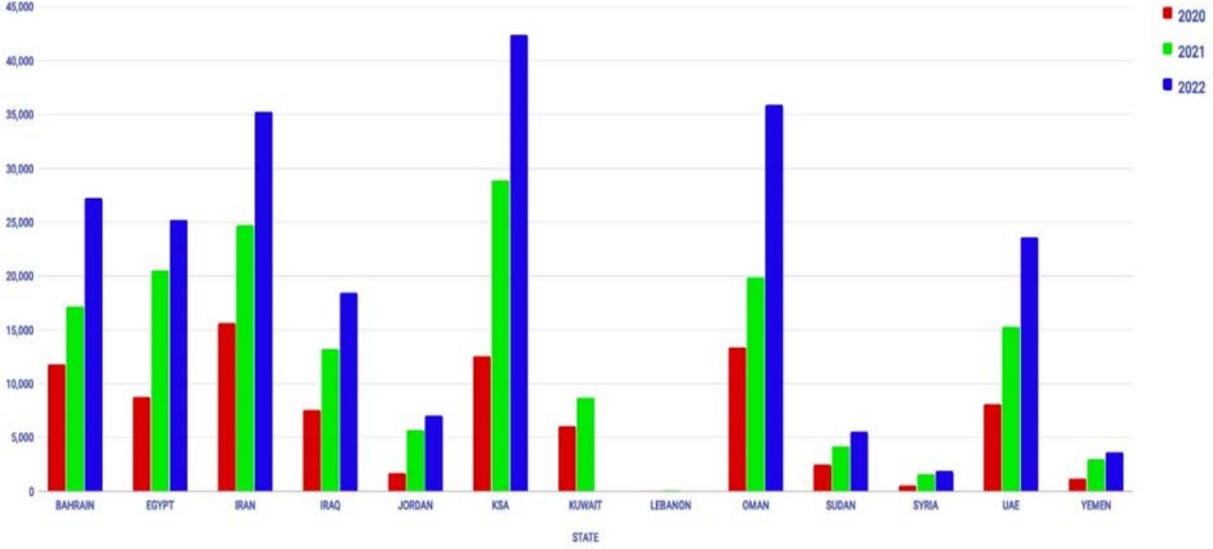
MID States	No. of Flights	Received Dates	Status
Bahrain FIR	27297	01/08/2022	Accepted (Corrected TDS)
Cairo FIR	25262	30/07/2022	Accepted
Amman FIR	7085	06/07/2022	Accepted
Muscat FIR	35947	27/07/2022	Accepted
Tehran FIR	35302	05/08/2022	Accepted
Khartoum FIR	5582	31/07/2022	Accepted (Corrected TDS)
Emirates FIR	23645	26/07/2022	Accepted
Damascus FIR	1946	22/07/2022	Accepted
Sana'a FIR	3666	28/07/2022	Accepted
Baghdad FIR	19279	05/07/2022	Accepted (Corrected TDS)
Kuwait FIR	-	13/08/2022	Rejected (Corrupted TDS)
Jeddah FIR	42433	28/07/2022	Accepted (Corrected TDS)
Beirut FIR	-		No Data Submitted
Tripoli FIR	-		No Data Submitted
Total	227,444		

Table 1: Details of the MID States RVSM Traffic Data Sample (TDS) for June 2022.

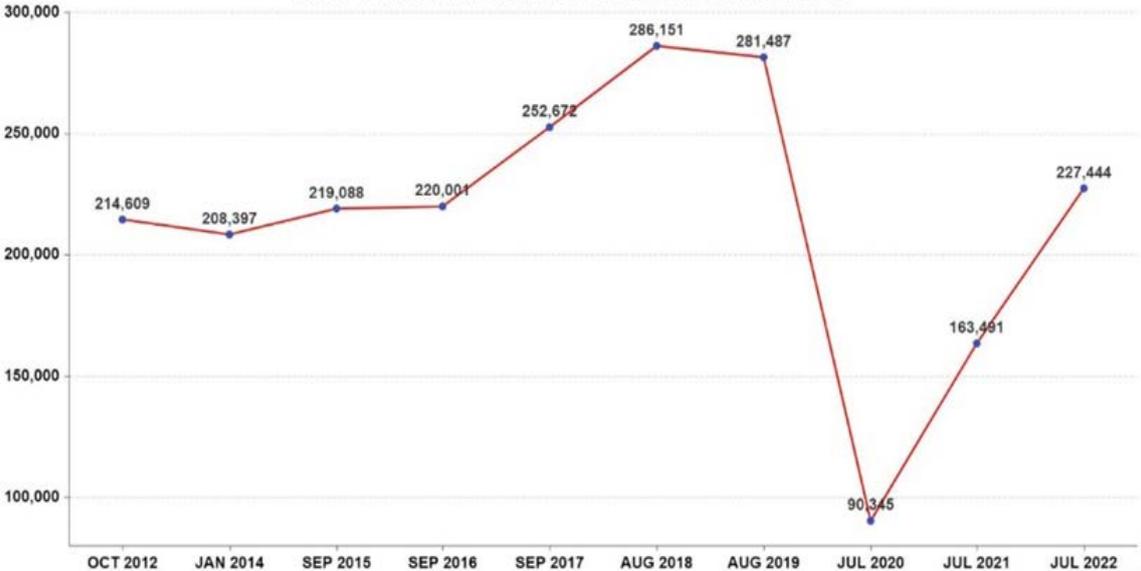
2.1.2 The graph below shows the description of the traffic data processed for each MIDRMA member state by the new upgraded version of the MID Risk Analysis Software (MIDRAS AI). A total of **227,444** flights were processed for the 11 Flight Information Regions (FIRs). These flights were carefully evaluated and processed to ensure accurate results based on the submitted data.



TREND OF THE NUMBER OF RVSM TDS OF 2020, 2021 and 2022



MID STATE RVSM TDS FROM 2012 TO 2022



#	MID FIRs	No of TDS July 2021	No of TDS June 2022	TDS Difference 2021 vs 2022	% of TDS Difference 2021 vs 2022
1	Bahrain FIR	17207	27297	10090	↑58.6 %
2	Cairo FIR	20568	25262	4694	↑22.8 %
3	Amman FIR	5750	7085	1335	↑23.2 %
4	Muscat FIR	19931	35947	16016	↑80.4 %
5	Tehran FIR	24768	35302	10534	↑42.5%
6	Khartoum FIR	4209	5582	1373	↑32.6 %
7	Emirates FIR	15331	23645	8314	↑54.2 %
8	Damascus FIR	1634	1946	312	↑19.1%
9	Sana'a FIR	3032	3666	634	↑20.9 %
10	Jeddah FIR	28943	42433	13490	↑46.6 %
11	Beirut FIR	85	NO TDS	-	-
12	Baghdad FIR	13283	19279	5996	↑45.1 %
13	Kuwait FIR	8750	Corrupted TDS	-	-
14	Tripoli FIR	NO TDS	NO TDS	-	-
	Total	163,491	227,444	72788	↑44.5 %

SMR 2021 vs SMR 2022 TDS Comparison Table

#	Waypoints	FIRs	Frequency
1	TASMI	BAGHDAD/KUWAIT	8466
2	DAVUS	BAHRAIN/KUWAIT	6977
3	SIDAD	BAGHDAD/KUWAIT	6500
4	NINVA	BAGHDAD/ANKARA	6159
5	RATVO	BAGHDAD/ANKARA	5980
6	TUMAK	BAHRAIN/EMIRATES	5340
7	ULADA	BAHRAIN/JEDDAH	5005
8	RASKI	MUSCAT/MUMBAI	4761
9	ALPOB	BAHRAIN/EMIRATES	4631
10	ULINA	CAIRO/AMMAN	4465
11	GABKO	TEHRAN/EMIRATES	4156
12	SODEX	EMIRATES/MUSCAT	4147
13	BONAM	TEHRAN/ANKARA	3992
14	MENSA	EMIRATES/MUSCAT	3949
15	KITOT	CAIRO/JEDDAH	3801
16	PASOV	EMIRATES/MUSCAT	3619
17	DEESA	AMMAN/JEDDAH	3567
18	NALPO	BAHRAIN/EMIRATES	3514
19	LONOS	BAHRAIN/KUWAIT	3452
20	DAROR	BAHRAIN/JEDDAH	3341

Top 20 Busiest Points in the MID RVSM Airspace

2.1.3 It is truly unfortunate that, despite issuing the RVSM SMR for the region for many years, MIDRMA still faces many difficulties and challenges in receiving TDS from some member states in the required format. The requirement to collect TDS is repeated every year in the same format and with no changes, but the TDS received often ~~contain~~contains many errors and, in some cases, are completely corrupted and cannot be used for safety analysis.

2.1.4 MIDRMA was forced to reject the TDS from Kuwait, which was corrupted with many errors and missing flights and could not be processed in MIDRAS. Meanwhile, the TDS from Iraq and Sudan were temporarily rejected to correct all errors. The meeting should note that despite several reminders being sent to the focal point to comply with the MIDANPIRG Conclusion 19/2 and the ICAO State Letter issued to submit the requested TDS, no TDS was received from Lebanon.

