

MID RVSM TF/6
Report on Agenda Item 3

REPORT ON AGENDA ITEM 3: SAFETY AND AIRSPACE MONITORING ASPECTS (SAM/WG)

3.1 The working group reviewed its terms of reference and noted in particular the requirement to:
traffic increases

vertical occupancies (traffic densities, passing frequencies, etc.)

Appendix 3A to the Report on
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3.1.1 Additionally, the normal working arrangements, whereby the TF Chairman, WG Rapporteurs and the ICAO Secretariat to the widest possible extent, undertake co-ordination with other working group and with the Task Force as a whole, were noted.

3.2 The duties and responsibilities of the MECMA were reviewed. The working group noted the delineation of responsibilities between itself and the MECMA. The latter is responsible for the day-to-day and time-consuming tasks, such as establishing and maintaining databases and the conduct of readiness assessments and safety assessments those related to RNP, are as stated in **Appendix 3B** to the Report on Agenda Item 3.

3.2.1 The UAE GCAA re-stated its position that its acceptance to host, staff and equip MECMA is limited to activities associated with RVSM implementation on 27 November 2003. In the event of a partial implementation on this date, readiness assessments and safety analyses in conjunction with any subsequent implementation would have to be referred to another body.

ress is:

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3.2.3 MECMA has expanded its website www.mecma.com, presenting the background and terms of reference of MECMA. Furthermore, forms for reporting of traffic data, coordination failures, calculation of flying time in the FL290/FL410 level band and large height deviations have been updated. Furthermore, links to ARINC and CSSI websites are established to facilitate access to GMU monitoring services.

Aircraft Passing Frequencies

3.3 The Reich collision risk model is based on a number of parameters that must be established for the airspace being assessed. The formulation of the model depends on the structure and traffic pattern of the ATS route system at hand. For a single route, the aircraft passing frequency is an important parameter in calculation of risk.

Definition: A passing is an event when two aircraft navigating along the same track, and at adjacent levels, pass one another either in the same direction (overtaking) or in opposite direction.

3.3.1 ICAO guidance material specifies that:

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- all ATS routes within three adjacent ACCs should be examined on an individual basis when estimating aircraft passing frequencies or occupancy.
- If this is not practical, care should be taken that the routes analysed provide representative estimates.
- Each route should be divided into segments, for example, by reporting points or navigation aid locations.
- The traffic movement data, organised by flight level on each segment, must then be examined either manually or automatically to determine the number of pairs of aircraft at adjacent flight levels that pass each other in the same or in opposite directions.
- The number of same- and opposite-direction aircraft passings should then be combined with similar counts from all other route segments analysed.
- The sum of the overall same and opposite-direction aircraft passings should then be multiplied by 2 and divided by the total number of flight hours above FL 290 in straight and level flight on the segments during the periods analysed, giving the same and opposite-direction aircraft passing frequency estimates.
- If occupancy analysis is deemed appropriate, vertical occupancies can be estimated in a manner analogous to that for estimating lateral occupancies shown in ICAO Doc 9426, Air Traffic Services Planning Manual.

3.3.2 However, taking into account the MID Region conditions, where there are three very large FIRs and a number of small/medium size FIRs, it is necessary to expand the general criterion for three adjacent ACCs.

3.3.3 The concepts of passing frequency, level occupancy and the radar-derived equivalent analyses carried out in the European Region are detailed in the report of RVSM TF/4, while the practical repercussions of excessive passing frequencies are set out in the report of RVSM TF/5.

3.3.4 Calculations had previously been carried out for Amman, Bahrain, Emirates, Muscat and Tehran FIRs based on traffic data for the period 20 January – 20 February 2001. Based upon these calculations, deductions were possible for the route segment MITEX (now ULOVO) TRF within Jeddah FIR. The results demonstrated that certain changes to the route structure would be required for safe implementation of RVSM.

3.3.5 At TF/5, Yemen provided traffic data for the month of August 2001 and MECMA has since conditions:

- 1,842 flights above FL265 were processed.
- 642 flights below FL265 were disregarded.
- FL265 was used for cut-off as the sample indicated that very few flights operate below their optimum cruising levels. Hence traffic presently operating below FL265 were unlikely to move into the RVSM level band.
- The results are presented in Table 3.1, below:

3.3.6 The population as related to the period of observation is relatively low, which leads to statistical aberrations in some cases e.g. for BOSKI, where the observed passing rate undoubtedly is higher than that which would be observed over a longer period. Consequently, calculations were not carried out on points with less than 100 flights.

