



International Civil Aviation Organization

Regional Aviation Safety Group - Middle East

Fifth Meeting (RASG-MID/5)

(Doha, Qatar, 22-24 May 2016)

Agenda Item 5: Update from and Coordination with MIDANPIRG

REDUCED VERTICAL SEPARATION MINIMA (RVSM)

(Presented by the MIDRMA)

SUMMARY

This paper provides an update on the issues related to RVSM operations and safety monitoring activities in the MID Region.

Action by the meeting is at paragraph 3.

REFERENCES

- ATM SG/2 Report
- MIDANPIRG/15 Report
- MRC/1 Minutes
- MSG/5 Report
- RASG-MID/4 Report
- RSC/4 Report

1. INTRODUCTION

1.1 The ATM SG/2 meeting recalled that the First MIDANPIRG/RASG-MID Coordination meeting (MRC/1) held in Bahrain on 10 June 2015 identified RVSM safety monitoring as one of the subjects of interest for both MIDANPIRG and RASG-MID and agreed that MIDANPIRG will be the leading group for this subject. In this respect, the meeting underlined that the MIDRMA's contribution to the work programme of the RASG-MID is essential, in order to further raise awareness about the safety issues related to RVSM operations and monitoring; especially those related to RVSM approvals and certification and address them with the airworthiness experts supporting the activities of the RASG-MID.

1.2 The meeting may wish to recall that the Middle East Regional Monitoring Agency (MIDRMA) has been established by MIDANPIRG in accordance with the provisions of ICAO Annex 11, to monitor the height-keeping performance of aircraft operating between FL290 and 410 inclusive, in order to ensure that the continued application of the vertical separation minimum meets the safety objectives. The MIDRMA is composed of the fifteen (15) MID States and is hosted in Bahrain, and staffed with three full time experts equipped with the latest GPS-based Monitoring Units (GMUs).

1.3 Reduced Vertical Separation Minima (RVSM) was introduced in the ICAO Middle East RVSM airspace on 27 November 2003, in compliance with ICAO Annex 11 and ICAO Doc 9574 provisions.

2. DISCUSSION

2.1 The main objective of the MIDRMA is to ensure that the following key safety objectives as set out by MIDANPIRG, through Conclusion 12/16, continue 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.
- 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.

History of Technical Risk Values						
Year 2006	Year 2008	Year 2010	Year 2011	Year 2012/13	Year 2014	Year 2015
2.17×10^{-14}	1.93×10^{-13}	3.96×10^{-15}	5.08×10^{-14}	6.37×10^{-12}	3.18×10^{-12}	Ongoing

History of Overall Risk Values						
Year 2006	Year 2008	Year 2010	Year 2011	Year 2012/13	Year 2014	Year 2015
Not Calculated	4.19×10^{-13}	6.92×10^{-12}	1.04×10^{-11}	3.63×10^{-11}	4.91×10^{-11}	Ongoing

2.2 Since the implementation of RVSM within the ICAO Middle East airspace, a number of issues affecting the ICAO TLS have been identified, such as:

- complying with the provisions of Annex 6 related to height keeping performance monitoring;
- reporting Large Height Deviation (LHD); and
- operations of military aircraft within the RVSM airspace, in particular the validation of height-keeping performance requirements for some aircraft types and the necessity for an RVSM approval to be issued by the appropriate State airworthiness authority.

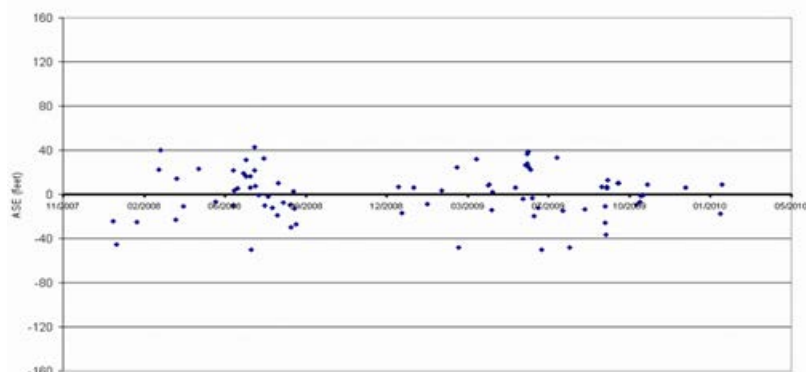
Requirements of height monitoring (Annex 6)

2.3 In May 2011, ICAO Member States implemented a long-term RVSM monitoring policy requiring that aircraft operating within the RVSM airspace complete a re-occurring monitoring flight in order to maintain their RVSM approval status. Operators must complete an RVSM monitoring flight every two years (or 1,000 hours of flight whichever is greater) as per ICAO Annex 6 Part 1 Chapter 7.

