INTERNATIONAL CIVIL AVIATION ORGANIZATION

BAGHDAD FIR RVSM IMPLEMENTATION WORKING GROUP

Second Meeting (BFRI WG/2)

(Cairo, Egypt 13-15 December 2010)

Approved by the Meeting
and published by authority of the Secretary General

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PART I – HISTORY OF THE MEETING

1. PLACE AND DURATION

1.1 The Second Meeting of the Baghdad FIR RVSM Implementation Working Group was convened at the ICAO MID Regional Office in Cairo, from13 to 15 December 2010.

2. OPENING

2.1 The Meeting was opened by Mr. Mohamed R. M. Khonji, ICAO Regional Director, Middle East Office who welcomed the delegates to Cairo. In his welcome address Mr. Khonji recalled that RVSM has been successfully implemented in the MID Region since 27 November 2003, nevertheless, he highlighted that RVSM has not yet been implemented within Baghdad FIR.

2.2 Mr. Khonji pointed out that the pressing need and importance of implementing RVSM in the Baghdad FIR was underlined and recognized by Users and States during many meetings. In this regard, he recalled that MIDANPIRG/11, through Decision 11/23, agreed to the establishment of the Baghdad FIR RVSM Implementation Working Group (BFRI WG), for the development of necessary planning materials related to RVSM implementation in the Baghdad FIR and for assisting the Iraqi Civil Aviation Authority (ICAA) in the implementation of such an important project in an expeditious manner.

2.3 Mr. Khonji highlighted briefly the main outcome of MIDANPIRG/12 related to RVSM Implementation within Baghdad FIR. Finally he wished the meeting fruitful deliberations.

3. ATTENDANCE

3.1 The meeting was attended by a total of thirty one (31) participants from seven (7) States (Bahrain, Iraq, Jordan, Kuwait, Saudi Arabia, Syria and Turkey) and one (1) Organization (IATA). The list of participants is at **Attachment A** to the Report.

4. OFFICERS AND SECRETARIAT

4.1 Mr. Mohamed Smaoui, Regional Officer, Air Navigation Services/Aeronautical Information Management (RO/ANS/AIM) was the Secretary of the meeting supported by Mr. Jehad Faqir, Deputy Regional Director, Mr. Raza Gulam, Regional Officer, Communications, Navigation and Surveillance (RO/CNS) and Mr. Saud Al Adhoobi, Regional Officer, Air Traffic Management (RO/ATM) from the ICAO Middle East Office.

5. LANGUAGE

5.1 The discussions were conducted in the English language and documentation was issued in English.

6. AGENDA

6.1 The following Agenda was adopted:

Agenda Item 1:	Adoption of Provisional Agenda
Agenda Item 2:	Review of MIDANPIRG/12 outcome related to the implementation of RVSM within Baghdad FIR
Agenda Item 3:	Assessment of Operators Readiness for RVSM Implementation
Agenda Item 4:	Air Traffic Control (ATC) Readiness Assessment
Agenda Item 5:	RVSM Pre-Implementation Safety Assessment
Agenda Item 6:	Action Plan for the Implementation of RVSM within Baghdad FIR
Agenda Item 7:	Future Work Programme
Agenda Item 8:	Any other Business

7. CONCLUSIONS AND DECISIONS – DEFINITION

7.1 The MIDANPIRG records its actions in the form of Conclusions and Decisions with the following significance:

a) **Conclusions** deal with matters that, according to the Group's terms of reference, merit directly the attention of States, or on which further action will be initiated by the Secretary in accordance with established procedures; and

b) **Decisions** relate solely to matters dealing with the internal working arrangements of the Group and its Sub-Groups

8. LIST OF CONCLUSIONS AND DECISIONS

DRAFT CONCLUSION 2/1:	*GO DECISION FOR RVSM IMPLEMENTATION WITHIN BAGHDAD FIR*
DRAFT DECISION 2/2:	*DISSOLUTION OF THE BFRI WORKING GROUP*

PART II: REPORT ON AGENDA ITEMS

REPORT ON AGENDA ITEM 1: ADOPTION OF THE PROVISIONAL AGENDA

1.1 The meeting reviewed and adopted the provisional agenda as at paragraph 6 of the history of the meeting.

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Report on Agenda Item 2

REPORT ON AGENDA ITEM 2: REVIEW OF MIDANPIRG/12 OUTCOME RELATED TO THE IMPLEMENTATION OF RVSM WITHIN BAGHDAD FIR

2.1 The meeting recalled that MIDANPIRG/11, through Decision 11/23, agreed to the establishment of the Baghdad FIR RVSM Implementation Working Group (BFRI WG) with Terms of Reference (TOR) as at **Appendix 2A** to the Report on Agenda Item 2, for the development of necessary planning materials related to RVSM implementation in Baghdad FIR and for assisting the Iraqi Civil Aviation Authority in the implementation of such an important project, in an expeditious manner.

2.2 The meeting noted that the MIDANPIRG/12 meeting held in Amman, Jordan, 17-21 October 2010 was apprised of the outcome of the BFRI WG/1 Meeting held in Cairo, from 18 to 20 January 2010. It was highlighted that MIDANPIRG/12 noted that the Action Plan for the implementation of RVSM within Baghdad FIR, which was initially developed by the BFRI WG/1 meeting, was further reviewed and updated by the Baghdad FIR RVSM Implementation Special Coordination Meeting (BFRI SCM) held in Bahrain, 29-30 September 2010, as at **Appendix 2B** to the Report on Agenda Item 2.

2.3 The meeting recalled that MIDANPIRG/12 noted IFALPA's concerns related to the shortcomings in the current Baghdad FIR communications infrastructure. However, it was highlighted that Iraq is aware of these shortcomings and is implementing a comprehensive infrastructure improvement programme to ensure that reliable and redundant ground-ground and air-ground communications are available throughout the Baghdad FIR.

2.4 It was highlighted that the MIDANPIRG/12 meeting noted that the BFRI SCM meeting concluded that conditions would be favorable for meeting the RVSM safety goals associated with RVSM implementation in Baghdad FIR and urged all concerned parties to take necessary actions to support the implementation of RVSM within Baghdad FIR on 10 March 2011. Accordingly, MIDANPIRG/12, through Decision 12/19, delegated the authority to take the Go/No-Go Decision for RVSM implementation within Baghdad FIR to the BFRI Working Group:

DECISION 12/19: RVSM IMPLEMENTATION WITHIN BAGHDAD FIR

That, the Baghdad FIR RVSM Implementation Working Group (BFRI WG) is delegated the authority to take the Go/No-Go Decision for RVSM implementation within Baghdad FIR.

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Appendix 2A to the Report on Agenda Item 2

BAGHDAD FIR RVSM IMPLEMENTATION WORKING GROUP (BFRI WG)

A) TERMS OF REFERENCE

With a view to coordinate and support the RVSM implementation activities in the Baghdad FIR, the Baghdad FIR RVSM Implementation Working Group (BFRI WG) shall:

1) Carry out a readiness assessment survey for RVSM implementation within Baghdad FIR;

2) Assist Iraq in the development of a comprehensive RVSM implementation plan and national safety plan;

3) Monitor and coordinate with Iraq the implementation of the RVSM programme within Baghdad FIR;

4) Carry out a Functional Hazard Analysis (FHA) which provides assurance that all hazards and risks associated with RVSM implementation within Baghdad FIR have been identified and analyzed;

5) Assist Iraq in the identification of necessary ATS equipment changes to accommodate the RVSM operations within Baghdad FIR;

6) Assist Iraq in the development of necessary ATS procedures related to RVSM operations within Baghdad FIR, including the contingency procedures;

7) Develop in coordination with the MID RMA an RVSM Pre-Implementation Safety Case (PISC) to provide evidence about the safe implementation of RVSM in Baghdad FIR;

8) Identify the needs for training and assist Iraq in the development of a training plan for the ATS personnel;

9) Consider interface issues related to RVSM implementation and operations with the adjacent Regions;

10) Assist Iraq in the publication of necessary Aeronautical Information Publication related to RVSM implementation within Baghdad FIR;

11) Monitor the process of signature of updated Letter of Agreements between Baghdad ACC and the adjacent ACCs;

12) Prepare necessary proposal for amendment to Doc 7030 related to RVSM implementation within Baghdad FIR; and

13) Address any other issue related to RVSM implementation within Baghdad FIR.

B) COMPOSITION

The BFRI WG will be composed of:

Bahrain, Iran, Iraq, Jordan, Kuwait, Saudi Arabia and Syria, MID RMA, IATA and IFALPA.

Other representatives, who could contribute to the activity of the Working Group, could be invited to participate as observers.

C) WORKING ARRANGEMENTS

1) The BFRI WG shall:

   - report to the ATM/SAR/AIS Sub Group;
   - appoint a Rapporteur to facilitate its proceedings; and
   - meet as required and be dissolved once RVSM is implemented within Baghdad FIR.

2) The work of the BFRI WG shall be carried out mainly through exchange of correspondence (email, facsimile, tel, etc) between its Members; and

3) The convening of the Working Group meetings should be initiated by the Rapporteur in coordination with the Members of the Group and the ICAO MID Regional Office.

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Appendix 2B to the Report on Agenda Item 2

ACTION PLAN FOR RVSM IMPLEMENTATION IN BAGHDAD FIR (as updated by the BFRI SCM)

ID	ACTION	TO BE DELIVERED BY	TARGET DATE	STATUS	COMMENTS (As of 30 September 2010)
1	Nomination of RVSM Focal Point	Iraq	19 Jan 2010	Closed	Ali Khalil Ibrahim is RVSM Focal Point
2	Nomination of Baghdad FIR RVSM Program Manager	Iraq	1 Mar 2010	Closed	Ali Khalil Ibrahim is Baghdad FIR RVSM Program Manager
3	Promulgation of national regulation to enable the implementation of RVSM	Iraq	13 Jan 2011	Open	Iraq Civil Aviation Law currently under review; RVSM amendments will be incorporated into Law after review completed. Until review is complete, AIP will serve as regulatory document. Initially, an AIC will be published as advance notification to airspace users. Enroute section of Iraq AIP will be amended on AIRAC date of 13 Jan 2011.
4	Provide the MIDRMA with traffic data for the month of February 2010 (including A/C REG)	Iraq	15 Mar 2010	Closed	Submitted as required.
5	Submission of the latest airways structure for Baghdad FIR to the MIDRMA	Iraq	15 Apr 2010	Closed	Latest Baghdad FIR airways structure published in AIP. There will be no airspace changes to the ATS route network within Baghdad FIR affecting the current prospects of meeting the Target Level of Safety on RVSM implementation date.
6	Calculating the passing frequency for all Bagdad FIR airways	Iraq and MIDRMA	15 Nov 2010	Open	Passing frequency associated with heavily used portion of current route structure is very close to 0 for same-direction traffic; there is little to no opposite direction opposite-direction traffic at adjacent flight levels in the heavily used portion of current FIR route structure.