2.1.5 Compiling the TDS and verifying its validity and suitability for use is a laborious task that requires a great deal of effort, time, and precision to produce reliable outcomes. As a result, MIDRMA requires all member states to double-check their data before sending it to avoid rejection and delay work on the SMR.

2.2 Technical Height Keeping Performance Risk Assessment

RVSM Safety Objective 1

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

The result shows the risk of collision due to technical height-keeping performance is estimated to be 7.23×10^{-11} fatal accidents per flight hour, which is less than the ICAO TLS 2.5×10^{-9} .

MID RVSM SMRs Technical Risk Values				
Year 2006	Year 2008	Year 2010	Year 2011	Year 2012/13
2.17×10^{-14}	1.93×10^{-13}	3.96×10^{-15}	5.08×10^{-14}	6.37×10^{-12}
Year 2014	Year 2015	Year 2016	Year 2017	Year 2018
3.18×10^{-12}	3.056×10^{-10}	6.347×10^{-11}	4.966×10^{-11}	1.562×10^{-11}
Year 2019	Year 2020	Year 2021	Year 2022	
2.012×10^{-13}	9.185×10^{-13}	3.509×10^{-12}	7.23×10^{-11}	

According to the technical risk values as shown in the above table the TLS values still meet the ICAO TLS.

From June 2022 TDS, the following were calculated:

Average Aircraft Diameter (lambda xy): 0.028065 NM **170.53 ft**

Average Aircraft Wingspan (lambda y): 0.025946 NM **157.65 ft**

Average Aircraft Height (lambda z): 0.0080463 NM **48.89 ft**

Number of Flights involved: **227,444**

Flying Time: **177,093 hours**

Flying Distance: **80,635,248 NM**

Average Speed: **440.01 Kts**

Average Passing Frequency: **1.01647E-001**

2.2.1 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. $P_z(1000)$ – the probability of vertical overlap due to technical height-keeping performance, between aircraft flying 1000 ft. separation in MID RVSM airspace is estimated **1.925×10^{-9}** valid and is less than the ICAO requirement of **1.7×10^{-8}** .
- c. The monitoring target for the MID RVSM height-monitoring programme is an on-going process.
- d. The input data used by the CRM is valid.
- e. An adequate process is in place to investigate and correct problems in aircraft technical height-keeping performance.

2.2.2 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 $P_y(0)$ for the SMR 2021 has the following to consider:

- a. The MIDRMA continued to calculate the probability of lateral overlap $P_y(0)$ for all the MID RVSM airspace as per the ICAO methodology developed for this purpose and derived by the MID Risk Analysis Software (MIDRAS).
- b. The MIDRMA calculated the probability of lateral overlap $P_y(0)$ for each MIDRMA Member State and found all the results are valid:

1- Bahrain FIR

Passing Frequency (n_equiv): 4.57187E-002

Probability of Lateral Overlap ($P_y(0)$): 0.16872

2- Cairo FIR

Passing Frequency (n_equiv): 2.40516E-001

Probability of Lateral Overlap ($P_y(0)$): 0.16112

Baghdad FIR

Passing Frequency (n_equiv): 1.66367E-002

Probability of Lateral Overlap ($P_y(0)$): 0.17745

-10-

3- Tehran FIR

Passing Frequency (n_equiv): 4.57844E-002
Probability of Lateral Overlap (Py(0)): 0.16025

4- Amman FIR

Passing Frequency (n_equiv): 3.68688E-002
Probability of Lateral Overlap (Py(0)): 0.14975

5- Muscat FIR

Passing Frequency (n_equiv): 3.05063E-001
Probability of Lateral Overlap (Py(0)): 0.16736

6- Jeddah FIR

Passing Frequency (n_equiv): 2.79243E-002
Probability of Lateral Overlap (Py(0)): 0.15313

7- Khartoum FIR

Passing Frequency (n_equiv): 8.41044E-002
Probability of Lateral Overlap (Py(0)): 0.18605

8- Damascus FIR

Passing Frequency (n_equiv): 2.40182E-001
Probability of Lateral Overlap (Py(0)): 0.12036

9- Emirates FIR

Passing Frequency (n_equiv): 2.54162E-002
Probability of Lateral Overlap (Py(0)): 0.16413

10- Sana'a FIR

Passing Frequency (n_equiv): 2.92994E-001
Probability of Lateral Overlap (Py(0)): 0.18113

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

Average Passing Frequency: **1.01647E-001**

2.2.3 Pz(1000) Compliance

The Pz(1000) is the probability that two aircraft at adjacent RVSM flight levels will lose vertical separation due to technical height keeping errors. The value of the probability of vertical overlap Pz(1000), based on the actual observed ASE and typical AAD data is estimated to be of **1.925 x 10⁻⁹**.

This value meets the Global System Performance Specification that the probability that two aircraft will lose procedural vertical separation of 1000ft should be no greater than **1.7x10⁻⁸**.

The MIDRMA continues to issue the minimum monitoring requirements (MMRs) through the automated MMR software which is programmed to address the MIDRMA member states with their updated requirements according to the latest RVSM approvals received, the MMR table valid for 01st May 2023 is available in [para 2.4.7](#).

Note: All member states are required to check and comply with their MMR through the MIDRMA website (www.midrma.com).

2.2.4 Conclusions on Technical Vertical Collision Risk:

- a. The current computed vertical-collision risk due to technical height-keeping performance meets the ICAO TLS.
- b. The probability of vertical-overlap estimate, Pz(1000), satisfies the global system performance specification.

- c. Most monitoring groups are complying with ICAO TVE component requirements (also known as technical height-keeping group requirements).

2.2.5 Recommendations for Safety Objective 1:

- a. The MIDRMA shall continue to review the content and structure of its aircraft monitoring groups (on going task).
- b. The MIDRMA will continue to keep the methods of calculating the technical CRM parameters and the risk due to technical height keeping errors under review and update all parameters and data used in the MID Risk Analysis Software (MIDRAS AI).

Note: New Upgraded MIDRAS AI is fully operational and used by the MIDRMA for the risk analysis.

- c. The MIDRMA shall carry out continuous height monitoring survey and investigation concerning aircraft flying within the MID RVSM airspace by collecting the TDS from member states offered to submit their RVSM TDS on a monthly basis.
- d. More MIDRMA Member states other than Bahrain, Iraq and UAE are encouraged to send their monthly RVSM traffic data to explore more possible violations to the MID RVSM airspace.

2.3 Assessment of overall risk due to all causes against the TLS of 5×10^{-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 5×10^{-9} fatal accidents per flight hour.

The value computed for the overall risk is estimated 1.204×10^{-7} this meets RVSM Safety Objective 2.

Overall Risk Values				
Year 2006	Year 2008	Year 2010	Year 2011	Year 2012/13
Not calculated	4.19×10^{-13}	6.92×10^{-12}	1.04×10^{-11}	3.63×10^{-11}
Year 2014	Year 2015	Year 2016	Year 2017	Year 2018
4.91×10^{-11}	7.351×10^{-10}	5.691×10^{-10}	4.518×10^{-11}	9.845×10^{-11}
Year 2019	Year 2020	Year 2021	Year 2022	
8.345×10^{-10}	5.206×10^{-10}	4.073×10^{-10}	1.204×10^{-7} (Above ICAO TLS)	

2.3.1 Conclusions regarding the overall vertical risk:

- a. The overall risk of collision due to all causes, including technical risk and all risks due to operational errors and in-flight contingencies in the MID RVSM was calculated and failed to meet Safety Objective No. 2 due to an isolated event that resulted in a high operational error period, causing the overall risk value to exceed the ICAO TLS.

Note: The calculated overall risk exceeded the ICAO TLS due to only ONE LHD report.

2.3.2 Recommendations Applicable to Safety Objective 2:

- a. The MIDRMA should continue to encourage states to provide Large Height Deviation Reports (LHD) of all categories, not only those related to handover issues.
- b. As some member states have failed to respond to their related LHD reports, the MIDRMA will follow-up through the upgraded LHD online reporting system to monitor and alert member states about reports that require investigation. The system will also notify states of their deadline to respond to the concerned reporting ATCU.
- c. The MIDRMA, in coordination with the Member States, will ensure that incidents and violations that have a direct impact on the implementation of RVSM within the MID Region are continuously reported through the MIDRMA LHD online reporting system in a timely manner. This will facilitate operational safety assessment analysis.

2.3.3 Large Height Deviation Reports (LHDs) 2022

2.3.3.1 The level of collision risk resulting from errors in ATC instructions, emergency and operational procedures in the MID RVSM airspace needs to be assessed, in addition to that resulting from technical height-keeping deviations. The primary source of reporting Large Height Deviation is the ATC units providing air traffic control services in the airspace where RVSM is applied. All MIDRMA Member States are required to submit Large Height Deviation Reports which occurred in their FIRs on a monthly basis (preferably as soon as they occur), even if none were reported during the month of reporting.