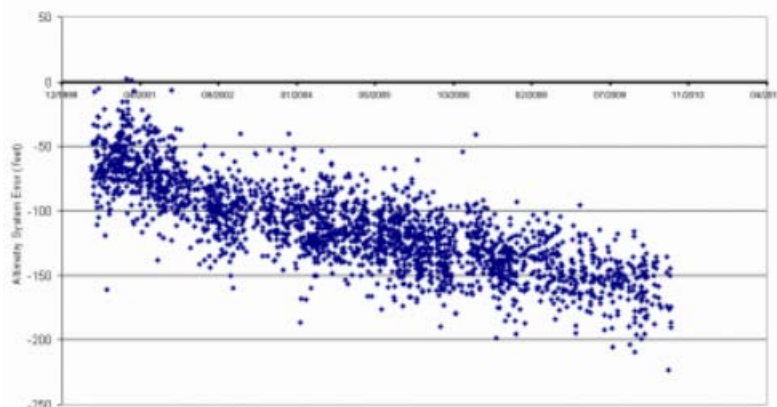
2.4 Safe operation within RVSM airspace requires measurement of aircraft altitudes within stringent tolerances. Differences, known as Altimetry System Error (ASE) occur between the altitude indicated by the altimeter and the actual pressure altitude corresponding to the undisturbed ambient pressure the aircraft is operating at. Since the altimeter displays a level that includes ASE the presentation to the pilot, ATC, and airborne collision avoidance systems is not the actual height of the aircraft. These errors are not apparent during flight operations. To be compliant for height monitoring according to ICAO Annex 6 Part 1, the ASE of an aircraft must be minimized and be no greater than 245 ft. Therefore, continued safe RVSM operations require a high level of accuracy from altimetry systems and the ongoing system performance monitoring as well as individual aircraft performance monitoring are necessary to ensure that safety goals and requirements are met all the time.

2.5 Before the development of Height Monitoring Systems it was not feasible to measure the ASE of large populations of aircraft. It was believed that an aircraft’s ASE was stable over time and that large errors could be clearly identified by regular maintenance checks and inspections. The evidence gathered by the European Regional Monitoring Agency and other RMAs indicates that these assumptions are not always correct.

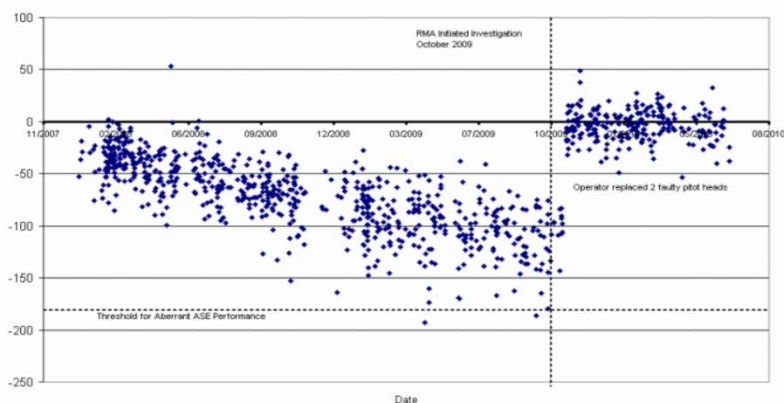
2.6 The graph below illustrates some aircraft ASE profiles:



Good ASE



Deteriorating ASE



Before and after ASE fixed

2.7 In order to accomplish the ICAO Annex 6 height monitoring requirements, the MIDRMA believes, along with the support of MIDANPIRG, that the RVSM Minimum Monitoring Requirements (MMRs) adopted for global application by all ICAO Regional Monitoring Agencies (RMAs) shall be the basis for the implementation of this requirement and the MIDRMA coordinated with all Member States to publish the MMR table which reflects all height monitoring requirements for each state, this table was continuously reviewed and published by the MIDRMA at regular intervals or when requested by any Member State.

2.8 Due to the continuous changes in the MMR tables and the increased demand for height monitoring by airline operators registered in the ICAO Middle East Region and their urgent requests to know the height monitoring status of their fleet, the MIDRMA decided to develop a software to calculate the MMR for each airline operator approved to fly RVSM by the MIDRMA Member State and upload the software in the MIDRMA website as an online tool which can be used H24 by the Airworthiness/Flight Operations authorities and all the airline operators registered and RVSM approved by the MIDRMA Member States.

2.9 The accuracy of the generated MMR tables through the MMR online tool depends on the updated RVSM approval list received from each MIDRMA Member State at the beginning of each month or whenever an RVSM approval is granted; however, the MIDRMA found some Member States are so late to update their RVSM approval list, which can cause unknown approved aircraft operate within the RVSM airspace without knowing the approval status; and can lead to a violation of RVSM airspace.

2.10 The idea of the MMR online tool is unique as it's only used by the MIDRMA and has never been used by any other RMA in the world. Currently the tool is available for use in the MIDRMA website with a feature to allow the users to export the data directly from the site to an excel sheet.

2.11 During the last reporting period of the MID RVSM Safety Monitoring Report, the MIDRMA encountered difficulties with some MIDRMA Member States in implementing the issued Minimum Monitoring Requirements table. These difficulties are:

- a) some airline operators are reluctance to, or circumvention of the height monitoring;
- b) lack of awareness by airline operators to achieve their monitoring targets; and
- c) ineffective follow-up by the responsible Airworthiness Authorities to enforce the height monitoring requirements, according to ICAO Annex 6.