7	Conclusions of the passing frequency results, evaluation of the need for ATS Route Network amendments related to RVSM and follow up implementation of the proposals with Iraq	Iraq and MIDRMA	30 Sep 2010	Done	Traffic on the predominant unidirectional north-south routings accounts for roughly 97 percent of operations in FIR; the current estimates of passing frequency on these routes, very close to 0, precludes need for changes to route structure in order to ensure satisfaction of TLS on implementation date. Passing frequencies to be estimated prior to start of BFRI WG/2.
8	Submit RVSM approvals to the MIDRMA for all Iraqi registered aircraft or any airline operators certified by Iraq and to continue updating these approvals as necessary	Iraq	On monthly basis	Ongoing	Information submitted on regular basis as required.
9	Submit Coordination Failure Reports (CFR) and Altitude Deviation Reports (ADR) to the MIDRMA on a monthly basis	Iraq	On Monthly basis	Ongoing	Reports are being submitted as required
10	Develop ATC operational policy & procedures for normal RVSM operations	Iraq	1 Dec 2010	Open	Concept of Operation for Baghdad FIR RVSM completed in May 2010. Development of ATC operational policy and procedures initiated during first week in October. Policy and procedure development will proceed in accordance with plan to meet implementation date. Evidence of expected completion to be presented at BFRI WG/2.
11	Assess the impact of RVSM implementation on ATC automation systems, plan for upgrades/modifications and effectively implement necessary changes.	Iraq	31 Jan 2011	Ongoing	May 2010 Concept of Operation identified automation system upgrades required to support RVSM implementation. ICAA has confirmed that automation system upgrades are feasible within time period needed to support implementation. Evidence of expected completion to be presented at BFRI WG/2.

12	Develop ATC procedures for non-approved State aircraft to transit RVSM airspace	Iraq	1 Dec 2010	Open	Concept of Operation for Baghdad FIR RVSM, completed in May 2010, identified need to address non-approved State aircraft. See comments under Item 10 for current status. Evidence of expected completion to be presented at BFRI WG/2.
13	Develop procedures for handling non-compliant civil aircraft	Iraq	1 Dec 2010	Open	Concept of Operation for Baghdad FIR RVSM, completed in May 2010, identified need to address non-compliant civil aircraft. See comments under Item 10 for current status. Evidence of expected completion to be presented at BFRI WG/2.
14	Develop procedures for suspension of RVSM	Iraq	1 Dec 2010	Open	Concept of Operation for Baghdad FIR RVSM, completed in May 2010, identified need to address criteria and procedures for suspension of RVSM. See comments under Item 10 for current status. Evidence of expected completion to be presented at BFRI WG/2.
15	Development of Iraq national safety plan	Iraq	1 Dec 2010	Open	National Safety Plan drafting in progress. Several areas of plan complete in draft form; ATC portion of plan requires information from process to develop procedures and related items. Plan to be completed after conduct of early-October initial planning for ATC actions to support RVSM. Final draft to be presented to BFRI WG/2.
16	Simulations to support ATC training needs and assess ATC workload, identify eventual need for additional training and/or amendment of RVSM procedures	Iraq	Feb 2011	Open	Concept of Operation for Baghdad FIR RVSM, completed in May 2010, identified need to address simulation of RVSM procedures. See comments under Item 10 for current status. Evidence of expected completion to be presented at BFRI WG/2.
17	ATC training plan	Iraq	1 Dec 2010	Open	Concept of Operation for Baghdad FIR RVSM, completed in May 2010, identified need to address training. See comments under Item 10 for current status. Evidence of expected completion to be presented at BFRI WG/2.

18	Update of LOAs between Iraq and all adjacent FIRs	Iraq and neighboring States	15 Feb 2011	Open	Draft LOAs will be presented at BFRI WG/2. Signed LOAs required not later than 15 Feb, but preferably during BFRI WG/2.
19	ATCOs trained for RVSM operation	Iraq	15 Feb 2011	Open	Training to be completed near implementation date. Evidence of expected completion to be presented at BFRI WG/2.
20	Carry out pre-implementation safety analysis	Iraq and MIDRMA	1 Dec 2010	Open	The ICAA will conduct pre-implementation safety assessment in coordination with MIDRMA. Results will be presented to BFRI WG/2.
21	Carry out pre-implementation readiness assessment	Iraq	15 Feb 2011	Open	ICAA will conduct internal RVSM readiness assessment in accordance with established ICAO criteria and report results to MIDRMA and ICAO MID Office.
22	Prepare necessary proposal for amendment to Doc 7030 related to RVSM implementation within Baghdad FIR	ICAO MID Office	31 Dec 2010	Ongoing	Draft proposal to be presented to BFRI WG/2. Iraq to request that ICAO MID circulate Doc 7030 amendment after BFRI WG/2.
23	Go/No-Go Decision for RVSM Implementation effective 10 March 2011	BFRI WG	15 Dec 2010	Open	

RVSM IMPLEMENTATION-DEPENDENT CNS REQUIREMENTS

(Note: CNS Requirements are not part of ACTION PLAN adopted at BFRI WG/1; added at BFRI SCM)

ID	ACTION	TO BE DELIVERED BY	TARGET DATE	STATUS	COMMENTS (As of 30 September 2010)
	Integration of Basra and Kirkuk radars at Baghdad ACC	ICAA	Oct 2010	Ongoing	Kirkuk radar available at Baghdad ACC effective July 2010; Basra radar planned for integration by end of October 2010.
	Reliable ground-ground communications with adjacent FIRs	ICAA	1 Dec 2010	Open	Very Small Aperture Terminal (VSAT)-based satellite relay of communications exists in portions of FIR; funds have been allocated for expansion of VSAT system to meet minimum communications requirements. Funds have been allocated to connect Baghdad ACC to the existing fiber-optic backbone in Iraq; funds also have been allocated for connections of adjacent FIRs to this backbone.

REPORT ON AGENDA ITEM 3: ASSESSMENT OF OPERATORS READINESS FOR RVSM IMPLEMENTATION

3.1 The meeting noted that the Iraqi Civil Aviation Authority (ICAA) collected a sample of traffic movements within the airspace controlled by the Baghdad Area Control Centre (ACC) for the month of February 2010. A summary of this traffic sample is presented in Table 1:

Operator Class	Number of Flights	Proportion of Flights
Commercial	5,035	85.98%
IGA	38	0.65%
State	783	13.37%
Total	5,856	100.00%

Table 1. Summary of February 2010 BFIR Traffic Sample

3.2 The meeting noted that the February 2010 traffic sample was further analyzed along with current Regional Monitoring Agency (RMA) RVSM approval data to provide a projection of operator readiness to conduct RVSM operations by the March 2011 timeframe. The data largely indicates that current operators within Baghdad FIR are already approved to conduct RVSM operations. This finding is also supported by the fact that RVSM has been already implemented in the FIRs surrounding the Baghdad FIR since November 2003. Accordingly, it was confirmed that Operators readiness for the implementation of RVSM in the Baghdad FIR is projected to be roughly 100% as shown in **Appendix 3A** to the Report on Agenda Item 3.

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Appendix 3A to the Report on Agenda Item 3

DETAILED SUMMARY OF PROJECTED RVSM AIRWORTHINESS APPROVAL STATUS FOR MARCH 2011 TIMEFRAME

This Appendix provides the full details of commercial, State and IGA operators and aircraft types observed in the February 2010 traffic sample from the Baghdad FIR.

ICAO Operator/ Type Designator	Number of Flights	Proportion of Operations	Cumulative Proportion	Projected Ops Conducted by Approved Aircraft	Cumulative % of Projected Ops Conducted by Approved Aircraft	Operator Class
UAE-B777	466	7.96%	7.96%	YES	7.96%	COM
C17	464	7.92%	15.88%	YES	15.88%	STATE
UAE-B77W	292	4.99%	20.87%	YES	20.87%	COM
QTR-A340	204	3.48%	24.35%	YES	24.35%	COM
KC35	143	2.44%	26.79%	YES	26.79%	STATE
UAE-A332	141	2.41%	29.20%	YES	29.20%	COM
ETD-A332	137	2.34%	31.54%	YES	31.54%	COM
GFA-A332	132	2.25%	33.79%	YES	33.79%	COM
RCH-IL76	125	2.13%	35.93%	YES	35.93%	COM
UAE-B773	122	2.08%	38.01%	YES	38.01%	COM
KLM-A332	119	2.03%	40.04%	YES	40.04%	COM
BAW-B777	107	1.83%	41.87%	YES	41.87%	COM
UAE-A388	96	1.64%	43.51%	YES	43.51%	COM
RCH-DC10	78	1.33%	44.84%	YES	44.84%	COM
QTR-A330	70	1.20%	46.04%	YES	46.04%	COM
QTR-A333	66	1.13%	47.17%	YES	47.17%	COM
QTR-A320	64	1.09%	48.26%	YES	48.26%	COM
FDX-MD11	63	1.08%	49.33%	YES	49.33%	COM
RCH-B763	63	1.08%	50.41%	YES	50.41%	COM
DLH-A333	62	1.06%	51.47%	YES	51.47%	COM
RCH-MD11	60	1.02%	52.49%	YES	52.49%	COM
UAE-A343	59	1.01%	53.50%	YES	53.50%	COM
BAW-B772	59	1.01%	54.51%	YES	54.51%	COM
UAL-B772	58	0.99%	55.50%	YES	55.50%	COM
UAE-A333	52	0.89%	56.39%	YES	56.39%	COM
DHX-B727	48	0.82%	57.21%	YES	57.21%	COM
DLH-B737	46	0.79%	57.99%	YES	57.99%	COM
CKS-B747	43	0.73%	58.73%	YES	58.73%	COM
UAE-B772	42	0.72%	59.44%	YES	59.44%	COM
ALK-A340	41	0.70%	60.14%	YES	60.14%	COM
IAW-B737	40	0.68%	60.83%	YES	60.83%	COM