OYSC FIR	Same	Opp	Flights	Nx (same)	Nx (opp)	Nx(equiv)
SAA	0	10	716	0.00	0.11	0.11
KAPET	0	11	407	0.00	0.22	0.22
RIBOK	0	14	391	0.00	0.29	0.29

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LAKNA	0	11	369	0.00	0.24	0.24
PARIM	2	4	274	0.06	0.12	0.22
ALULA	0	0	205	0.00	0.00	0.00
OKTOB	0	1	170	0.00	0.05	0.05
BOSKI	1	10	163	0.05	0.49	0.58
TORBA	1	0	148	0.05	0.00	0.10
RIN	0	0	146	0.00	0.00	0.00
ANGAL	0	3	122	0.00	0.20	0.20
KRA	0	0	106	0.00	0.00	0.00
SYN			94			
PURAD			81			
FIR			75			
GDA			31			
TAZ			20			
SUHIL			13			
FARES			7			
Totals	4	64	3,538	0.01	0.16	0.18
					c1/c2	1.81

Table 3.1: Passing Frequencies OYSC FIR

3.3.7 The overall result of 0.18 equivalent passings per flight hour is, however, a reliable figure and is well inside the MID limit of 1.25. Furthermore, it should be noted that none of the calculated figures exceed half the MID limit.

3.3.8

present an obstacle to achieving the TLS with the present route structure.

3.4 Traffic sampling is required for planning of RVSM implementation in the Middle East Region for a variety of purposes hereunder: readiness assessments, safety assessments and ATM measures.

3.4.1 Nine States forwarded traffic samples that were used for preparation of the preliminary readiness assessment, presented at TF/3 in August 2001. The reported data was adequate for this purpose, which is more limited in scope than the full safety analysis. However, only six States provided data with the contents and format required for data processing, upon which further progress in the safety analysis depends. However, the pre-implementation safety assessment must be based on more recent and more comprehensive data.

3.4.2 Traffic data for the period **26 December 2002 to 23 January 2003**, is required by MECMA by 30 January 2003 in order to complete the readiness assessment and safety assessment in support of the further work of the RVSM Task Force.

3.4.3 Initially, traffic data for the month of December was chosen. However the period was exceptionally changed to cover period 26 December 2002 to 23 January 2003 at the request of some States. This would permit sampling of data after implementation of the revised route structures, necessary for safe RVSM operations. While some of the changes have been introduced already, many will be implemented on 28 November 2002 and the uni-directional routes (UR219 and UN318) will be implemented on 26 December 2002.

3.4.4 The traffic sampling was expected to yield about 100,000 flight data records that need to be processed in a variety of ways to extract the required data. The large volume of data precludes manual handling and automatic processing can only be accomplished if the data is formatted correctly and parsed for errors such as typographical mistakes and incorrect type designators.

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3.4.5 Traffic need only to be included in the sample if either the entry Flight Level, the exit Flight Level or the Flight Level at an intermediate reporting point, which is included in the traffic sample on a systematic basis, is above FL255. Subject to correct formatting, inclusion of traffic below FL255 does not present significant processing problems for MECMA, and States may elect to include traffic at all levels. Traffic should be included in the file, irrespective of RVSM status.

3.4.6 To facilitate correct reporting of traffic data, MECMA has produced an MS Excel spreadsheet, of which a hard copy is provided as **Appendix 3C** to the Report on Agenda Item 3. The following issues are drawn to the attention of the reporting authorities:

- a) **Date** of flight must be entered in a format recognized by MS Excel. The implication is that text formats are not acceptable.
- b) **Callsign** is a text field of maximum 7 characters. While less than 7 characters is acceptable (and common), it is important that only alphanumeric data is included, and that any spaces and tabs be removed.
- c) **Type** must be the appropriate aircraft type designator in accordance with ICAO Doc 8643. Field length is maximum 4 characters.
- d) **ADEP** and **ADES** are the airport of departure and airport of destination, respectively. For unknown airports or tactical flights, ZZZZ is acceptable.
- e) **Entry point** -
letter name code of a reporting point, the published ident (2 or 3 letters) of a navigational aid or the airport of departure, if within the FIR.
- f) **Entry time**
departing from airports within the FIR, it will be ATD. Please ensure that data is in a time format recognised by MS Excel.
- g) **Entry level**
departing from airports within the FIR, it will be 0. Please ensure that data is numerical (integer).
- h) **Exit point** -
letter name code of a reporting point, the published ident (2 or 3 letters) of a navigational aid or the destination airport, if within the FIR.
- i) **Exit time** is the t
at airports within the FIR, it will be ATA. Please ensure that data is in a time format recognized by MS Excel.
- j) **Exit level** For flights
arriving at airports within the FIR, it will be 0. Please ensure that data is numerical (integer).