Reporting Large Height Deviation (LHD)

2.12 Experience has shown that the primary source of reporting Large Height Deviation is the ATC units providing Air Traffic Control services in the airspace where RVSM is applied. MIDRMA member States are required to submit Large Height Deviation Reports which occurred in their FIRs on a monthly basis even if none was reported during the month of reporting.

2.13 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 in all the previous Safety Monitoring Reports (SMRs) have been severely limited by the continued NIL reporting of Large Height Deviations from some members which does not support a high confidence in the SMRs results.

2.14 In order to improve the level of reporting LHD by Member States, the MIDRMA developed an online reporting LHD tool and upload it in their official website and provided training and guidance materials to all MIDRMA Member States for the reporting method by using this tool.

2.15 The MIDRMA observed the level of reporting LHD after the implementation of this tool improved by more than 70% which is acceptable now for calculating all the safety parameters for the SMR.

The operations of military aircraft within the RVSM airspace

2.16 It was a fundamental requirement for the implementation of RVSM that there was access to airspace for military users. It was necessary for the military flights to operate as before the implementation of RVSM with tactical freedom. There was also recognition that some military flights operating as General Air Traffic would not be able to meet the appropriate height-keeping performance to obtain RVSM approval. The exemption policy already developed and agreed by all the ICAO Middle East States participated in the MID RVSM Task Force during the pre-implementation phase of RVSM.

2.17 It is important to emphasize that the operation of an aircraft in a 1,000 ft. vertical separation minima which does not comply with stringent altimetry system performance requirements, constitutes a significant risk to mid-air collision. The same risk exists for an approved aircraft which is configured differently to the configuration for which the approval was granted.

2.18 Recently, the Airworthiness Authorities in UAE and Qatar managed to certify all their C17s aircraft and Oman certified some other types which are used by their military, while the Airworthiness Authorities in Kuwait is still reviewing the certifications process of their C17s aircraft.

2.19 The MIDRMA continuously monitor the activities of the non-approved military cargo aircraft operating in the Middle East airspace and expects an increase in the number of violations to the RVSM airspace in the near future due to lack of awareness by the military authorities as they consider if the aircraft is capable to fly RVSM they can file "W" in their flight plans and operate in the RVSM airspace.

MIDRMA Tools

2.20 The MIDRMA has several tools to improve the monitoring of RVSM implementation such as:

- Large Height Deviation (LHD) Online Reporting Tool;
- Collision Risk Assessment software;
- Online Auto Minimum Monitoring Tool; and
- Airspace Collision Risk Hot-spot Analysis software.

2.21 States are invited to visit the MIDRMA website (midrma.com) for more information.

2.22 The meeting may wish to note that the MIDANPIRG/15 meeting reviewed and endorsed the MID RVSM Safety Monitoring Report (SMR) 2014, and initial results of the SMR 2015 were presented to the MIDRMA Board/14 meeting (Khartoum, Sudan, 1-3 February 201). Both reports presented evidence that, according to the data and methods used, the key safety objectives as set out by MIDANPIRG, through Conclusion 12/16, continue to be met.

2.23 The ATM SG/2 meeting (Cairo, Egypt, 30 November - 03 December 2015) was apprised of the MIDRMA activities related to the Minimum Monitoring Requirements (MMR). The meeting noted with appreciation that the MIDRMA developed an Auto Online MMR Tool to enable the Civil Aviation Authorities in the MID Region to check their MMR for each airline operator under their responsibility and identify the aircraft that are non-compliant with the Annex 6 requirements for height-keeping performance. The Tool is available on the MIDRMA website. Accordingly, the meeting agreed to the following Draft Conclusion:

DRAFT CONCLUSION 2/3: AUTO ONLINE MMR TOOL

That, States be urged to:

- a) use the Auto Online Minimum Monitoring Requirements (MMR) Tool, available on the MIDRMA website; to ensure that all their operators/airframes are complying with Annex 6 requirements related to Height-Keeping Performance; and*
- b) provide feedback to the MIDRMA for the enhancement of the Tool.*

MIDRMA Airworthiness/Flight Operations focal points

2.24 The MIDRMA Board members/alternates and ATC and Airworthiness/Flight Operations focal points is at **Appendix A**. The Airworthiness/Flight Operations focal point should be the person within the CAA responsible for the RVSM certifications in order to improve the coordination process between the MIDRMA and the State.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) urge States to take necessary measures to ensure that their air operators comply with the ICAO provisions related to height keeping monitoring;
- b) encourage States to implement a certification process for the RVSM approval of their military aircraft, if not yet done so; and
- c) update, as deemed necessary, the MIDRMA Airworthiness/Flight Operations focal points at **Appendix A**.

LIST OF MIDRMA BOARD MEMBERS/ALTERNATES AND FOCAL PONTS

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