ICAO Operator/ Type Designator	Number of Flights	Proportion of Operations	Cumulative Proportion	Projected Ops Conducted by Approved Aircraft	Cumulative % of Projected Ops Conducted by Approved Aircraft	Operator Class
ETD-A333	40	0.68%	61.51%	YES	61.51%	COM
ISF-L101	39	0.67%	62.18%	YES	62.18%	COM
RCH-B742	39	0.67%	62.84%	YES	62.84%	COM
C5	38	0.65%	63.49%	YES	63.49%	STATE
Various IGA	38	0.65%	64.14%	YES	64.14%	IGA
UAE-B744	37	0.63%	64.77%	YES	64.77%	COM
BAW-B747	36	0.61%	65.39%	YES	65.39%	COM
RCH-B767	36	0.61%	66.00%	YES	66.00%	COM
BAW-B744	36	0.61%	66.62%	YES	66.62%	COM
QTR-A346	33	0.56%	67.18%	YES	67.18%	COM
KAC-A306	33	0.56%	67.74%	YES	67.74%	COM
KAC-B777	33	0.56%	68.31%	YES	68.31%	COM
GFA-A320	33	0.56%	68.87%	YES	68.87%	COM
CKS-B742	33	0.56%	69.43%	YES	69.43%	COM
KLM-B772	32	0.55%	69.98%	YES	69.98%	COM
ETD-A330	31	0.53%	70.51%	YES	70.51%	COM
UAE-A345	31	0.53%	71.04%	YES	71.04%	COM
DLH-B744	31	0.53%	71.57%	YES	71.57%	COM
P3	31	0.53%	72.10%	YES	72.10%	STATE
BAB-A320	29	0.50%	72.59%	YES	72.59%	COM
JZR-A320	29	0.50%	73.09%	YES	73.09%	COM
VIR-A340	28	0.48%	73.57%	YES	73.57%	COM
JAI-A332	27	0.46%	74.03%	YES	74.03%	COM
MPH-B747	25	0.43%	74.45%	YES	74.45%	COM
BOX-B777	25	0.43%	74.88%	YES	74.88%	COM
QTR-B777	25	0.43%	75.31%	YES	75.31%	COM
KAC-A340	23	0.39%	75.70%	YES	75.70%	COM
DLH-A343	23	0.39%	76.09%	YES	76.09%	COM
SWR-A333	23	0.39%	76.49%	YES	76.49%	COM
GFA-B777	23	0.39%	76.88%	YES	76.88%	COM
ALK-A343	22	0.38%	77.25%	YES	77.25%	COM
TVS-B738	21	0.36%	77.61%	YES	77.61%	COM
ETD-A346	21	0.36%	77.97%	YES	77.97%	COM
MPH-B744	21	0.36%	78.33%	YES	78.33%	COM
RBA-B767	20	0.34%	78.67%	YES	78.67%	COM
PHW-B737	20	0.34%	79.01%	YES	79.01%	COM
QTR-A332	20	0.34%	79.35%	YES	79.35%	COM
VIR-A346	20	0.34%	79.70%	YES	79.70%	COM
GFA-B747	19	0.32%	80.02%	YES	80.02%	COM

ICAO Operator/ Type Designator	Number of Flights	Proportion of Operations	Cumulative Proportion	Projected Ops Conducted by Approved Aircraft	Cumulative % of Projected Ops Conducted by Approved Aircraft	Operator Class
C130	19	0.32%	80.34%	YES	80.34%	STATE
BAW-B767	18	0.31%	80.65%	YES	80.65%	COM
RCH-B747	18	0.31%	80.96%	YES	80.96%	COM
DGD-IL76	18	0.31%	81.27%	YES	81.27%	COM
DAL-B772	17	0.29%	81.56%	YES	81.56%	COM
AUA-B763	17	0.29%	81.85%	YES	81.85%	COM
ETD-A320	17	0.29%	82.14%	YES	82.14%	COM
IAW-B767	16	0.27%	82.41%	YES	82.41%	COM
UAL-B777	16	0.27%	82.68%	YES	82.68%	COM
MAG-DC8	15	0.26%	82.94%	YES	82.94%	COM
CKS-B744	15	0.26%	83.20%	YES	83.20%	COM
JAE-B747	15	0.26%	83.45%	YES	83.45%	COM
AZG-IL76	15	0.26%	83.71%	YES	83.71%	COM
UAE-B77L	15	0.26%	83.97%	YES	83.97%	COM
DLH-A346	14	0.24%	84.20%	YES	84.20%	COM
RJA-E175	14	0.24%	84.44%	YES	84.44%	COM
TCX-A332	14	0.24%	84.68%	YES	84.68%	COM
BOX-B772	14	0.24%	84.92%	YES	84.92%	COM
GFA-A330	14	0.24%	85.16%	YES	85.16%	COM
BAW-B763	14	0.24%	85.40%	YES	85.40%	COM
GFA-A343	14	0.24%	85.64%	YES	85.64%	COM
ETD-A340	13	0.22%	85.86%	YES	85.86%	COM
GEC-MD11	13	0.22%	86.08%	YES	86.08%	COM
MON-A330	12	0.20%	86.29%	YES	86.29%	COM
RLB-IL76	12	0.20%	86.49%	YES	86.49%	COM
CLX-B747	12	0.20%	86.70%	YES	86.70%	COM
QTR-A300	12	0.20%	86.90%	YES	86.90%	COM
ETD-A345	11	0.19%	87.09%	YES	87.09%	COM
KLM-B777	11	0.19%	87.28%	YES	87.28%	COM
SOO-B747	11	0.19%	87.47%	YES	87.47%	COM
KAC-B772	11	0.19%	87.65%	YES	87.65%	COM
CLX-B744	11	0.19%	87.84%	YES	87.84%	COM
BOX-B77L	11	0.19%	88.03%	YES	88.03%	COM
AUA-B767	10	0.17%	88.20%	YES	88.20%	COM
IAW-CRJ9	10	0.17%	88.37%	YES	88.37%	COM
RCH-B752	10	0.17%	88.54%	YES	88.54%	COM
KLM-A333	10	0.17%	88.71%	YES	88.71%	COM
IAW-CR90	9	0.15%	88.87%	YES	88.87%	COM
SQC-B747	9	0.15%	89.02%	YES	89.02%	COM

ICAO Operator/ Type Designator	Number of Flights	Proportion of Operations	Cumulative Proportion	Projected Ops Conducted by Approved Aircraft	Cumulative % of Projected Ops Conducted by Approved Aircraft	Operator Class
HHI-A319	9	0.15%	89.17%	YES	89.17%	COM
SQC-B744	9	0.15%	89.33%	YES	89.33%	COM
DAL-B77L	9	0.15%	89.48%	YES	89.48%	COM
C12	9	0.15%	89.63%	YES	89.63%	STATE
QTR-A321	8	0.14%	89.77%	YES	89.77%	COM
TVS-B737	8	0.14%	89.91%	YES	89.91%	COM
QTR-B77W	8	0.14%	90.04%	YES	90.04%	COM
QTR-A319	8	0.14%	90.18%	YES	90.18%	COM
JAI-B777	8	0.14%	90.32%	YES	90.32%	COM
DLH-B777	8	0.14%	90.45%	YES	90.45%	COM
BER-A332	8	0.14%	90.59%	YES	90.59%	COM
UC35	8	0.14%	90.73%	YES	90.73%	STATE
IAW-B732	7	0.12%	90.85%	YES	90.85%	COM
ACX-B747	7	0.12%	90.97%	YES	90.97%	COM
MED-B737	7	0.12%	91.09%	YES	91.09%	COM
DLH-B747	7	0.12%	91.21%	YES	91.21%	COM
PAC-B747	7	0.12%	91.33%	YES	91.33%	COM
DHX-DC8	7	0.12%	91.44%	YES	91.44%	COM
QTR-B77L	7	0.12%	91.56%	YES	91.56%	COM
FLC-CL60	6	0.10%	91.67%	YES	91.67%	COM
DAL-B777	6	0.10%	91.77%	YES	91.77%	COM
RBA-B763	6	0.10%	91.87%	YES	91.87%	COM
SAS-A330	6	0.10%	91.97%	YES	91.97%	COM
GFA-A333	6	0.10%	92.08%	YES	92.08%	COM
RJA-E95	6	0.10%	92.18%	YES	92.18%	COM
GBB-DC9	6	0.10%	92.28%	YES	92.28%	COM
QTR-A306	6	0.10%	92.38%	YES	92.38%	COM
KAC-A333	6	0.10%	92.49%	YES	92.49%	COM
GFA-EQV	6	0.10%	92.59%	YES	92.59%	COM
AFR-A332	6	0.10%	92.69%	YES	92.69%	COM
RCH-B744	6	0.10%	92.79%	YES	92.79%	COM
K35R	6	0.10%	92.90%	YES	92.90%	STATE
TFL-B738	5	0.09%	92.98%	YES	92.98%	COM
RUN-A300	5	0.09%	93.07%	YES	93.07%	COM
CFG-B763	5	0.09%	93.15%	YES	93.15%	COM
NAF-DC10	5	0.09%	93.24%	YES	93.24%	COM
KAC-A343	5	0.09%	93.32%	YES	93.32%	COM
JAE-B744	5	0.09%	93.41%	YES	93.41%	COM
ICV-B744	5	0.09%	93.49%	YES	93.49%	COM

ICAO Operator/ Type Designator	Number of Flights	Proportion of Operations	Cumulative Proportion	Projected Ops Conducted by Approved Aircraft	Cumulative % of Projected Ops Conducted by Approved Aircraft	Operator Class
MNB-A300	5	0.09%	93.58%	YES	93.58%	COM
B707	5	0.09%	93.66%	YES	93.66%	STATE
MUA-DC87	4	0.07%	93.73%	YES	93.73%	COM
MIX-A300	4	0.07%	93.80%	YES	93.80%	COM
IAW-B763	4	0.07%	93.87%	YES	93.87%	COM
WLB-B737	4	0.07%	93.94%	YES	93.94%	COM
KKK-A320	4	0.07%	94.01%	YES	94.01%	COM
IAW-RJ9	4	0.07%	94.07%	YES	94.07%	COM
RFJ-B737	4	0.07%	94.14%	YES	94.14%	COM
DHX-B722	4	0.07%	94.21%	YES	94.21%	COM
JAI-B77W	4	0.07%	94.28%	YES	94.28%	COM
UBD-MD83	4	0.07%	94.35%	YES	94.35%	COM
TVL-B738	4	0.07%	94.42%	YES	94.42%	COM
RCH-B757	4	0.07%	94.48%	YES	94.48%	COM
SAW-MD83	4	0.07%	94.55%	YES	94.55%	COM
AFR-B777	4	0.07%	94.62%	YES	94.62%	COM
EDW-A332	4	0.07%	94.69%	YES	94.69%	COM
ALK-A330	4	0.07%	94.76%	YES	94.76%	COM
RJA-E195	4	0.07%	94.83%	YES	94.83%	COM
AUA-B777	4	0.07%	94.89%	YES	94.89%	COM
KC10	4	0.07%	94.96%	YES	94.96%	STATE
E120	4	0.07%	95.03%	YES	95.03%	STATE
C135	4	0.07%	95.10%	YES	95.10%	STATE
B767	4	0.07%	95.17%	YES	95.17%	STATE
B703	4	0.07%	95.24%	YES	95.24%	STATE
C37	4	0.07%	95.30%	YES	95.30%	STATE
KLM-A330	3	0.05%	95.36%	YES	95.36%	COM
SQC-B74Y	3	0.05%	95.41%	YES	95.41%	COM
UAE-A340	3	0.05%	95.46%	YES	95.46%	COM
CFG-B753	3	0.05%	95.51%	YES	95.51%	COM
ETD-A300	3	0.05%	95.56%	YES	95.56%	COM
ICV-B747	3	0.05%	95.61%	YES	95.61%	COM
UAE-A380	3	0.05%	95.66%	YES	95.66%	COM
VDA-A124	3	0.05%	95.71%	YES	95.71%	COM
GTI-B747	3	0.05%	95.77%	YES	95.77%	COM
IAW-C900	3	0.05%	95.82%	YES	95.82%	COM
JCI-IL76	3	0.05%	95.87%	YES	95.87%	COM
SAS-A333	3	0.05%	95.92%	YES	95.92%	COM
JAI-A333	3	0.05%	95.97%	YES	95.97%	COM