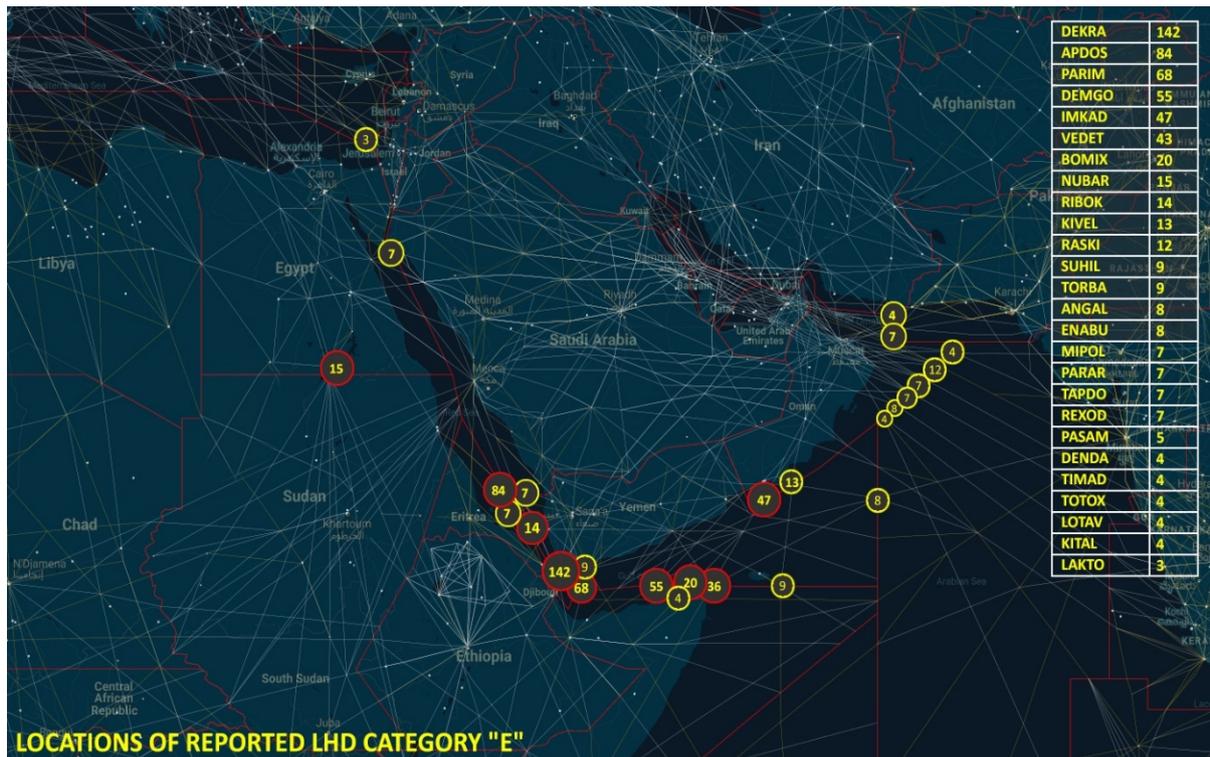
2.3.3.2 The vertical risk estimation due to atypical errors has been demonstrated to be the major contributor to the overall vertical-risk estimation for the ICAO MID RVSM airspace. The MIDRMA noticed good improvement from some member states that did not previously submit LHD reports equivalent to their high volume of traffic, while some other members remain the same and have not shown much improvement despite continuous monthly reminders sent to all member states.

2.3.3.3 The estimation of total risk (Safety Objective 2) combines the results from Safety Objective 1 with the estimation of risk due to all other factors. This second component, often termed operational risk, is dependent on many factors, including airspace configuration, traffic densities, ATC procedures, individual controller/pilot actions, and specific sector operational characteristics. The operational risk is estimated by evaluating the magnitude and duration of events extracted from operational incident reports which are transformed into Large Height Deviation reports.

2.3.3.4 The table below presents a summary of the operational risk associated with Large Height Deviation (LHD) reports by LHD categories. These reports are used to calculate the overall vertical collision risk for the MID RVSM airspace.

LHD Cat. Code	Large Height Deviation (LHD) Categories	No. of LHDs	LHD Duration (Sec.)
A	Flight crew fails to climb or descend the aircraft as cleared	3	35
B	Flight crew climbing or descending without ATC clearance	2	60
C	Incorrect operation or interpretation of airborne equipment	1	40
D	ATC system loop error	-	-
E	ATC transfer of control coordination errors due to human factors	14	660
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	1	30
I	Turbulence or other weather related cause	-	-
J	TCAS resolution advisory and flight crew correctly responds	-	-
K	TCAS resolution advisory and flight crew incorrectly responds	-	-
L	ACFT being provided with RVSM separation is not RVSM approved	1	3420
M	Other	1	40
Total		21	4285

Summary of Operational Risk associated with Large Height Deviation Reports



2.3.3.5 The MIDRMA has continued to monitor the LHD reports at the eastern boundaries of Muscat FIR, which are filed by Mumbai and Muscat ACCs. The MIDRMA would like to draw the meeting's attention to the fact that the Muscat/Mumbai RVSM safety protocol has been open since 2017, and it is time to make a decision to close it provided the risk is eliminated or reduced to its bare minimum. However, the MIDRMA cannot see that the risk has been reduced without confirmation of installing OLDI/AIDC in both ACCs, tables 1 and 2 below reflects the LHD reports filed by both ACC related to each other during this SMR reporting cycle.

Table 1: LHD Reports Filed by Muscat Related to Mumbai

#	ID	Date of Occ	Reported By	Related to	Location	Nature of the occurrence:	Category
1	10527	6/2/2022	Muscat	Mumbai	PARAR	Revised FL Not Coordinated	E
2	10528	18/02/2022	Muscat	Mumbai	KITAL	ACFT Entered FIR Without Coordination	E
3	10529	27/02/2022	Muscat	Mumbai	RASLI	ACFT Entered FIR Without Coordination	E
4	10589	1/3/2022	Muscat	Mumbai	LOTAV	Revised FL Not Coordinated	E
5	10590	7/3/2022	Muscat	Mumbai	TOTOX	Revised FL Not Coordinated	E
6	10591	7/3/2022	Muscat	Mumbai	TOTOX	Revised Estimate Not Coordinated	E
7	10592	27/03/2022	Muscat	Mumbai	RASKI	Revised FL Not Coordinated	E
8	10837	1/7/2022	Muscat	Mumbai	TOTOX	ACFT Entered FIR Without Coordination	E
9	10838	3/7/2022	Muscat	Mumbai	KITAL	ACFT Entered FIR Without Coordination	E
10	10839	7/7/2022	Muscat	Mumbai	PARAR	Revised FL Not Coordinated	E
11	10840	17/07/2022	Muscat	Mumbai	REXOD	ACFT Entered FIR Without Coordination	E
12	10841	20/07/2022	Muscat	Mumbai	RASKI	Revised FL Not Coordinated	E
13	10842	20/07/2022	Muscat	Mumbai	LOTAV	ACFT Entered FIR Without Coordination	E
14	10843	27/07/2022	Muscat	Mumbai	PARAR	Revised Estimate Not Coordinated	E
15	10844	28/07/2022	Muscat	Mumbai	RASKI	Revised FL Not Coordinated	E
16	10845	30/07/2022	Muscat	Mumbai	RASKI	Revised FL Not Coordinated	E
17	10907	8/8/2022	Muscat	Mumbai	LOTAV	Revised Estimate Not Coordinated	E
18	10908	12/8/2022	Muscat	Mumbai	LOTAV	ACFT Entered FIR Without Coordination	E
19	10909	15/08/2022	Muscat	Mumbai	RASKI	Revised FL Not Coordinated	E
20	10910	16/08/2022	Muscat	Mumbai	REXOD	Revised FL Not Coordinated	E
21	10911	16/08/2022	Muscat	Mumbai	RASKI	ACFT Entered FIR Without Coordination	E
22	10912	18/08/2022	Muscat	Mumbai	TOTOX	Revised FL Not Coordinated	E
23	10913	20/08/2022	Muscat	Mumbai	RASKI	Revised FL Not Coordinated	E
24	10914	25/08/2022	Muscat	Mumbai	KITAL	ACFT Entered FIR Without Coordination	E
25	10915	26/08/2022	Muscat	Mumbai	PARAR	ACFT Entered FIR Without Coordination	E
26	10916	28/08/2022	Muscat	Mumbai	PARAR	ACFT Entered FIR Without Coordination	E
27	11010	2/10/2022	Muscat	Mumbai	REXOD	ACFT Entered FIR Without Coordination	E
28	11011	4/10/2022	Muscat	Mumbai	KITAL	ACFT Entered FIR Without Coordination	E
29	11012	4/10/2022	Muscat	Mumbai	REXOD	ACFT Entered FIR Without Coordination	E
30	11013	8/10/2022	Muscat	Mumbai	RASKI	ACFT Entered FIR Without Coordination	E
31	11014	10/10/2022	Muscat	Mumbai	REXOD	Revised Estimate Not Coordinated	E
32	11015	10/10/2022	Muscat	Mumbai	RASKI	ACFT Entered FIR Without Coordination	E
33	11016	12/10/2022	Muscat	Mumbai	PARAR	Revised FL Not Coordinated	E
34	11017	15/10/2022	Muscat	Mumbai	RASKI	ACFT Entered FIR Without Coordination	E
35	11018	17/10/2022	Muscat	Mumbai	REXOD	ACFT Entered FIR Without Coordination	E