Note: For large FIRs, it is relevant to include intermediate points in particular when these points are route intersections. Reporting shall be Point (ident), ETO and Level, as specified for Entry and Exit points.

3.4.7 A soft copy of the traffic data form is available on MECMA website, mecma.com, from where it can be downloaded.

3.4.8 Traffic data should be forwarded to MECMA on the address as detailed in paragraph 3.2.2.

3.4.9 The meeting reached the following conclusion:

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CONCLUSION 6/1: 2ND TRAFFIC SAMPLE

- a) States should provide MECMA a complete record of flights above FL255 during the period of **26 December 2002 to 23 January 2003**. The flight data should be in the specified format and forwarded to MECMA on a weekly basis.
- b) The traffic data for the last week (17 - 23 January) should reach MECMA by 30 January 2003.

3.5 MECMA is, *inter alia*, tasked with conducting safety assessments as an aid for the Middle East RVSM Task Force for decision making in preparation for RVSM implementation on 27 November 2003. In order to produce an adequate assessment, it is vital that MECMA has sufficient information to be accomplished only if each State provides MECMA with an up-to-date version of the State Safety Plan in April 2003, prior to the eighth meeting of the MID RVSM Task Force.

3.5.1 ans, MECMA had produced an example plan (Appendix 3-D) based upon the one produced by Eurocontrol for use by the 41 States that implemented RVSM in January 2002.

3.5.2 The objective of the example Safety Plan is to set out those national activities that are required to support safe implementation of RVSM. The plan also addresses safety requirements identified by

described in some detail:

- a) The role of the activity in support of the safe implementation and operation of RVSM.
- b) The standards to be applied to the conduct of the activity.
- c) The additional supporting activities that will provide confidence that the identified National activities will lead to the successful implementation of RVSM.
- d) The objective of providing this level of information is to offer early assurance that each State has identified the requirements associated with safe implementation of RVSM; delegated authority and assigned responsibility to the staff members concerned with the programme and allocated the necessary resources. Furthermore, regulatory and safety management issues need to be addressed and documented.
 - Aircraft and operators need approvals for RVSM. The regulations, processes and responsibilities need to be identified.
 - ATS staff need to be trained in preparation for RVSM operations.
 - ATS equipment needs to be upgraded to accommodate RVSM operations. Modifications must be specified and contracts made and managed to ensure integrity in the modification process.
 - Changes to ATS procedures must be identified. Some changes will be associated with equipment changes, while others will be designed to cater for equipment characteristics or rooted in airspace changes.
 - Airspace design needs to be reviewed and changes identified. Such redesign may involve restructuring of the ATS route system, while others may be associated with re-sectorisation.
 - Switchover to RVSM must be planned in detail and provisions made for both a safe transition to RVSM as well as reversion to CVSM, if necessary.
 - Operational monitoring of RVSM, hereunder approvals and assigned altitude deviations.

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- The Eurocontrol functional hazard assessment (FHA) has recently been updated and the revised version is intended to be added to the attached example national safety plan after next review at TF/7.
 - The Eurocontrol countdown plan will be added to the guidance material after next review at TF/7.
- e) The national safety plan will need to be produced in several stages. A preliminary version of the state safety plan will need to be provided in January 2003 for approval by the CAA or Ministry of Transport.
- f) To produce the safety assessment in preparation for the Go / No-go decision in August 2003, it is vital that MECMA has sufficient information to form a reasonable view of each

MECMA with an up-to-date version of the State Safety Plan in April 2003, prior to the eighth meeting of the MID RVSM Task Force.

3.5.3 Based on the foregoing the meeting formulated the following conclusion:

CONCLUSION 6/2: NATIONAL SAFETY PLANS

That:

- a) Development of national safety plans is required to assure safe implementation of RVSM;
- b) the Middle East RVSM Task Force adopt the model national safety plan at **Appendix H** to the report for implementation of RVSM as guideline to States;
- c) States produce a preliminary version of the State Safety Plan in January 2003 for approval by the CAA or Ministry of Transport, and
- d) States provides MECMA with an up-to-date version of the State Safety Plan in April 2003, prior to the eighth meeting of the MID RVSM Task Force.

3.6 Aircraft /operator approval data for MECMA

3.6.1 ntral registry of
State RVSM approvals of operators and aircraft using the airspace where the MID Provider States will apply RVSM. In conjunction with this activity, MECMA will work closely with other Regional Monitoring Agencies (RMAs) in development of the means for collecting information about such approvals.