ICAO Operator/ Type Designator	Number of Flights	Proportion of Operations	Cumulative Proportion	Projected Ops Conducted by Approved Aircraft	Cumulative % of Projected Ops Conducted by Approved Aircraft	Operator Class
CSN-A321	3	0.05%	96.02%	YES	96.02%	COM
BOX-B737	3	0.05%	96.07%	YES	96.07%	COM
RBA-B777	3	0.05%	96.12%	YES	96.12%	COM
SQC-B777	3	0.05%	96.17%	YES	96.17%	COM
MAG-DC86	3	0.05%	96.23%	YES	96.23%	COM
MILI	3	0.05%	96.28%	YES	96.28%	STATE
B737	3	0.05%	96.33%	YES	96.33%	STATE
All others	215	3.67%	100.00%	YES	100.00%	VARIOUS
Total	**5,856**		100.0%		**100.00%**	

REPORT ON AGENDA ITEM 4: Air Traffic Control (ATC) Readiness Assessment

ATC Procedures

4.1 The meeting was apprised of the ATC procedures developed by the ICAA for the implementation of RVSM in that volume of airspace between FL290 and FL410 inclusive in the Baghdad FIR (Baghdad FIR RVSM airspace), including procedures for exceptions to RVSM approval, in-flight contingencies, and severe turbulence.

4.2 It was highlighted that those aircraft that are not RVSM-compliant and yet have a demonstrated need for access to the RVSM airspace could be allowed to enter the RVSM airspace on an individually analyzed basis:

a) State aircraft;
b) Aircraft operating on Humanitarian Missions or Lifeguard Flights;
c) Manufacturer delivery-flight aircraft and aircraft in a maintenance status; and
d) Non-approved RVSM aircraft capable of flying at FL430 and above.

4.3 The meeting noted that all of these exceptions would be handled on an individual basis and should be accommodated based on controller workload. These aircraft shall be separated by 2000 ft from all other aircraft within the RVSM airspace.

4.4 With regard to c) above, it was highlighted that in some cases, such as delivery of new aircraft, the Civil Aviation Authority might grant Temporary RVSM approval to the aircraft/operator until the height-keeping monitoring results could be obtained in order to obtain the final RVSM approval.

4.5 The meeting reviewed the ATC-Pilot Phraseology related to the implementation of RVSM developed by the ICAA as at **Appendix 4A** to the Report on Agenda Item 4. The meeting reviewed also the In-Flight Contingency Procedures and the procedures to be used in case of severe turbulence within the RVSM airspace and agreed that these procedures are in accordance with ICAO requirements.

Air Traffic Controllers Training

4.6 The meeting noted that the ICAA has developed a plan for training the Air Traffic Controllers (ATCOs) in the various aspects of RVSM based on a “train-the-trainers” concept. It was highlighted that the plan calls for a two-stage training process. In the first stage, a consultant engaged by the ICAA will administer a three-day in-depth course to the ICAA training staff. This initial stage will address all aspects of RVSM introduction and use, with emphasis on proven training techniques. In the second stage, the ICAA training staff will use the material presented in the first stage to administer training to the Baghdad Area Control Center (ACC) ATCOs engaged in the provision of air traffic services.

4.7 The meeting noted that stage 1 will commence approximately 30 days before the planned 10 March 2011 RVSM implementation date and will cover the following syllabus:

a) Introduction/Overview
b) History of RVSM Development and Application
c) RVSM Environment
d) Exception Handling

e) Non-RVSM-approved climb/descent through RVSM airspace
f) Contingencies
g) Workload Issues
h) Regional Procedures/Issues

4.8 It was also highlighted that stage 1 will permit thorough examination of the RVSM aspects of Letters of Agreement (LOAs) governing transition of traffic between the Baghdad FIR and the six neighbouring FIRs; and an in-depth examination of the interrelation between the application of RVSM and the decision support rendered by the Baghdad ACC air traffic control automation system, AutoTrac II, through provision of the State RVSM approval status of aircraft operating in the Baghdad FIR.

4.9 The meeting was informed that stage 2 consists of providing RVSM training to all Baghdad ACC ATCOs prior to the planned implementation date, with three important aspects:

a) quality control exercised by the ICAA in administration of RVSM training. Key items in this quality control process are:

i) assurance that controllers are provided sufficient time away from their operational duties to attend one of the training courses;

ii) maintenance of accurate course attendance records, including time spent on training simulators, if used;

iii) clarification, and, if necessary, further training, should a controller express lack of understanding of any aspect of instruction;

iv) testing controllers and assistants on their theoretical understanding of RVSM operational aspects pertaining to the Republic of Iraq airspace; and

v) evaluation of controllers concerning practical application of RVSM procedures, including contingency procedures, using the simulator phase of the training program, if the simulator is used; this evaluation will be documented and retained in the controllers' training files.

b) presentation of training material in a manner encouraging open discussion, and interaction with those being trained. The effect of this interaction will be to identify areas of difficulty in understanding training material. Such difficulties will be addressed on an individual or group basis through further explanation and training if necessary.

c) timeliness: considering that administration of training too far in advance of RVSM introduction has limited value, the training will be provided to each controller not more than 30 days prior to RVSM implementation. Refresher briefings will be available in the days prior to implementation to anyone who so requests. In order to ensure timeliness, any operational controller trained more than 30 days prior to the implementation of RVSM will be required to complete refresher training prior to controlling aircraft once the RVSM is implemented.

4.10 It was highlighted that the Baghdad ACC ATCOs are already used to the RVSM Flight Levels since they are currently using them with 2000 ft vertical separation. Accordingly, RVSM implementation will not make noticeable difference in operation of the airspace within the Baghdad FIR.

4.11 Based on the above, the meeting agreed that the ICAA should take necessary measures to implement the training plan in an efficient and timely manner in order for all the Baghdad ACC ATCOs to be trained and ready for RVSM implementation by 10 March 2011.

ATC Automation

4.12 The meeting noted that the ICAA assessed the impact of RVSM implementation on ATC automation systems called for in Item 11 of the Action Plan for RVSM implementation in Baghdad FIR and identified three major areas for which the upgrades of the ATC automation system in use at the Baghdad ACC (AutoTrac) would be necessary to accommodate application of the RVSM:

a. flight plan data processing;
b. controller display system processing; and
c. short-term conflict alert (STCA).

4.13 It was noted that in order to carry out these upgrades, the manufacturer of the AutoTrac system, the Raytheon Company, installed a recent AutoTrac II software release in November 2010. The release has been tested and shown to provide the necessary RVSM accommodations.

CNS Infrastructure upgrades

4.14 The meeting was apprised of the completed and planned actions by the ICAA to improve the CNS infrastructure in the Baghdad FIR. In this regard it was noted that US$6.9 million has been approved for the improvement of the CNS infrastructure in the Baghdad FIR.

4.15 With regard to Ground-Ground Communications, the meeting noted that Landline Communications through the Iraqi Telecommunication and Post Company (ITPC) are available to the ACCs in Amman, Damascus, and Ankara. Very Small Aperture Terminal (VSAT) Communications are available with Kuwait and Tehran. Ground-Ground Communications within the Baghdad FIR are reliable and redundant through the VSAT system.

4.16 The meeting noted that the ICAA has drafted Requests for Proposals (RFPs) for VSAT upgrades, fiber optic connectivity throughout the country and adjacent FIRs, and Aeronautical Fixed Telecommunication Network (AFTN).

4.17 The meeting further noted that the fiber optics network currently provides limited capability in the Baghdad FIR and that Funds have been allocated to upgrade the VSAT network in Iraq and provide VSAT connectivity to adjacent FIRs. In addition, the meeting was informed that the ICAA signed a contract with the Iraqi Telecommunications and Post Company (ITPC) to install fiber optic communications throughout the country and up to the adjacent FIRs except for Syria. The meeting noted that work is expected to be completed in April 2011. It was also highlighted that after the fiber optic network installation is complete, the VSAT stations will remain in place as a viable back-up.

4.18 The meeting noted with appreciation the willingness of Syria to discuss bi-laterally with Iraq all the pending issues related to ground-ground communications with a view to improve the coordination between the ATS Units.

4.19 With respect to Air-Ground Communications, the ICAA has installed radios and antennas at Tallil base and Basrah International Airport, in order to ensure the safety of RVSM operations in the Baghdad FIR. The installation of these radios provides Baghdad ACC with full radio coverage throughout the primary North/South corridors.

4.20 The meeting noted that the Kirkuk radar (DASR-11) has been fully integrated into the Baghdad ACC and provides excellent coverage of the northern part of Baghdad FIR, as well as coverage beyond the borders to the north in order to see aircraft approaching. It was also noted with appreciation that effective 14 December 2010, the Basrah THALES Star 2000 radar is also fully integrated into the Baghdad ACC and provides excellent coverage of the southern part of Baghdad FIR. Accordingly, the main north-south traffic flow within Baghdad FIR, is currently fully under radar coverage.

4.21 Based on the above, the meeting reviewed the CNS Action Plan as updated by Iraq and urged Iraq to take necessary measures to improve the CNS infrastructure in a timely manner to support the RVSM implementation on 10 March 2011, especially the Ground-Ground Communications.

Update of the Letters of Agreement (LOAs)

4.22 The meeting noted that the current Letters of Agreement (LOAs) between Baghdad ACC and the adjacent ACCs address a number of ATC coordination issues such as common definitions and abbreviations, areas of common interest, exchange of flight data, general conditions for acceptance of flights, procedures for coordination, transfer of control, transfer of communication, radar based coordination procedures, and separation issues.