36	11019	16/10/2022	Muscat	Mumbai	PARAR	Revised FL Not Coordinated	E
37	11020	17/10/2022	Muscat	Mumbai	REXOD	Revised FL Not Coordinated	E
38	11021	19/10/2022	Muscat	Mumbai	RASKI	ACFT Entered FIR Without Coordination	E

Table 2: LHD Reports Filed by Mumbai Related to Muscat

#	ID	Date of Occurrence	Reported By	Related to	Location	Nature of the occurrence:	
1	LHD001275	9/1/2022	Mumbai	Muscat	TOTOX	No or late estimate time revision	E
2	LHD001276	9/1/2022	Mumbai	Muscat	REXOD	No or late estimate time revision	E
3	LHD001277	9/1/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
4	LHD001278	31/01/2022	Mumbai	Muscat	TOTOX	No or late FL revision	E
5	LHD001300	27/02/2022	Mumbai	Muscat	KITAL	No or late FL revision	E
6	LHD001301	23/02/2022	Mumbai	Muscat	PARAR	No or late FL revision	E
7	LHD01355	3/3/2022	Mumbai	Muscat	LOTAV	No or late FL revision	E
8	LHD001356	5/3/2022	Mumbai	Muscat	KITAL	No transfer information	E
9	LHD001357	5/3/2022	Mumbai	Muscat	KITAL	No transfer information	E
10	LHD001358	9/3/2022	Mumbai	Muscat	PARAR	No transfer information	E
11	LHD001359	12/3/2022	Mumbai	Muscat	PARAR	No or late FL revision	E
12	LHD001360	13/03/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
13	LHD001361	19/03/2022	Mumbai	Muscat	LOTAV	No transfer information	E
14	LHD001363	27/02/2022	Mumbai	Muscat	RASKI	No transfer information	E
15	LHD001365	18/02/2022	Mumbai	Muscat	KITAL	No transfer information	E
16	LHD001367	6/2/2022	Mumbai	Muscat	PARAR	No or late FL revision	E
17	LHD001368	27/03/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
18	LHD001369	7/3/2022	Mumbai	Muscat	TOTOX	No or late estimate time revision	E
19	LHD001372	7/3/2022	Mumbai	Muscat	TOTOX	No or late FL revision	E
20	LHD001373	1/3/2022	Mumbai	Muscat	LOTAV	No or late FL revision	E
21	LHD001401	29/04/2022	Mumbai	Muscat	LOTAV	No or late FL revision	E
22	LHD001446	3/5/2022	Mumbai	Muscat	RASKI	No transfer information	E
23	LHD001447	8/5/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
24	LHD001450	27/05/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
25	LHD001451	30/05/2022	Mumbai	Muscat	REXOD	No transfer information	E
26	LHD001472	15/06/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
27	LHD001518	1/7/2022	Mumbai	Muscat	TOTOX	No transfer information	E
28	LHD001519	3/7/2022	Mumbai	Muscat	KITAL	No transfer information	E
29	LHD001520	7/7/2022	Mumbai	Muscat	PARAR	No transfer information	E
30	LHD001521	17/07/2022	Mumbai	Muscat	REXOD	No transfer information	E
31	LHD001522	20/07/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
32	LHD001523	20/07/2022	Mumbai	Muscat	LOTAV	No transfer information	E
33	LHD001524	27/07/2022	Mumbai	Muscat	PARAR	No or late estimate time revision	E
34	LHD001525	28/07/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
35	LHD001526	30/07/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
36	LHD001566	14/08/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
37	LHD001567	17/08/2022	Mumbai	Muscat	PARAR	No or late FL revision	E
38	LHD001570	28/08/2022	Mumbai	Muscat	REXOD	No or late FL revision	E

39	LHD001571	30/08/2022	Mumbai	Muscat	REXOD	No or late FL revision	E
40	LHD001572	30/08/2022	Mumbai	Muscat	TOTOX	No or late FL revision	E
41	LHD001574	21/07/2022	Mumbai	Muscat	KITAL	No or late FL revision	E
42	LHD001661	2/9/2022	Mumbai	Muscat	LOTAV	No or late FL revision	E
43	LHD001664	19/9/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
44	LHD001665	22/9/2022	Mumbai	Muscat	PARAR	No or late FL revision	E
45	LHD001666	24/9/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
46	LHD001667	27/9/2022	Mumbai	Muscat	PARAR	No or late FL revision	E
47	LHD001668	1/10/2022	Mumbai	Muscat	REXOD	No or late FL revision	E
48	LHD001669	7/10/2022	Mumbai	Muscat	KITAL	No or late FL revision	E
49	LHD001670	8/10/2022	Mumbai	Muscat	TOTOX	No transfer information	E
50	LHD001671	15/10/2022	Mumbai	Muscat	TOTOX	No or late FL revision	E
51	LHD001672	19/10/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
52	LHD001673	19/10/2022	Mumbai	Muscat	LOTAV	No or late FL revision	E
53	LHD001696	2/11/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
54	LHD001698	13/11/2022	Mumbai	Muscat	TOTOX	No or late FL revision	E
55	LHD001778	4/12/2022	Mumbai	Muscat	TOTOX	No or late FL revision	E
56	LHD001779	5/12/2022	Mumbai	Muscat	RASKI	No transfer information	E
57	LHD001780	15/12/2022	Mumbai	Muscat	RASKI	No or late FL revision	E
58	LHD001781	21/12/2022	Mumbai	Muscat	TOTOX	No or late FL revision	E
59	LHD001782	14/12/2022	Mumbai	Muscat	PARAR	No or late FL revision	E
60	LHD001783	25/12/2022	Mumbai	Muscat	PARAR	No or late FL revision	E
61	LHD001784	26/12/2022	Mumbai	Muscat	LOTAV	No or late FL revision	E

2.3.3.6 The latest updated received from Mumbai and Oman ATMUs concerning the OLDI/AIDC connections is still pending due to computability issues from both sides and units are working hard to rectify this issue.

2.3.3.7 The magnitude and duration of the submitted LHD reports have impacted the overall risk (Safety Objective 2). In particular, the LHD submitted by Sana'a ACC against Mogadishu was very high. This was due to a non-RVSM approved IL76 belonging to the China Airforce, which infringed the MID RVSM airspace within Sana'a FIR. The aircraft was transferred from Mogadishu ACC to Sana'a ACC without a flight plan and without prior coordination at FL310 for a period of 3420 seconds. This non-RVSM approved IL76 was spotted by Muscat ATC at the FIR boundary entry point and was immediately instructed to descend below the RVSM airspace.

2.3.2.7.1 The investigation carried out by Sana'a ACC showed that the main reasons which led to the incident are the followings:

- a. State/Military aircraft (type IL76) transferred by Mogadishu at an RVSM level;
- b. No FPL received by Sana'a ACC;
- c. No warning is available regarding the RVSM status of this IL76; and
- d. Sana'a ACC provides ATS procedurally (non-radar).

2.3.3.7.2 This incident was addressed to the last MIDRMA Board/18 meeting which was held in Doha, Qatar 19-20 September 2022 while reviewing the SMR 2022 initial results and agreed with the following mitigation measures:

- a. MIDRMA to open a safety protocol between Sana'a and Mogadishu, in coordination with the AFI RMA (ARMA), ICAO MID and ESAF Regional Offices.
- b. MIDRMA to provide necessary training and awareness to Yemen.
- c. States are urged to comply with the Minimum Monitoring Requirements (MMR).
- d. MIDRMA to improve the format and content of the Monthly Bulletin containing the List of Non-RVSM approved Aircraft; in particular by adding the information related to the State of Registry and Operators, as well as to add a warning on the types of aircraft with a high number of violations observed.
- e. The results of the investigation related to the IL76 incident should be shared and used as a lesson learned to avoid similar cases being repeated in the future.
- f. MIDRMA to identify the areas where possible intruders might operate within the MID RVSM Airspace (including ACFT types, FIRs, interface, etc.).

2.3.3.7.3 The ICAO MID and ICAO ESAF Offices organized a meeting in Cairo, Egypt (31 January – 2 February 2023) attended by the ATMUs of Djibouti, Ethiopia, Oman, Saudi Arabia, Somalia, and Yemen, as well as three (3) international organizations (IATA, ARMA, and MIDRMA). The objective of the meeting was to address the ATM issues in the interface area between the states in the MID Region and EASF Region, particularly the increased number of LHD reports submitted by Sana'a ACC. The meeting urged the concerned states to address and resolve the issue in coordination with the relevant regional offices and RMAs.

2.3.3.7.4 The MIDRMA presented all the archived LHD reports filed by Yemen and requested that all possible solutions be explored and agreed upon in order to reduce the number of these LHDs as soon as possible. This is because it has started to affect the overall ICAO TLS. The attendees agreed to continue arranging other meetings to discuss this issue with neighboring ACCs.

2.3.3.8 During MIDRMA Board 17 & 18, it was pointed out that there was a lack of response to the received LHD reports through the online system, despite the feature of direct response to the reporting unit being available to ensure that all responses are archived and referenced when needed. Unfortunately, the vast majority of Member States continue to ignore this feature and do not investigate or reply to the received LHD reports."