3.6.2 The readiness assessment pre-implementation safety assessment must be based on recent and comprehensive data, and in May 2002 MECMA requested information from all the Middle East States concerning approvals of operators and aircraft registered in the respective States. Nine States have responded with the requested data, while three attending States are yet to provide the necessary data.

3.6.3 Middle East States should maintain a database of all national RVSM airworthiness and operational approvals granted for MID RVSM operations. Approvals granted for the Middle East Region should be sent to MECMA as they are granted for RVSM operations by State authorities. In order to facilitate the process of transferring data between State databases and the MECMA database, it is recommended that individual States establish their own RVSM approvals databases in the same format as the MECMA database and that States send approvals via MS Excel file preferably e-mailed as an attachment.

3.6.4

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Note: If a State does not have access to the Internet, the information can be dispatched to the MECMA by airmail, fax, or courier service.

3.6.5 States should send updated database information as soon as it becomes available. However, it may not be practical to pass information every time a new approval is granted and the minimum requirement is for RVSM approvals, correct as of the last working day of the month, to be with the MIDANPIRG by the 10th of the following month. This is only applicable to any additions to the State approvals database during the preceding month. Any withdrawals of approval must be notified to the MIDANPIRG immediately. It should be noted that an approval is not transferable and that if an aircraft is sold or leased, re-approval from the State of Registry will need to be sought.

3.6.6 The State RVSM database of aircraft approvals contains the following fields:

- a) State of Registry. Enter the single or dual letter ICAO identifier as contained in ICAO Doc 7910/103 (March 2002). In the case of their being more than one identifier designated for the State, use the letter identifier that appears first.
- b) -letter ICAO identifier as contained in ICAO Doc

Remarks field.
- c) Aircraft type. Enter the ICAO designator as contained in ICAO Doc 8643/30 (November 2002), e.g. for Airbus A320-211, enter A320; for Boeing B747-438 enter B744.
- d) Aircraft Series -
Airbus A320-211 enter 211; for Boeing B747-438, enter 400 or 438.
- e) Manufacturers Serial Number.
- f) Year of Manufacturer. In YYYY format e.g. 1996.
- g) -XYZ write A6XYZ.
- h) Registration Date. In format DD/MM/YY. Example: for 14 October 2002, write 14/10/02.
- i) Mode S Address. Enter ICAO allocated Aircraft Mode S (6 character, hexadecimal) address code.
- j) Operations Approval Issue Date. In format DD/MM/YY.
- k) Operations Withdrawal Date. In format DD/MM/YY.
- l) Reason For Withdrawal.
- m) RVSM Approval - Enter yes or no.
- n) RVSM Approval Issued Date. In format DD/MM/YY.
- o) RVSM Expiry Date. In format DD/MM/YY.
- p) Compliance method. On what basis the aircraft is made RVSM compliant. Enter the following:
 - i. TC for Type Certificate.
 - ii. STC for Supplementary Type Certificate.
 - iii. SB for Service Bulletin with Reference Number.
 - iv. SL for Service Letter with Reference Number.
 - v. MOD for Modification.
- q) Remarks.

3.6.7 The State RVSM approvals of operators database will contain the following fields (Provide all information available):

- a) Code of Operator. En -letter ICAO identifier as contained in ICAO Doc
- b) Name of Operator. Full name of the operator
- c) State of the operator. Enter the single letter ICAO identifier as contained in ICAO Doc 7910/103 (March 2002). In the case of their being more than one identifier designated for the State, use the letter identifier that appears first.
- d) Address. Address to contact operator.
- e) Telephone. Telephone Number of the operator.
- f) Fax. Fax Number of the operator.
- g) E-mail. E-mail address of the operator.

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- h) AFTN. AFTN address of the operator.
 - i) Sita. Sita address of the operator.
 - j) Telex. Telex Number of the operator.
 - k) Contact. Name of the contact person.
- 3.6.8 States are reminded that the integrity of the database depends on regular and timely updates and that access to RVSM airspace may be denied in the absence of up-to-date information.
- 3.6.9 Any aircraft wishing to fly in MID RVSM airspace must be approved and indicate that approval in field 10 of the ICAO flight plan by entering the Letter . Crews of aircraft not matching this criterion are to be challenged by air traffic controllers in the FIRs that have introduced RVSM. This is most likely to be done to crews who show signs of uncertainty of the procedures. Any crew not able to confirm that they possess approval to operate will be directed to descend clear of MID RVSM airspace. The ATS Provider State should then notify the MECMA, who will then write to the State of Registry concerning the aircraft under investigation. The burden is put onto the State to ensure that the operator is made aware of the implications of non-compliance and to take necessary enforcement action to ensure that the incident is not repeated.