4.23 The meeting noted that the LOAs between Baghdad ACC and Ankara ACC and Kuwait ACC were updated beginning of 2010; however, the LOAs with the remaining adjacent States (Iran, Jordan, Saudi Arabia and Syria) have not been updated since 2008 or 2009. The meeting noted with appreciation that the LOAs between Ankara and Baghdad ACCs, Ankara and Damascus ACCs and Bahrain and Kuwait ACCs have been reviewed and amended by concerned parties and are being processed for signature.

4.24 The meeting reviewed the updated Draft LOAs developed by the ICAA to support RVSM implementation in the Baghdad FIR. It was highlighted in particular that the following text was introduced in the section for Operational Coordination Requirements, to accommodate RVSM in the Baghdad FIR:

> ***"D.6 RVSM Operational Coordination Requirements.***
>
> *D.6.1 _____ and Baghdad ACC(s) shall coordinate flights, including the RVSM status on any aircraft crossing the common FIR boundary in accordance with ICAO Doc 4444. The transferring ACC must insure the receiving ACC has received the equipment suffix on all flights crossing the common boundary indicating RVSM status.*
> *D.6.2 _____ and Baghdad ACC(s) shall advise the other if they are transferring a non-RVSM approved aircraft that is being provided service as an "exception" aircraft in a timely manner prior to the aircraft crossing the common FIR boundary.*

D.6.3 If either _____ or Baghdad ACC(s) have suspended RVSM operations within 150 nautical miles of the common FIR boundary for any reason, the suspending ACC shall advise the other ACC."

4.25 As part of the process of LOAs update, the meeting addressed the issue of implementation of 20 NM longitudinal separation. In this respect, the meeting was apprised of the difficulties that Bahrain and Turkey are facing to accommodate the traffic growth and the airspace congestion. The meeting recalled that MIDANPIRG/12 urged all MID States to implement 20 NM longitudinal separation, and further develop plans for further reduction of longitudinal separation from 20 NM to 5 NM. The meeting recalled also that 20 NM longitudinal separation has been implemented between Bahrain, Jordan, Saudi Arabia and Syria since 29 July 2010.

4.26 The meeting noted the position of Turkey with regard to the ATS route structure between Ankara and Baghdad FIRs. In this regard, the meeting recalled with appreciation that further to the BFRI WG/1 meeting, Turkey has issued a NOTAM early March 2010, related to the dualisation of traffic over KABAN and the implementation of the unidirectional route UT888 Southbound, which improved the traffic flow within Baghdad FIR.

4.27 The meeting noted that the daily average traffic over NINVA and KABAN has already reached 250 flights. It was highlighted also that the demand for southbound flow is increasing more than northbound flow. Turkey underlined that to handle the increasing traffic in a safe and efficient manner, taking into consideration the military restrictions and ground-ground data and voice communication problems, concerned parties should make additional arrangements such as the full implementation of UP975 and UL602. In this respect, the meeting noted that a bilateral meeting between Syria and Turkey was held in August 2010, during which the following was agreed:

- the control of the traffic between LESRI and KANOK/RAGAN at or above FL290 (unidirectional southbound) will be provided by Ankara ACC; and
- Ankara ACC will transfer the control of traffic direct to Baghdad ACC over point KANOK/RAGAN.

4.28 In connection with the above, it was highlighted that both five-letter name-codes (5LNCs) KANOK (used by Syria) and RAGAN (used by Iraq) are duplicate 5LNCs and should be replaced by a new 5LNC. Accordingly, it was agreed to replace these 5LNCs by the code SIDNA, which will be the FIR boundary point between Baghdad and Damascus FIRs on UP975. In order to comply with the MID Air Navigation Plan, Iraq was reminded to change the ATS Route designators UT888 by UM688 and R784 by UM860.

4.29 The meeting noted that Iraq agreed in principle to re-activate the ATS Route UP975. However, it was highlighted that implementing this route, which crosses the main parallel route structure within Baghdad FIR, before the RVSM implementation date, would necessitate the recalculation of the passing frequency, the technical risk and overall risk and accordingly the review and update of the whole RVSM pre-implementation safety assessment, which would necessarily delay the RVSM implementation. In addition, the meeting recalled that MIDANPIRG/12 urged all concerned parties to take necessary actions to support the implementation of RVSM within Baghdad FIR on 10 March 2011. Accordingly, it was re-emphasized that all efforts should be made to avoid any delay in the implementation of RVSM. From a safety point of view it was also highlighted that the implementation of more than one major change at the same date should be avoided (RVSM implementation and re-activation of UP975).

4.30 Based on all the foregoing, the meeting agreed that:

- as a first step, to manage the airspace congestion, especially over KABAN and NINVA, 20 NM longitudinal separation between Bahrain, Kuwait, Iraq and Turkey will be implemented on the AIRAC date 10 February 2011;

- 10 March 2011 is maintained as the date for RVSM implementation within Baghdad FIR; and

- the ATS Route UP975 will be re-activated on the AIRAC date 7 April 2011.

4.31 The meeting agreed that the above should be reflected in the updated LOAs. In this respect, the meeting noted that Iraq requested that bilateral meetings with the six adjacent States be held beginning of 2011 (January-February 2011) in order to address the Ground-Ground Communication problems and associated Coordination Failures, as well as to sign the updated LOAs. Accordingly, the meeting urged Iran, Jordan, Kuwait, Saudi Arabia, Syria and Turkey to review the draft LOAs prepared by Iraq, provide their comments/updates as soon as possible and take necessary action to arrange for a bi-lateral meeting with Iraq during which the updated LOA will be signed and other coordination issues will be addressed, in particular the Ground-Ground Communication problems.

ATC-PILOT PHRASEOLOGY

MESSAGE	PHRASEOLOGY
For a controller to ascertain the RVSM approval status of an aircraft:	(call sign) *confirm RVSM approved*
Pilot indication that flight is RVSM approved	Affirm RVSM
Pilot reports lack of RVSM approval (non-RVSM status). Pilot will report non-RVSM status, as follows: a. On the initial call on any frequency in the RVSM airspace; and b. In all requests for flight level changes pertaining to flight levels within the RVSM airspace; and c. In all read backs to flight level clearances pertaining to flight levels within the RVSM airspace; and d. In read back of flight level clearances involving climb and descent through RVSM airspace (FL 290 - 410).	*Negative RVSM*, (supplementary information, e.g. "State Aircraft").
Pilot report of In-Flight Contingency ***NOTE*** *This phrase is to be used to convey both the initial indication of RVSM aircraft system failure and on initial contact on all frequencies in RVSM airspace until the problem ceases to exist or the aircraft has exited RVSM airspace.*	*Unable RVSM Due Equipment*
ATC denial of clearance into RVSM airspace	*Unable clearance into RVSM airspace, maintain FL*
Pilot reporting inability to maintain cleared flight level due to weather encounter.	*Unable RVSM due* (state reason) (e.g., turbulence, mountain wave)
ATC request of pilot to confirm that an aircraft has regained RVSM-approved status or a pilot is ready to resume RVSM	*Confirm able to resume RVSM*
Pilot ready to resume RVSM after aircraft system or weather contingency	*Ready to resume RVSM*

BFRI WG/2
Report on Agenda Item 5

REPORT ON AGENDA ITEM 5: RVSM PRE-IMPLEMENTATION SAFETY ASSESSMENT

5.1 The meeting recalled that as part of the requirements for the implementation of RVSM within Baghdad FIR, the ICAA was requested to develop an RVSM pre-implementation safety assessment, in coordination with the MIDRMA in order to determine whether the introduction of RVSM into the airspace of the Baghdad FIR will be safe. Satisfactory demonstration that RVSM implementation will be safe is equivalent to determining whether the implementation will satisfy the following three (3) RVSM safety objectives adopted by MIDANPIRG:

Safety Objective 1 (Technical Risk): *The risk of collision in the MID RVSM airspace due solely to technical height-keeping performance meets the ICAO Target Level of Safety (TLS) of* ***2.5 x 10^{-9}*** *fatal accidents per flight hour.*

Safety Objective 2 (Overall Risk): *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 MID RVSM airspace meets the ICAO overall TLS of* ***5 x 10^{-9}*** *fatal accidents per flight hour.*

Safety Objective 3: *propose safety level improvements to ensure that any identified serious or risk bearing situations do not increase and, where possible, that they decrease. This should set the basis for a continuous assurance that the operation of RVSM will not adversely affect the risk of en-route mid-air collision over the years.*

5.2 The meeting reviewed the pre-implementation safety assessment developed by the ICAA at **Appendix 5A** to the Report on Agenda Item 5. In particular, considering that the overwhelming majority of flights operate on two unidirectional routings (north-south) with usable flight levels on each routing separated by 2000 ft and that there are no plans to change this structure upon RVSM implementation; it was noted that the effective same-direction and opposite-direction occupancies or passing frequencies in the Baghdad FIR is zero (0). As a result, the technical risk is very close to zero (0) meeting the applicable TLS value of 2.5 x 10^{-9} fatal accidents per flight hour.

5.3 Notwithstanding the above, the meeting noted that there are east-west routes published in the Iraq Aeronautical Information Publication which are currently suspended. It was highlighted that if these routes are opened at some time after RVSM implementation, there may be some non-zero crossing-route passing frequency as a result. While it is not possible to forecast what that passing frequency may be, it was highlighted that this would be reflected in the RVSM Post-Implementation Safety Assessment, which would be presented to the ATM/SAR/AIS SG/12 meeting scheduled to be held in Cairo, 21-24 November 2011 and in the MID RVSM Safety Monitoring Report SMR 2012.

5.4 The meeting noted that the ICAA provided the MIDRMA with necessary information related to the radars used in Baghdad FIR (radar type, radar data format, etc) for the purpose of including Iraq in the RADAC system in order to obtain accurate and real measurements of the passing frequency based on the provided radar data.

5.5 With regard to the assessment of the overall risk due to all causes against the TLS of 5X10^{-9} fatal accidents per flight hour, the meeting noted that considering the success of scrutiny groups in other ICAO Regions, the ICAA established the Baghdad FIR RVSM implementation Scrutiny Group (BF/RSG) as part of its preparations for RVSM implementation.

5.6 The meeting noted that the ICAA has not forwarded any ADRs to the MIDRMA since May 2010 (no occurrence). However, there has been, a considerable number of CFRs sent to the MIDRMA. The analysis of these CFRs identified the difficulties related to the communications infrastructure within the Baghdad FIR as a main factor. Recognizing their potential adverse influence on operational risk, the ICAA has taken several steps to address the ongoing problem of coordination failures:

a. ATC procedures used in the Baghdad ACC require that no aircraft be permitted to change level until well within radar coverage.

b. Radars at Kirkuk and Basrah have been integrated into the surveillance suite of the Baghdad ACC to provide complete coverage of the main north-south flows and the ability to detect aircraft approaching the Ankara-Baghdad and Kuwait-Baghdad FIR boundaries prior to entry into Iraqi airspace.

c. The VSAT communications system used within the Baghdad FIR and for communications with neighboring FIRs is being upgraded and made more robust.

d. Civil aviation communications are being integrated into the existing Iraq national fiber optic backbone; when completed, this integration will provide two redundant and independent communications systems, one VSAT-based and the other landline-based, to support intra- and inter-FIR communications.

e. Improvements to the Baghdad FIR Aeronautical Fixed Telecommunications Network (AFTN) are being pursued.

f. The ICAA has established the Baghdad FIR RVSM Scrutiny Group (BF/RSG) to: review all LHDs reported within the Baghdad FIR, identify systematic causes for the errors and recommend remedial actions.