2.3.3.9 The table below reflects the LHD reports received from all MIDRMA member states from 01st January until 31st December 2022:

MID FIRs	No. of Reported LHDs	No. of Related LHDs
Bahrain	5	NIL
Baghdad	1	1
Amman	2	2
Tehran	2	8
Cairo	26	13
Damascus	NIL	1
Khartoum	9	17
Kuwait	NIL	4
Muscat	53	41
Jeddah/ Riyadh	11	102
Tripoli	NIL	NIL
Emirates	5	1
Sana'a	424	3

2.3.4 Assessment of Non-RVSM Approved Aircraft 2022

2.3.4.1 The MIDRMA conducts systematic reviews of the operator compliance with State RVSM approvals within the ICAO Middle East Region as part of the tasks and responsibilities of a Regional Monitoring Agency (RMA), as specified in ICAO Docs. 9937 and 9574. In order to protect the safety of the RVSM airspace, these checks are performed to detect aircraft that are not approved and using the RVSM airspace.

2.3.4.2 Although daily compliance monitoring of the entire ICAO Middle East airspace would be preferable, challenges in collecting traffic information make this impracticable. According to ICAO Doc 9937, the responsible RMA must monitor full airspace compliance for at least 30 days per year, while MIDRMA fulfills this responsibility on a monthly basis.

2.3.4.3 MIDRMA stipulates that there must be two sources of data to track operator adherence to state RVSM approval:

- a- List of operators, types and registration marks of aircraft operating in the RVSM airspace, and
- b- The latest worldwide RVSM approvals database.

2.3.4.4 The first requirement is met once a year in the form of the traffic data sample used for the MID RVSM risk analysis, as well as the monthly RVSM TDS received from Bahrain, IRAQ, and the UAE, though aircraft registrations are missing in much of the data from some Member States. As a result, this information cannot confirm the true state of non-compliant traffic in some FIR regions.

2.3.4.5 MIDRMA uses Bahrain, Baghdad, and Emirates FIRs RVSM traffic data as the primary source for checking non-RVSM approved aircraft in the MIDRMA area of responsibility because it is difficult to obtain traffic data from all Member States on a monthly basis. The MIDRMA would like to take this opportunity to thank Bahrain CAA, IRAQ CAA, and UAE General Civil Aviation Authority for sending their FIRs RVSM

traffic on a monthly basis for inspecting the noncompliant aircraft in the region. The data received from these Member States is consistently complete and in the proper format.

Note: Recently, Jeddah sent a trial RVSM TDS, which will improve MIDRMA's scrutiny of non-RVSM approved aircraft.

2.3.4.6 The second requirement in 2.6.3.3 is the combined approvals database containing the approval records provided by all RMAs (Worldwide Combined RVSM Approvals Database) is used to verify the RVSM approval status of the operations identified in the traffic movement data sample. The combined global RVSM database updated by all RMAs on a regular basis.

2.3.4.7 To ensure that traffic data only includes valid RVSM approvals, it is compared to the most recent global RVSM approval database. The processes that fit this description but didn't have valid RVSM approvals will be listed for further investigation and confirmation. Cross-checks with the MIDRMA's latest updated RVSM approvals, typos in traffic data, code sharing, and lease agreements between airline operators who will maintain aircraft under a duplicate RVSM approval in two countries at the same time are all part of the verification process. The appropriate Civil Aviation Airworthiness Authority will be contacted to clarify the discrepancy and request a response with their findings and the corrective measures being taken to resolve the issue once the verification process is finished and our findings are validated.

2.3.4.8 The primary systemic cause of the non-conformity of the missing approvals, according to the findings of MIDRMA's investigation, is the delay in notifying the appropriate RMA before the aircraft begin to operate within the RVSM airspace. These results highlight how crucial it is for states to promptly inform the concerned RMA of the operator approval status.

2.3.4.9 When the findings of MIDRMA have been checked and verified, official letters or emails will be sent to the following:

- a- MIDRMA Airworthiness Inspectors responsible for the non-RVSM approved aircraft found operating in ICAO MID RVSM airspace or outside the region if reported by other RMAs, and will be required to respond with the results of their investigations.
- b- All RMAs responsible for violating aircraft must conduct investigations into noncompliant aircraft operations in the MID RVSM airspace and report their findings.

2.3.4.10 This type of scrutiny, which is carried out using the monthly RVSM traffic data received from Bahrain, Iraq, and the UAE, assisted MIDRMA in tracking down violating aircraft and alerting relevant air traffic control units of those aircraft.

2.3.4.11 The tables below reflect the MIDRMA Bulletin of the Non-RVSM Approved aircraft observed operating within the ICAO MID RVSM airspace and in the RVSM airspace of other RMAs, the expectation from this analysis related to States exercising operational authority would act to address the approval issue well in advance and before allowing the approved aircraft to operate within the RVSM airspace to avoid undesirable actions against legitimate operators and also States that find such aircraft operating in their airspace will take appropriate action.

NON-RVSM approved aircraft – Responsibility of MIDRMA Member States

#	Observed Operating RVSM in	ACFT Reg.	ICAO Type	First Observed on	Responsible State
1	Jeddah	STALL	CRJ1	11-06-2022	SUDAN
2	Khartoum, Jeddah	STTAH	B737	06-01-2022	SUDAN
3	EURRMA	5ALEX	BE200	09-07-2022	LIBYA
4	Baghdad, Damascus	YKATA	IL76	01-01-2020	SYRIA

NON-RVSM approved aircraft – Responsibility of other RMAs

#	Observed in FIR	ACFT Reg.	ICAO Type	First Observed on	Responsible RMA
1	Sana'a	21140	IL76	19-06-2022	CHINARMA
2	Bahrain, Emirates	40001A	C17	25-01-2020	AAMA
3	Emirates	60208A	C17	30-03-2020	AAMA
4	Emirates	5NBOD	GLF4	28-01-2022	AFIRMA
5	Cairo	5YFAN	CRJ2	15-07-2020	AFIRMA
6	Khartoum	5YWBH	C56X	14-07-2020	AFIRMA
7	Cairo	ETATF	B350	08-07-2020	AFIRMA
8	Sana'a	ZSCQP	CRJ9	07-07-2020	AFIRMA
9	Emirates	FAB2857	KC39	22-05-2022	CARSAM
10	Emirates	CNTMX	E35L	29-12-2021	EURRMA
11	Baghdad, Emirates	EW550TH	IL76	04-12-2021	EURRMA
12	Cairo	UR11316	AN12	22-07-2020	EURRMA
13	Cairo	URAZN	B753	01-02-2022	EURRMA
14	Cairo	URAZO	B753	01-02-2022	EURRMA
15	Cairo	URAZR	B77W	03-02-2022	EURRMA
16	Bahrain, Emirates, Baghdad	URFSA	IL76	09-05-2021	EURRMA
17	Bahrain, Baghdad	URFSC	IL76	28-09-2021	EURRMA
18	Bahrain, Emirates	URFSC	IL76	05-12-2021	EURRMA
19	Bahrain, Emirates	URFSD	IL76	29-09-2021	EURRMA
20	Emirates	URFSD	IL76	24-12-2021	EURRMA
21	Emirates	URSQO	B738	02-12-2021	EURRMA
22	Cairo	80002A	C17	23-07-2020	MAAR
23	Cairo, Muscat	CB8001	C17	29-07-2020	MAAR
24	Cairo, Muscat, Emirates	CB8004	C17	24-07-2020	MAAR
25	Bahrain	IN307	IL38	03-12-2020	MAAR
26	Muscat	K3604	E35L	17-07-2020	MAAR
27	Emirates	KJ3452	IL76	03-08-2020	MAAR
28	Emirates	KJ3454	IL76	16-03-2020	MAAR
29	Bahrain, Emirates	N312JE	CL60	25-08-2022	NAARMO
30	Bahrain, Emirates	N46HB	F9000	22-08-2022	NAARMO
31	Bahrain, Emirates	N88YH	CRJ2	17-08-2022	NAARMO
32	Cairo	N1112B	B350	16-07-2020	NAARMO
33	Emirates	N131GA	GLF5	14-03-2020	NAARMO
34	Emirates	N145DB	E35L	22-01-2022	NAARMO

35	Emirates	N181CK	GLEX	17-12-2020	NAARMO
36	Bahrain, Emirates, Baghdad	N298RB	GLF4	14-05-2021	NAARMO
37	Baghdad, Emirates	N298RB	GLF4	09-01-2022	NAARMO
38	Emirates	N302PJ	H25B	01-07-2021	NAARMO
39	Emirates	N405LL	H25B	29-05-2022	NAARMO
40	Emirates	N410F	FA8X	09-05-2022	NAARMO
41	Emirates	N411VP	EA50	01-05-2022	NAARMO
42	Bahrain, Emirates	N44UA	CL60	07-06-2020	NAARMO
43	Emirates	N5062	SF50	14-01-2020	NAARMO
44	Bahrain, Baghdad	N527EF	GLF4	11-04-2020	NAARMO
45	Bahrain	N558QA	C510	05-05-2022	NAARMO
46	Khartoum	N604DT	CL60	26-02-2022	NAARMO
47	Bahrain, Emirates	N605AS	PC12	11-04-2022	NAARMO
48	Bahrain, Emirates, Baghdad	N685MF	GLF4	08-12-2021	NAARMO
49	Emirates	N685SC	CL60	06-05-2022	NAARMO
50	Cairo	N71KM	C30J	26-02-2022	NAARMO
51	Cairo	N866G	ZZZZ	14-02-2022	NAARMO
52	Bahrain, Baghdad	N920SA	F2TH	18-02-2021	NAARMO
53	Emirates	N981DB	H25B	05-04-2022	NAARMO
54	Emirates	XAFEM	GA6C	03-02-2022	NAARMO