TERMS OF REFERENCE

Safety & Airspace Monitoring Work Group (SAM/WG)

The SAM/WG is responsible for mathematical and statistical analysis to assist with the maintenance and on-going monitoring of safety through the assessment of collision risk for Middle East Region RVSM and other tasks as agreed with the RVSM Task Force.

The main tasks of the SAM/WG are:

- a) To develop a monitoring program to ensure that the quantity and quality of data are collected to allow an assessment of vertical collision risk;
- b) To review existing mathematical and statistical techniques to assure their appropriateness for MID Region RVSM;
- c) To ensure the transferability of aircraft data collected from other airspace regions;
- d) To support the assessment of the safety of RVSM prior to and during the Verification and Operational Trials by the production of collision risk assessments based on height deviation incidents and height monitoring data to determine whether the TLS is being met;
- e) To devise suitable methodologies for incorporating the effects of projected traffic increases and system changes on occupancy and collision risk in the future environment;
- f) To identify those elements which are critical in the assessment of collision risk and suggest areas where improvements might be effective in reducing risk;
- g) To establish a policy for investigating those errors that may jeopardise satisfaction of the Target Level of Safety (TLS);
- h) To estimate periodically the vertical occupancies (traffic densities, passing frequencies, etc.) in the MID Region; and
- i) To perform periodically other data collections (e.g. ASE stability) in order to ensure that the parameter values used in the mathematical collision risk models remain current.

DUTIES AND RESPONSIBILITIES OF MECMA

The Middle East Central Monitoring Agency (MECMA) for RVSM implementation has the following duties and responsibilities:

- a) to establish and maintain a central registry of State RVSM approvals of operators and aircraft using the Middle East Region airspace where RVSM will be applied;
- b) to facilitate the transfer of approval data to and from other RVSM regional monitoring agencies;
- c) to establish and maintain a data base containing the results of height-keeping performance monitoring and all altitude deviations of 300 ft or more within Middle East Region airspace, and to include in the database the results of MECMA requests to operators and States for information explaining the causes of observed large height deviations;
- d) provide timely information on changes of monitoring status of aircraft type classifications to State authorities and operators;
- e) to assume overall responsibility for
 - i) coordination of the Global Positioning System Monitoring System (GMS); and
 - ii) assessing compliance of operators and aircraft with RVSM height-keeping performance requirementsin conjunction with RVSM introduction in the Middle East Region;
- f) to provide the means for identifying non-RVSM approved operators using Middle East airspace where RVSM is applied; and notifying the appropriate State approval authority; and
- g) to conduct readiness assessments and safety assessments as an aid for the Middle East RVSM Task Force for decision making in preparation for RVSM implementation on a specified date.
- h) *to establish and maintain a database containing results of navigation error monitoring;*
- i) *to prepare, each six months, reports setting out the results of navigation error monitoring for the preceding six-month period. These results shall be presented to the ICAO Middle East Office, Cairo, and States as part of their decision process related to safety management;*
- j) *to conduct safety assessments as an aid for the Middle East RNP/RNAV Task Force for decision making in conjunction with expansion or changes to the RNP route structure within the Middle East Region;*
- k) *to liaise with other Regional monitoring agencies and organisations to harmonise RNP implementation and upgrading.*

Date	Callsign	Type	ADEP	ADES	Entry Point	Entry Time	Entry Level	Exit Point	Exit Time
1-Dec-02	CAL067	MD11	OMAA	LIRF	OMAA	0:01	0	BALUS	0:19
1-Dec-02	UAE463	A332	OMDB	FAJS	OMDB	0:01	0	DENBO	0:10
1-Dec-02	DLH759	B744	VOMM	EDDF	GISMO	0:03	350	PAPAR	0:23
1-Dec-02	EEZ2108	B763	LIMC	VRMM	SISOK	0:04	330	LABRI	0:23
1-Dec-02	PIA742	B743	OEJN	OPRN	TUGOS	0:08	370	ENADA	0:24
1-Dec-02	SIA404	B772	OMDB	LTBA	OMDB	0:11	0	BALUS	0:30
1-Dec-02	AHK002	B742	EBBR	OMDB	PAPAR	0:12	370	OMDB	0:22
1-Dec-02	UAE9990	B744	EHAM	OMDB	TUGOS	0:15	370	OMDB	0:26
1-Dec-02	BBB106	B763	LSZH	VRMM	TUGOS	0:19	330	DENBO	0:36
1-Dec-02	UAE700	A306	OMDB	VIDP	OMDB	0:28	0	ENADA	0:38

Exit Level

310

250

350

370

370

350

0

0

330

250