5.7 The meeting noted that the predominant effect on operational risk is time spent at incorrect flight level. It was further noted that control-transfer errors are the principal potential contributors to time at incorrect flight level in the Baghdad FIR.

5.8 In connection with the above, it was noted that the BF/RSG has agreed that, although control-transfer errors are occurring currently at a high frequency, the existing LOA arrangements and Baghdad ACC procedures combined with imminent complete surveillance coverage of the high-traffic portion of the FIR mitigate their effect on operational risk.

5.9 It was highlighted that the pre-implementation safety assessment developed by the ICAA does not provide specific detail as to the risk level of each cause type of LHD. In this respect, it was underlined that the satisfaction of the safety objectives for operational risk necessitates the accomplishment of evaluation and mitigation measures associated with functional hazard assessments (FHA) in conjunction with the development and continued updating of National Safety Plan (NSP). Accordingly, the meeting noted that the MIDRMA requested the ICAA to provide an addendum to the pre- implementation safety assessment, detailing the functional hazard assessment of each cause for LHD, using either the NAT Region approach (DOC 9574 Appendix A, para 5.2) or the EUR Region Functional Hazard Assessment. In addition the ICAA was requested to provide/develop documented procedures for the handling of coordination failures between Baghdad ACC and the neighbouring ATS Units.

5.10 As a result, considering the assessment of the current ATC operations, combined with the planned improvements listed above, the meeting agreed that the sum of estimated operational and technical risk should allow satisfaction of the overall TLS value of 5×10^{-9} fatal accidents per flight hour when RVSM is implemented in the Baghdad FIR.

5.11 With regard to Safety Objective 3, the meeting noted that supporting satisfaction of this objective is equivalent to providing assurance that operations in the Baghdad FIR after RVSM implementation will be monitored for occurrences of LHDs and that any systematic causes for these deviations will be identified and addressed through remedial actions. In this respect the meeting agreed that the establishment of the BF/RSG would assist in the satisfaction of this Safety Objective within the Baghdad FIR.

5.12 Based on the above, the meeting approved the pre-implementation safety assessment developed by the ICAA at **Appendix 5A** to the Report on Agenda Item 5, considering the commitment of Iraq to provide an addendum detailing the functional hazard assessment of each cause for LHD.

IMPLEMENTATION OF THE REDUCED VERTICAL SEPARATION MINIMUM INTO THE AIRSPACE OF THE BAGHDAD FLIGHT INFORMATION REGION

PRE-IMPLEMENTATION SAFETY ASSESSMENT

Prepared for Presentation to the Second Meeting of the

Baghdad FIR RVSM Implementation Working Group
(BFRI WG/2)

EXECUTIVE SUMMARY

The Iraq Civil Aviation Authority (ICAA) is working to implement the Reduced Vertical Separation Minimum (RVSM) in the airspace of the Baghdad Flight Information Region (FIR). The RVSM, or application of a 1000 ft vertical separation standard between flight levels (FLs) 290 and 410, inclusive, will replace the 2000 ft standard currently in use. In carrying out its work, the ICAA is following the Action Plan adopted at the First Meeting of the Baghdad FIR RVSM Implementation Working Group.

A key item in that Action Plan is the conduct of a pre-implementation safety assessment in order to show that:

a. the two relevant International Civil Aviation Organization (ICAO) safety goals are met when RVSM is implemented in the Baghdad FIR, and

b. this implementation supports satisfaction of the three Safety Objectives adopted by the ICAO Middle East (MID) Region.

The two ICAO safety goals apply to the airspace in which the RVSM is to be implemented, in this case that of the Baghdad FIR. On the other hand, the term "supports satisfaction" is used in relation to the MID Safety Objectives since these Objectives are set for all MID RVSM airspace of which the Baghdad FIR is only a part.

The pre-implementation safety assessment for Baghdad FIR RVSM is contained in this document. The data and analysis presented herein are intended to show that introduction of the RVSM into the airspace of the Baghdad FIR will be safe, which is to say that ICAO safety goals will be met and MID Safety Objectives supported.

ICAO Doc 9574, the guidance material for RVSM implementation and continued safe use, identifies the two ICAO safety goals as:

> **Safety Goal 1:** Technical risk, or the risk of collision associated with aircraft height-keeping performance, does not exceed a Target Level of Safety (TLS) of 2.5×10^{-9} fatal accidents per aircraft flight hour; and
>
> **Safety Goal 2:** Overall risk, or the risk of collision due to all causes - which includes the technical risk and all risk due to operational errors and in-flight contingencies, such as pilot/controller errors, height deviations due to emergency procedures, and turbulence - does not exceed a Target Level of Safety (TLS) of 5×10^{-9} fatal accidents per aircraft flight hour.

As applied to the Baghdad FIR, the three MID Safety Objectives are:

> **Objective 1:** The risk of collision associated with aircraft height-keeping performance in the Baghdad FIR RVSM airspace meets the ICAO 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 Baghdad FIR RVSM airspace meets the ICAO overall TLS of 5×10^{-9} fatal accidents per flight hour; and

Objective 3 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 in the Baghdad FIR will not adversely affect the risk of en-route mid-air collision over the years.

After application of ICAO collision risk methodology and analysis of Baghdad FIR airspace structure, operational characteristics and traffic flow data, the safety assessment has concluded the following with respect to the ICAO safety goals:

Safety Goal 1: Due to the airspace structure and traffic use patterns of the Baghdad FIR, technical risk will be, effectively 0 fatal accidents per aircraft flight hour, thereby satisfying the relevant TLS value of 2.5×10^{-9} fatal accidents per aircraft flight hour; and

Safety Goal 2: Current and planned surveillance improvements and communications infrastructure enhancements, in conjunction with existing procedures, currently, and will continue, to mitigate the consequences of frequently occurring coordination failure errors, ensuring that time spent at incorrect flight level in the Baghdad FIR is at or near 0 hours per year. This will result in low risk due to operational errors. When combined with the effectively nil technical risk, the sum of operational and technical risk will not exceed the relevant TLS value of 5×10^{-9} fatal accidents per aircraft flight hour.

Compliance with the two ICAO RVSM safety goals is equivalent to supporting satisfaction of MID Safety Objectives 1 and 2. Review of actions taken by the ICAA to identify and remove the systematic causes of large height deviations due to other than aircraft height-keeping performance leads to the following safety assessment conclusion regarding the last of the MID Safety Objectives:

Objective 3 The ICAA has established and continues to operate the Baghdad FIR RVSM Scrutiny Group which has as its purpose:

a. to review of large height deviations,

b. to identify any systematic causes for these deviations, and

c. to develop proposals for remedial actions to remove such causes.

Among the remedial actions recommended by the Baghdad FIR RVSM Scrutiny Group are increased emphasis on improvements to the surveillance and communications infrastructure of the Baghdad FIR and coordination with the air traffic service authorities of neighboring FIRs to remove systematic causes for transfer of control failures. The ongoing operation of the Baghdad FIR RVSM Scrutiny Group is intended to result in continuous reduction of operational errors and should contribute to the continuous assurance that the operation of RVSM in the Baghdad FIR will not adversely affect the risk of en-route mid-air collisions over the years.

PRE-IMPLEMENTATION SAFETY ASSESSMENT

1. INTRODUCTION

1.1. Background

The Reduced Vertical Separation Minimum (RVSM), or application of a 1000 ft vertical separation standard between aircraft operating in the flight level (FL) band 290 to 410, inclusive, is the high altitude vertical separation standard used in all of the airspace of the International Civil Aviation Organization's (ICAO) Middle East (MID) Region, with the exception of the Baghdad Flight Information Region (FIR).

The Iraqi Civil Aviation Authority (ICAA) has made introduction of the RVSM into the airspace of the Baghdad FIR a high priority for the near term. Because air traffic services (ATS) providers and airspace users would benefit from this change, concerned States in the MID formed the Baghdad FIR RVSM Implementation Working Group (BFRI WG) to assist Iraq in this implementation effort. At its First Meeting (BFRI WG/1), the BFRI WG adopted March 2011 as the goal for RVSM implementation (reference 1) and developed a list of tasks, or Action Plan, judged to be necessary prerequisites for implementation of the RVSM in the Baghdad FIR.

A key item in the Action Plan (Item 20) is to determine whether introduction of the RVSM into the airspace of the Baghdad FIR will be safe. Satisfactory demonstration that RVSM implementation will be safe is equivalent to determining whether the implementation will satisfy the safety goals recommended in ICAO RVSM guidance material (reference 2). Because the Baghdad FIR is part of the MID Region, it is also necessary to demonstrate support for satisfaction of RVSM Safety Objectives adopted by the Region. There are three such objectives, the first two of which are consistent with the safety goals of reference 2. Determining whether implementation of the RVSM in the Baghdad FIR complies with ICAO RVSM safety goals and supports satisfaction of the MID RVSM Safety Objectives requires, in part, conduct of a safety assessment described in ICAO Doc 9574, *Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive*, Second Edition.

1.2. Purpose

The purpose of this document is to present the pre-implementation assessment of the safety of implementing the RVSM in the Baghdad FIR.

1.3. Structure of the Document

The overall conclusion reached in this document is that introduction of the RVSM into Baghdad FIR airspace will be safe. Equivalently, the document concludes, based on application of ICAO collision risk methodology and analysis of data collected in Baghdad FIR airspace, that performance after introduction of the RVSM will comply with ICAO RVSM safety goals and support satisfaction of MID RVSM Safety Objectives.

Section 2 of this document reviews the ICAO RVSM safety goals and MID RVSM Safety Objectives.

Sections 3, 4 and 5 provide details of the safety assessment as they relate to demonstration of compliance with ICAO safety goals and support for satisfaction of MID RVSM Safety Objectives.

Section 6 summarizes all findings and includes recommendations for actions after implementation.

Appendix A provides technical details of collision risk models applicable in the safety assessment.

Appendix B provides information about Coordination-Failure and Altitude-Deviation large height deviations (LHDs) occurring in the Baghdad FIR.

Appendix C presents the Terms of Reference of the Baghdad FIR RVSM Scrutiny Group.