2.3.5 Minimum Monitoring Requirements 2022

2.3.5.1 All operators that operate or intend to operate in airspace where RVSM is applied are required to participate in the regional RVSM monitoring program. This monitoring program addresses requirements for monitoring the height-keeping performance of aircraft in order to meet regional safety objectives and addresses the requirements for monitoring established in ICAO Annexes 6 and 11 as well as Doc 9574 and 9937. In their application to the appropriate State authority for RVSM approval, operators must show a plan for meeting the applicable monitoring requirements. Initial monitoring should be completed as soon as possible but not later than 3 months after the issue of the temporary RVSM approval and thereafter as directed by the regional monitoring agency. A table detailing the minimum monitoring requirements is published by the MIDRMA in conjunction with ICAO and other Regional Monitoring agencies and it is available on the MIDRMA website.

2.3.5.2 Since the height monitoring mandated, the MIDRMA and MIDANPIRG agree that this requirement should be implemented in accordance with the RVSM Minimum Monitoring Requirements (MMRs), the MIDRMA continued to coordinate with all MIDRMA Member States to publish their minimum monitoring requirements through the MIDRMA's automated MMR system, which is published on the MIDRMA website to ensure the availability of these requirements at all times for the concerned MID Civil Aviation Authorities and airline operators.

2.3.5.3 The majority of current aircraft types are eligible for RVSM airworthiness approval under group approval provisions. These provisions permit the defining of aircraft-type groups consisting of aircraft types which are designed and assembled by one manufacturer and are of nominally identical design and build with respect to all details that could influence the accuracy of height-keeping performance. It is not normally necessary to monitor all airframes within a monitoring group providing an adequate sample is available and the performance of the group is within the satisfied parameters. The minimum monitoring requirements (MMR) document lists the aircraft types which are eligible for RVSM approval under the group provisions and the groups to which they

belong. It also indicates the level of monitoring that should be expected for each operator.

2.3.5.4 The total number of RVSM approved aircraft registered by the MIDRMA member states is **1921** aircraft, the MIDRMA continuously monitor the validity dates of height monitoring requirements for all these aircraft and keep all member states fully aware of the validity status through the Minimum Monitoring Requirement software available on the MIDRMA website.

Note: The online MMR software is linked with the MID RVSM approvals database and constantly updated with the member states approvals list.

2.3.5.5 The MIDRMA programmed the MMR software to send automatic reminders on a monthly basis for all member states to send their updated RVSM approval list, also the software sends a monthly summary MMR tables with the validity status for all the RVSM approved aircraft in the Middle East region. These reminders helped all MIDRMA focal points for airworthiness issues to react before the height monitoring expiry dates and instruct airline operators to conduct height monitoring when necessary.

2.3.5.6 MIDANPIRG Conclusion 17/3 concerning the procedures for the follow-up with States and the issuance of warning related to RVSM approved aircraft without valid height-keeping performance monitoring results. Accordingly, the MIDANPIRG agreed to the following conclusion:

MIDANPIRG CONCLUSION 17/3: PROCEDURE FOR THE FOLLOW-UP WITH STATES AND THE ISSUANCE OF WARNING RELATED TO RVSM APPROVED AIRCRAFT WITHOUT VALID HEIGHT-KEEPING PERFORMANCE MONITORING RESULTS

- a. The MIDRMA will notify the States concerned every 3 months about their aircraft noncompliance with ICAO RVSM Height Monitoring requirements;
- b. States should take remedial actions to rectify the situation and ensure that their relevant aircraft are complying with ICAO RVSM Height Monitoring requirements in a timely manner, and notify the MIDRMA about their corrective action plans;
- c. States should develop corrective action plans in coordination with the airlines concerned and MIDRMA, which includes a time frame to allow the concerned airline operator rectify this violation as early as possible, this period should not exceed 90 days to perform the height monitoring;
- d. If no height monitoring would be conducted during the 90 days, the concerned States must withdraw the RVSM approval of the aircraft concerned and inform the MIDRMA;
- e. The MIDRMA should issue a warning to all MID States and RMAs related to noncompliance aircraft registered in the MID Region;
- f. The MIDRMA in coordination with the ICAO MID Office will continue working closely with the States concerned to resolve the issue;
- g. Once the issue would be resolved, a notification should be issued by MIDRMA to all MID States and RMAs.

2.3.5.6.1 MIDRMA can't see the implementation of these procedures by some member states especially those with high percentage of their RVSM approved aircraft that are not compliant for long time of height monitoring according to ICAO Annex 6 part 1 requirements. It is therefore necessary to address this issue to the Member States shown in the MMR table below, which must explain to the meeting why their authorities didn't take any action to comply with this conclusion.

2.3.5.7 The updated Minimum Monitoring Requirements table reflected below.

MID STATES RVSM AIRCRAFT MINIMUM MONITORING REQUIREMENTS TABLE

Valid as of 01st May 2023

MID States	RVSM APPROVED A/C	HAVE RESULTS OR COVERED	NOT COVERED	NOT COVERED IN %	A/C MMR
Bahrain	64	49	15	23%	2
Egypt	152	132	20	13%	10
Iran	186	138	48	26%	24
Iraq	54	50	4	7%	4
Jordan	44	41	3	7%	2
KSA	294	243	51	17%	8
Kuwait	68	68	0	0%	0
Lebanon	31	31	0	0%	0
Libya	40	30	10	25%	8
Oman	76	76	0	0%	0
Qatar	284	284	0	0%	0
Sudan	16	16	0	0%	0
Syria	21	11	10	47%	8
UAE	585	506	79	13%	19
Yemen	6	4	2	33%	2
TOTAL	1921	1667	242	13%	87

2.3.6 RVSM Height Monitoring Activities Update

2.3.6.1 Syrian RVSM Approved Aircraft: Due to the increasing number and activities of RVSM-approved aircraft registered by the Syrian Civil Aviation Authority in the ICAO Middle East Region, MIDRMA submitted an official request on September 5th, 2021, to the FAA and the US Department of Treasury for an OFAC license to conduct RVSM height monitoring using the Enhanced GMU. The license is currently being processed and followed up by MIDRMA and the FAA, but there is uncertainty about whether or not it will be granted.

2.3.6.1.1 As we all know, height monitoring is a critical safety issue closely related to the analysis conducted in the annual SMR. The lack of height monitoring means the lack of 1000 ft vertical separation assurance. The Syrian Civil Aviation Authority (SCAA) has shown positive and responsible actions towards this matter and is ready to conduct the required monitoring for all their registered and approved aircraft as soon as possible. However, without an OFAC license, MIDRMA is restricted from performing height monitoring in accordance with the agreed purchase agreement for the EGMUs, which makes it impossible to accomplish this task.

2.3.6.2 Libya RVSM Approved Aircraft: The MIDRMA managed to conduct height monitoring for 14 aircraft registered by the Libyan CAA and was able to reduce the noncompliant percentage from 82% to 25%, there are 9 other aircraft that must be checked as soon as possible and work hard to prevent these aircraft from entering the airspace in case they fail to comply with RVSM height monitoring requirements as per ICAO Annex 6 Part 1.

2.3.6.3 Iran RVSM Approved Aircraft: The OFAC License granted to MIDRMA for inspecting the Iranian RVSM-approved aircraft expired on January 31, 2023, which prevented MIDRMA from using the EGMUs in Iran for any height monitoring after that date. Although a renewal request was submitted to the US Department of Treasury on September 5, 2021, it has failed to receive approval until now.

Note: In November 2022, MIDRMA successfully conducted RVSM height monitoring for all RVSM-approved aircraft registered by Iran CAO, and was able to score zero MMR for the first time since 2011.

2.3.6.3.1 The increasing number of non-compliant Iranian aircraft for height monitoring operating within the RVSM airspace alongside other approved and compliant aircraft due to the lack of the OFAC license allowing MIDRMA to carry out the RVSM height monitoring tasks is a cause for concern among aviation authorities. The RVSM airspace has been designed to accommodate aircraft that meet specific height monitoring requirements to ensure that vertical separation always exists. Non-compliant aircraft pose a significant risk to other aircraft flying within this airspace, as they may not maintain the required vertical separation, resulting in potential collisions.