Appendix D provides definitions and explanation of terms used in the document.

2. RVSM SAFETY GOALS AND OBJECTIVES

2.1. ICAO RVSM Safety Goals

Demonstration that implementation of the RVSM in the Baghdad FIR will be safe is equivalent to demonstrating that safety goals will be met after implementation. From reference 2, the two ICAO safety goals are:

Safety Goal 1: Technical risk, or the risk of collision associated with aircraft height-keeping performance, does not exceed a Target Level of Safety (TLS) of 2.5×10^{-9} fatal accidents per aircraft flight hour.

Safety Goal 2: Overall risk, or the risk of collision due to all causes - which includes the technical risk and all risk due to operational errors and in-flight contingencies, such as pilot/controller errors, height deviations due to emergency procedures, and turbulence - does not exceed a TLS of 5×10^{-9} fatal accidents per aircraft flight hour.

It is important to note that these goals must be satisfied in the airspace where the RVSM is to be introduced. There is no provision for averaging risk over several FIRs, for example, in order to satisfy these goals.

2.2. Regional RVSM Safety Objectives

It is also necessary to show that implementation of RVSM in the Baghdad FIR will support satisfaction of the MID RVSM Safety Objectives. The use of the phrase "support satisfaction" is deliberate: the Safety Objectives are defined for the entire MID Region, of which the Baghdad FIR is only a part. Demonstration of support will be taken to mean that the MID RVSM Safety Objectives will be satisfied in the Baghdad FIR when the RVSM is implemented.

From reference 3, the Middle East Regional Monitoring Agency (MIDRMA) 2010 Safety Monitoring Report, the MID RVSM Safety Objectives are:

Objective 1: In accordance with ICAO Guidance Material, the risk of collision associated with aircraft height-keeping performance in the MID RVSM airspace meets the ICAO TLS of 2.5×10^{-9} fatal accidents per flight hour.

Objective 2: In accordance with ICAO Guidance Material, 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: 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.

As may be observed, Safety Objectives 1 and 2 are identical to the two ICAO RVSM safety goals for the RVSM airspace of the MID Region.

2.3. Practical Considerations Related to Safety Goals and Objectives

The first ICAO safety goal addresses risk due to aircraft height-keeping performance. In developing the guidance material, ICAO called on specialist groups in member States to formulate aircraft altimetry and altitude-keeping system requirements to meet that standard of height-keeping necessary for safe RVSM operations. Specialist bodies did carry out such work, which resulted in development of State approval processes and aircraft manufacturer equipment improvements. The overall result of these actions was that the standard of height-keeping performance has been shown to comply with those requirements necessary to control risk attributable to aircraft height-keeping performance. Monitoring of aircraft height-keeping performance in several regions has demonstrated this compliance for the vast majority of aircraft types and individual airframes.

While estimation of technical risk, in general, requires use of such monitoring results, none are presented in this document. The sophisticated systems necessary for such monitoring are not installed in the Baghdad FIR. It will be shown that other factors which affect technical risk, and which can be determined for the Baghdad FIR, are the basis for the proposition that the first ICAO RVSM safety goal, and the first MID RVSM Safety Objective, will be met in the Baghdad FIR.

Overall risk, addressed by the second ICAO RVSM safety goal and, equivalently, by the second MID RVSM Safety Objective, reflects not only technical risk but also the risk due to operational errors. Operational risk has been shown to threaten satisfaction of the second ICAO safety goal in some portions of global airspace, both before and after RVSM implementation. The MIDRMA defines two types of LHDs, or deviations greater than 300 ft in magnitude:

a. altitude deviations, in which an aircraft deviates from cleared flight level by 300 ft or more because of equipment failure, misunderstanding a clearance or being cleared incorrectly, and

b. coordination failures, which involve improper or non-existent transfer of control responsibility between air traffic control (ATC) units.

Both are the subject of monthly reports to the MIDRMA by MID States. In accordance with the Action Plan, the ICAA has been forwarding these Altitude Deviation Reports (ADRs) and Coordination Failure Reports (CFRs) to the MIDRMA since May 2010. There have been no ADRs forwarded by the ICAA since inception of reporting because none have been observed. On the other hand, there have been a number of CFRs forwarded each month.

The unacceptably high frequency of monthly CFRs led the ICAA to establish the Baghdad FIR RVSM Scrutiny Group (BF/RSG) which has met twice since August 2010. The Group is composed of experts in aircraft regulation, air traffic control, and communications/navigation/surveillance (CNS). The purpose of the Group is to:

a. review all reports of large height deviations in the Baghdad FIR;

b. identify systematic causes for large height deviations; and

c. recommend, where appropriate, remedial actions.

As a result of BF/RSG meetings, the Group has recommended greater emphasis on ICAA CNS infrastructure improvements and coordination between the ICAA and neighboring administrations to diminish the future prospect of CFR events.

3. TECHNICAL HEIGHT – KEEPING PERFORMANCE RISK ASSESSMENT

The purpose of the technical risk assessment is to determine if the first ICAO safety goal is met and satisfaction of MID RVSM Safety Objective 1 is supported. These safety criteria will both be met if the estimated technical risk is less than the ICAO TLS value of 2.5×10^{-9} fatal accidents per flight hour.

The risk models used in the assessment of technical height-keeping performance are shown in **Appendix A**. The parameters of the models are, in general, estimated from data collected from the airspace where the RVSM will be implemented.

General Risk Assessment Methodology

As is noted in Appendix C of reference 3, the mathematical model for collision risk has two key components:

a. the frequency with which aircraft with planned RVSM separation pass directly over one another, termed "horizontal overlap frequency," and

b. the probability that two aircraft with planned RVSM separation lose all of that separation, termed the "probability of vertical overlap."

The product of these two components, when divided by the average duration of simultaneous overlap in the three geometric dimensions, results in the estimate of technical collision risk.

The technical risk models presented in **Appendix A** address separately the horizontal overlap occurring for aircraft assigned to the same route at adjacent RVSM flight levels and for aircraft assigned to adjacent RVSM flight levels on routes which intersect. In the former case, horizontal overlap frequency is the product of the probability that aircraft assigned to adjacent flight levels overlap laterally and the frequency with which aircraft overlap longitudinally. The latter is usually termed "passing frequency."

Horizontal overlap frequency expected in the Baghdad FIR after RVSM implementation will now be discussed.

Horizontal Overlap Frequency Expected in the Baghdad FIR after RVSM Implementation

Reference 4 presents a detailed examination of Baghdad FIR traffic movements observed in a sample taken during February 2010. The sample was collected for the entire month and was intended to produce information for each flight which operated during the period. Sample yield was more than 5,000 flights.

Among other things, reference 4 examined traffic flows observed in the February traffic sample. This examination found that roughly 75 percent of all flights in the sample operated between origins and destinations in one of the States of the Gulf Cooperation Council (GCC) and Europe. An additional 8 percent operated between Europe and Asia and a further 5 percent between one of the GCC States and North America. All of these flows used the airspace of the Baghdad FIR to transit between origins and destinations outside the Baghdad FIR. The examination also found that about 6 percent of operations originated or terminated in the Baghdad FIR with the other airport being in a GCC State.

All flights in each of these heavy flows use one or the other of two north-south unidirectional routes for operations in the Baghdad FIR. Both of these routes connect the Ankara, Baghdad and Kuwait FIRs. Usable flight levels on these routes are separated by 2000 ft in order to provide seamless transition with the Ankara and Kuwait FIRs where RVSM has been in use for some time. Table 4 of reference 4, presented below as Table 3-1, summarizes the traffic-flow information by direction of flight for aircraft operating in the RVSM flight-level band of flight levels from 290 through 410, inclusive.

Traffic Flow	Description	Proportion of Flights
North/South	Operations following exclusively all, or a portion of, either UL602/L602/R784 between TASMI and KABAN or UT888/UP975/P975 between NINVA and SIDAD when operating in the RVSM flight level band	0.974
East/West	Operations originating or terminating in Baghdad FIR with companion destinations or origins requiring flight through at least a portion of the Damascus, Amman, Jeddah or Teheran FIRs; portions of flight near airports in Iraq conducted below RVSM flight level band	0.020
Others	Operations not falling into either of the other traffic-flow categories	0.006

Table 3-1 Traffic Flows by Direction of Flight Observed in February 2010 Sample of Traffic Movements from Baghdad FIR

Reference 4 identifies several characteristics of Baghdad FIR airspace which are important in terms of future RVSM use:

a. The 2000 ft separation between flight levels on the north-south trunk routes will be maintained after RVSM implementation in order to continue seamless transition between the Baghdad and Ankara, and Baghdad and Kuwait FIRs;

b. No east-west flights in the sample were observed to overfly the Baghdad FIR at RVSM flight levels;

c. East-west traffic in the sample was observed to originate or terminate solely within the Baghdad FIR; because of the location of the principal airports in the FIR, these operations did not cross the two north-south routes in the RVSM flight level band; and

d. The vast majority of east-west flights originated or terminated in the adjacent FIRs; there were no instances in the sample of two east-west flights operating on the same route in the RVSM flight level band at times which could lead to a passing.

As a consequence, reference 4 observes that the same-direction and opposite-direction passing frequencies for aircraft operating on the north-south routes will be 0.0 after RVSM implementation. The reference also observes that there is no evidence in the sample of flights passing on the same east-west route. As a result, reference 4 concludes that the same-direction and opposite-direction passing frequencies after RVSM implementation will be, effectively, 0.0.

Given that there were no observed instances of east-west flights crossing the north-south routes in the RVSM flight level band, reference 4 also concludes that crossing-route passing frequencies after RVSM implementation will also be, effectively, 0.0 if the operational characteristics of the airspace do not change.

It is very useful to observe the effect of zero-value passing frequencies on technical risk. Omitting terms describing time spent in simultaneous overlap, technical risk, N_{az}, can be represented as:

N_{az} = Probability of vertical overlap · Horizontal passing frequency / (average time of overlap)

Or

$N_{az} = P_z(1000) \cdot (n_z \text{ (same)} \cdot (\,) + n_z \text{ (opp)} (\,) + n_z (\theta) (\,))$

In this representation, $P_z(1000)$ is the probability that two aircraft with planned RVSM separation lose all vertical separation and n_z (same) and n_z (opp) are the passing frequencies for, respectively, aircraft assigned to the same route at adjacent RVSM levels flying in the same direction and opposite directions; n_z (θ) is the passing frequency for aircraft assigned to adjacent RVSM levels on routes which intersect at an angle θ.

As can be seen, if the passing frequencies are 0.0, technical risk is 0.0.

This leads to:

Conclusion 1 of the Safety Assessment

The conclusion of this safety assessment is that the ICAO safety goal associated with technical risk will be satisfied when the RVSM is implemented in the Baghdad FIR. The safety assessment also concludes that MID RVSM Safety Objective 1 will be supported when the RVSM is implemented in the Baghdad FIR.