2.3.6.4 Egypt RVSM Approved Aircraft: While there has been a slight improvement since November 2022 by Egypt CAA Airworthiness Authority in achieving the Minimum Monitoring Requirements for their RVSM approved aircraft as per ICAO Annex 6, the MIDRMA still has serious concerns about nearly 8 expired aircraft that have not undergone RVSM height monitoring for a long time. Immediate corrective measures are required to ensure that all Egyptian RVSM approved aircraft comply with the height monitoring requirements and maintain safe operations within the RVSM airspace

2.3.6.5 Sudan RVSM Approved Aircraft: The responsible Airworthiness Inspector coordinated with MIDRMA to conduct RVSM height monitoring by MID of November 2022 for all the remaining aircraft required to be monitored which will reflect Sudan CAA to be fully compliant for RVSM height monitoring.

2.4 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.

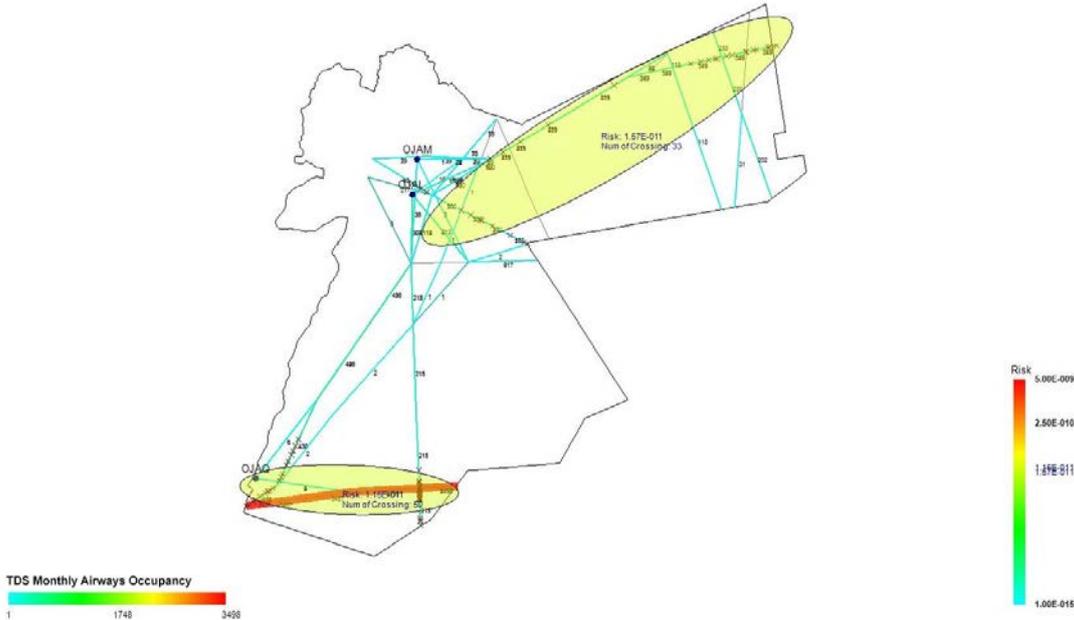
Conclusions:

It is clear that several safety-related issues need to be addressed to guarantee that RVSM operation does not increase the risk of en-route mid-air collisions over time. The report highlights serious and risk-bearing situations that must be urgently addressed to improve the overall safety of RVSM operations. One of the main issues identified is the infringement of the RVSM airspace by non-RVSM approved aircraft. It is crucial to take immediate action to prevent this from happening to ensure the continued safe operation of RVSM. In addition to addressing these issues, it is essential to raise awareness of RVSM requirements among all stakeholders involved in the implementation of RVSM in their airspace. This can be achieved through training and educational programs to ensure that all parties are aware of the importance of adhering to RVSM requirements to maintain a high level of safety in RVSM operations.

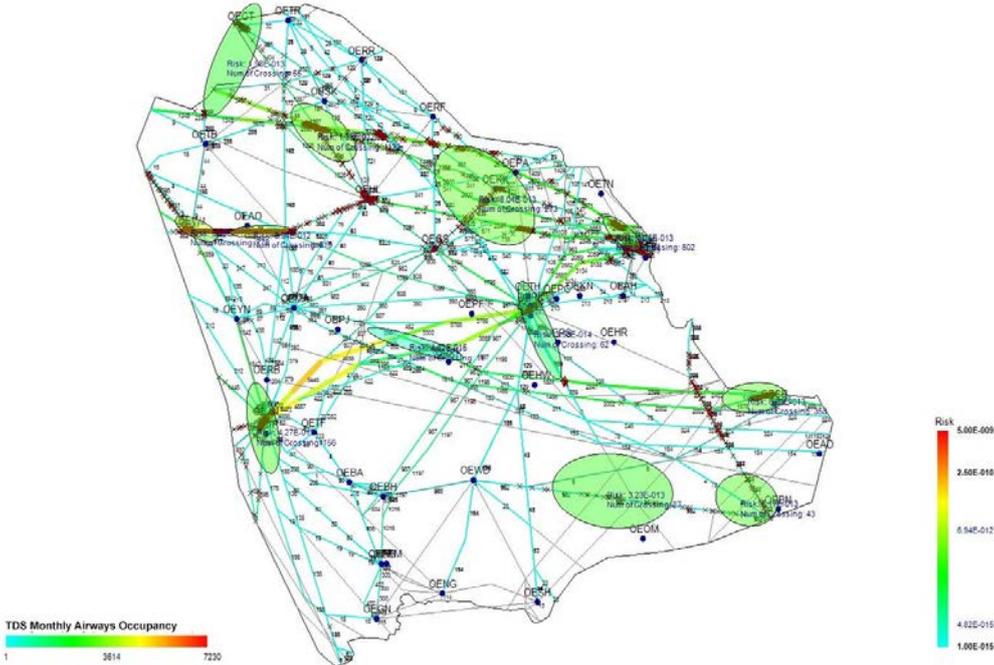
Note: The MIDRMA has developed a global RVSM database that can be accessed by all Member States' focal points, including those in ATC and Airworthiness, through a secured page on the MIDRMA website. Additionally, the MIDRMA RVSM bulletin, which lists non-RVSM approved aircraft, is also published on the same webpage.

Recommendations:

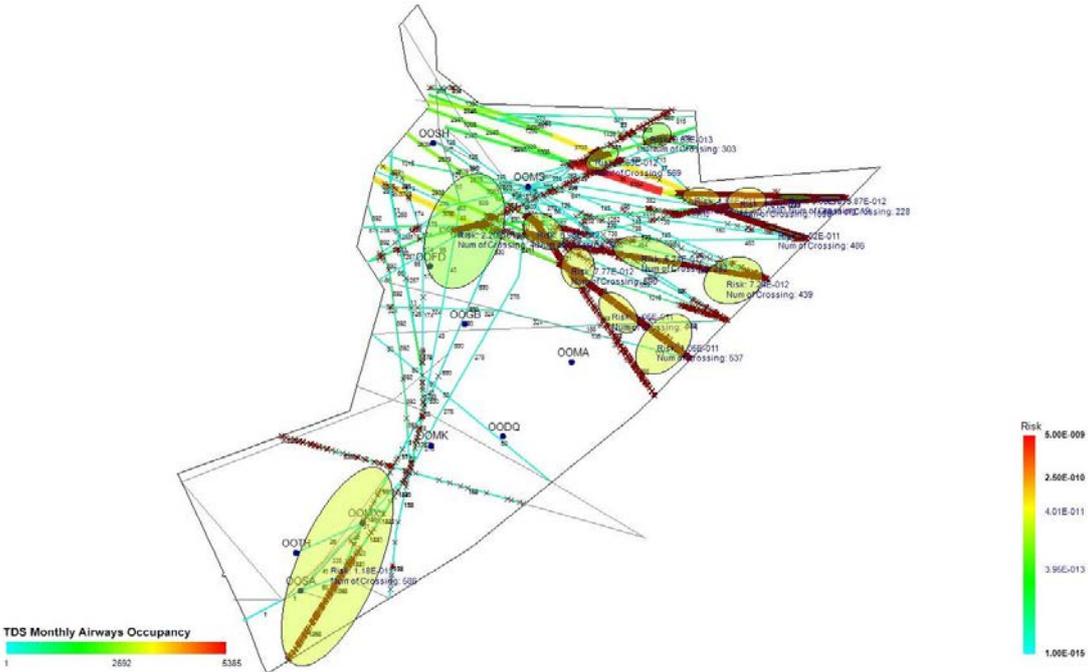
1. To address the safety-related issues identified in the SMR, improved procedures and practices must be recommended. These improvements should be designed to prevent or reduce the likelihood of serious or risk-bearing situations arising in the future.
2. Continuous assurance of RVSM operations should be established to ensure that the operation of RVSM does not adversely affect the risk of en-route mid-air collision over time. This should include regular monitoring and evaluation of RVSM operations to identify any new safety-related issues and ensure that all recommended improvements are implemented effectively.
3. To raise awareness of RVSM requirements among all concerned parties involved in the implementation of RVSM in their airspace, training and education programs should be developed and implemented. These programs should be designed to provide all relevant parties with the knowledge and skills necessary to comply with RVSM requirements and to ensure that RVSM operations are conducted safely and effectively.



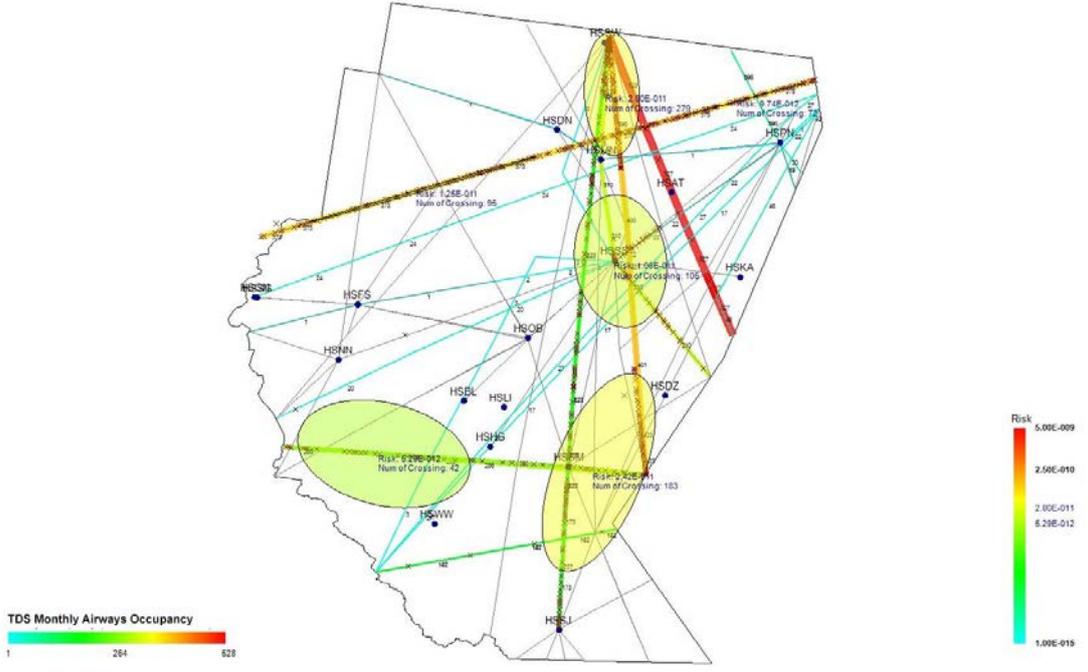
AMMAN FIR



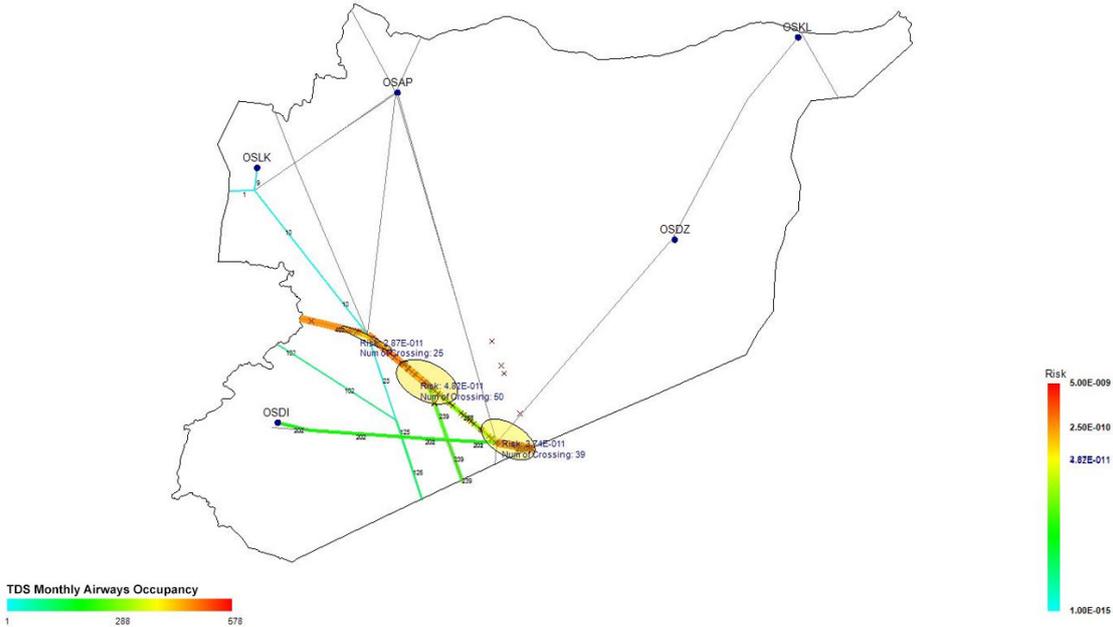
JEDDAH FIR



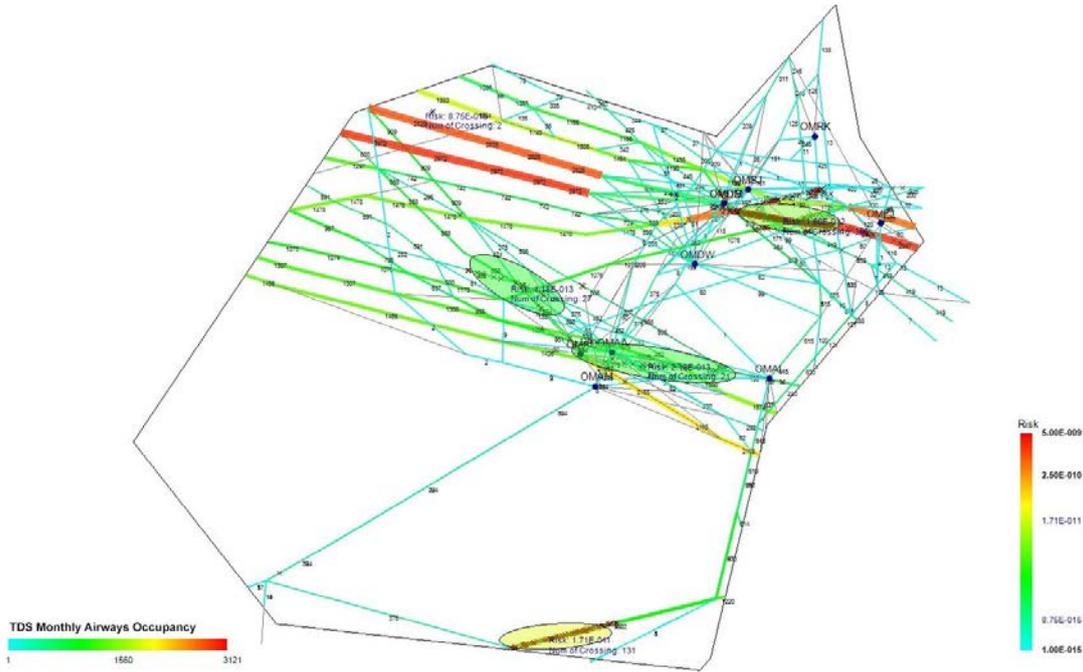
MUSCAT FIR



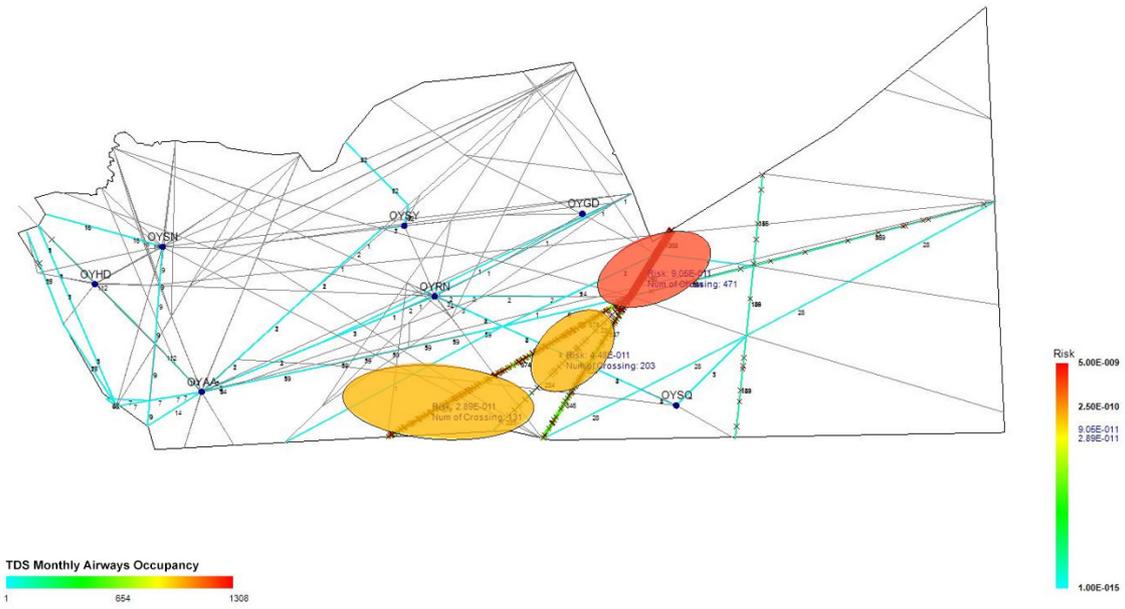
KHARTOUM FIR



DAMASCUS FIR



EMIRATES FIR



SANA'A FIR

- END -