As was noted in reference 4, there are east-west routes published in the Iraq Aeronautical Information Publication which are currently suspended. If these routes are opened at some time after implementation, there may be some non-zero crossing-route passing frequency as a result. While it is not possible to forecast what that passing frequency may be, it can be observed and reflected in a revised technical risk estimate either in the 90-day post implementation review of RVSM experience planned by the ICAA, or in the annual safety monitoring report prepared by the MIDRMA.

There is also the possibility that, because of considerations associated with direction of flight in neighboring FIRs, the direction of traffic flows at boundary fixes may need to change from that in use today. Such a change of flow direction at a boundary fix would be accomplished by introducing a crossing of routes at a fix within the Baghdad FIR.

Such a possibility was simulated by the Jeppesen Sanderson Corporation in support of the ICAA. Data for the simulation was extracted from the day in the February 2010 traffic sample with the highest traffic volume. The simulation was carried out using the Total Airspace and Airport Modeler (TAAM), a highly reliable modeling tool. The simulation scenario was to cross the two north-south routes at an intersection well within coverage of the Baghdad radar. It was found that, of the roughly 250 flights simulated for the day, about 20 pairs of aircraft were within a distance not greater than 20 miles from the intersection during the same time interval. Analysis

based on this simulation result indicates that the number of pairs would produce an intersecting-route passing frequency resulting in technical risk well below the TLS value.

Probability of Vertical Overlap

Aircraft height-keeping performance has been monitored in several regions for a number of years. In particular, the European Organisation for the Safety of Air Navigation, (EUROCONTROL) has operated ground-based monitoring systems known as height monitoring units (HMUs) in Germany, France and Austria since roughly the year 2000. In the process, EUROCONTROL has gathered several million observations of aircraft height-keeping performance, with each observation producing an estimate of the key height-keeping errors: Total Vertical Error (TVE), Altimetry System Error (ASE), and Assigned Altitude Deviation (AAD). The safety assessment presented in reference 3 made use of EUROCONTROL archives of these three types of errors and associated resulting assessments of compliance by aircraft types and individual airframes with RVSM requirements.

The safety assessment presented in this document did not attempt to assess height-keeping performance in the Baghdad FIR, since there are no HMUs or other systems capable of producing estimates of TVE, ASE and AAD in large quantities. It is important to note, however, that these performance measures will be used by the MIDRMA in future safety monitoring reports involving Baghdad FIR RVSM airspace.

The safety assessment presented in this document did consider the results presented in reference 3 as they pertain to poor aircraft group and individual airframe performance relative to RVSM height-keeping requirements. This consideration involved identifying poor performing groups and individual airframes observed in the February 2010 traffic sample.

Reference 3 notes that most of the 104 aircraft type monitoring groups known to be operating in the MID meet RVSM requirements governing TVE, ASE and AAD performance. Members of the following poor performing aircraft groups were observed in the February 2010 sample:

- 2 VC10 flights, an aircraft group which fails to meet the requirement that absolute value of average ASE should not exceed 80 ft
- 176 IL76 flights and 2 VC10 flights, types which fail to meet the requirement that the group average ASE plus three standard deviations of ASE not exceed 245 ft
- 2 VC10 flights, a group that fails to meet the requirement that the standard deviation of ASE not exceed 43 ft

Appendix A of reference 3 cites individual airframes which EUROCONTROL monitoring results indicate have produced ASE values in excess of 275 ft in magnitude and are, thus, non-compliant with individual airframe ASE requirements. The February 2010 sample contains the following non-ASE-compliant airframes:

- 7 flights by an A340
- 3 flights by a B767

Appendix A of reference 3 also cites individual airframes with aberrant, or distinctly larger than typical but not non-compliant, ASE. The February 2010 sample contains the following aberrant-ASE airframes:

- 7 flights by an IL76
- 5 flights by a B767
- 3 flights by a B767

In light of the passing-frequency results presented above, this ASE performance does not affect satisfaction of the technical-risk TLS in the Baghdad FIR. It is important, however, to take this performance into account if non-zero passing frequencies arise after RVSM implementation.

4. ASSESSMENT OF THE OVERALL RISK DUE TO ALL CAUSES AGAINST THE TLS OF 5X10^{-9} FATAL ACCIDENTS PER FLIGHT HOUR

The purpose of the overall risk assessment is to determine if the second ICAO safety goal is met and satisfaction of MID Safety Objective 2 is supported. These safety criteria will both be met if the risk due to all causes – the sum of technical risk and operational risk – is less than the ICAO TLS value of 5 x 10^{-9} fatal accidents per flight hour.

The model used to estimate operational risk is discussed in **Appendix A.**

General Considerations Concerning Operational Risk

Operational risk arises from LHDs, or deviations of at least 300 ft in magnitude, caused by errors made by flight crews in following proper ATC clearances, errors made by ATC in issuing clearances, failures to coordinate transfer of control for an aircraft between ATC units, departures from cleared flight level due to emergencies without following established contingency procedures and other human-induced errors.

Operational risk is directly proportional to the time which an aircraft spends at incorrect flight levels (that is, flight levels for which a controller has not issued a valid clearance) without ATC being aware of the error. By convention, once ATC becomes aware of an operational error and takes appropriate action, the error's effect on operational risk ceases.

The MIDRMA has established the requirement that all LHDs occurring in MID RVSM airspace be reported monthly. In addition, the MIDRMA requires reporting of all failures in coordination between ATC units when control responsibility for an aircraft is transferred. The MIDRMA has designated these two types of reports as Altitude Deviation Reports (ADRs) and Coordination Failure Reports (CFRs).

Operational Errors in the Baghdad FIR and Resulting Actions

The ICAA has been forwarding ADRs and CFRs to the MIDRMA since May 2010 as part of its commitment to the Action Plan adopted at BFRI WG/1. In fact, the ICAA has not forwarded any ADRs to the MIDRMA during this period since none have occurred. There has been, however, a

considerable number of CFRs sent. **Appendix B** presents a summary of CFR reports provided to the MIDRMA since May 2010.

Inspection of Appendix B will show that the number of CFRs varies considerably by month. Their occurrence reflects difficulties with the Baghdad FIR communications infrastructure and other factors. These difficulties are not a recent development and were highlighted by participants in BFRI WG/1 and other ICAO MID meetings.

Recognizing their potential adverse influence on operational risk, the ICAA has taken several steps (reference 5) to address the ongoing problem of coordination failures:

a. Letters of Agreement (LOAs) with neighboring States require that aircraft at the same flight level be separated by at least 40 miles longitudinally on entering the Baghdad FIR.

b. ATC procedures used in the Baghdad Area Control Center (ACC) require that no aircraft be permitted to change level until well within coverage of the Baghdad radar.

c. Radars at Kirkuk and Basra are being integrated into the surveillance suite of the Baghdad ACC to provide complete coverage of the main north-south flows and the ability to detect aircraft approaching the Ankara-Baghdad and Kuwait-Baghdad FIR boundaries prior to entry into Iraqi airspace.

d. The Very Small Aperture Terminal (VSAT) communications system used within the Baghdad FIR and for communications with neighboring FIRs is being upgraded and made more robust.

e. Civil aviation communications are being integrated into the existing Iraq national fiber optic backbone; when completed, this integration will provide two redundant and independent communications systems, one VSAT-based and the other landline-based, to support intra- and inter-FIR communications.

f. Improvements to the Baghdad FIR Aeronautical Fixed Telecommunications Network (AFTN) are being pursued.

g. The ICAA has established the Baghdad FIR RVSM Scrutiny Group (BF/RSG) to: review all LHDs reported within the Baghdad FIR, identify systematic causes for the errors and recommend remedial actions.

Operational Errors and Their Mitigation in the Baghdad FIR

Several of the steps taken by the ICAA have already led to mitigation of the consequences of coordination failures.

Through the longitudinal separation requirement included in each LOA, an aircraft entering the Baghdad FIR without prior coordination can be accommodated without concern that another uncoordinated aircraft will be close behind. Procedures at the ACC which require that an aircraft be well within coverage of the Baghdad radar before being granted clearance to change level in

order to ensure that a controller will not clear an aircraft to a level at which an uncoordinated aircraft will appear without warning. Introduction of additional radar coverage at the ACC will permit (and, in the case of traffic entering from the Ankara FIR, already is allowing) a controller to be aware of an uncoordinated aircraft before it enters the Baghdad FIR. Expansion of existing communications with adjacent FIRs will diminish the prospect that coordination failures will occur.

Finally, the ongoing work of the BF/RSG ensures that continuing attention will be paid to identifying the causes of LHDs and that remedial actions will be undertaken. In reviewing LHD occurrences in the Baghdad FIR, the BF/RSG has already made one key decision: if a controller is aware of an uncoordinated flight, the time at incorrect flight level associated with the operational error ceases. This decision is consistent with similar decisions made by RVSM scrutiny groups in the ICAO North American, Asia/Pacific and Caribbean and South American Regions.

Combined with the enhanced surveillance available and planned at the Baghdad ACC, this decision means that, in the very near term, the time at incorrect flight level associated with a coordination failure will be nil, if the flight is using one of the two north-south routes in the Baghdad FIR. As will be recalled from the previous section addressing technical risk, these routes accommodate roughly 97 percent of the operations in the Baghdad FIR. Virtually all CFRs forwarded to the MIDRMA have involved flights on these routes.

This review of the actions taken and planned to reduce the frequency of coordination failures and to mitigate the consequences of those which occur leads to:

Conclusion 2 of the Safety Assessment

The conclusion of this safety assessment is that the ICAO safety goal associated with overall risk will be satisfied when the RVSM is implemented in the Baghdad FIR. The safety assessment also concludes that MID RVSM Safety Objective 2 will be supported when the RVSM is implemented in the Baghdad FIR.

5. ASSESSMENT OF SUPPORT FOR MID RVSM SAFETY OBJECTIVE 3

It is useful to recall the Third MID RVSM Safety Objective:

Objective 3 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.

In relation to the implementation of the RVSM in the Baghdad FIR, this safety assessment interprets supporting satisfaction of this objective as equivalent to providing assurance that operations in the Baghdad FIR after RVSM implementation will be monitored for occurrences of LHDs and that any systematic causes for these deviations will be identified and addressed through remedial actions. In fact, this is the purpose of the BF/RSG, the Terms of Reference of which are shown at **Appendix C**.

The BF/RSG is chaired by the Director of the ICAA's Flight Safety Department and includes the Director of the ICAA's Air Traffic Services among its members. Thus, decisions and recommendations of the BF/RSG are assured of high level visibility within the ICAA. Further, the broad range of technical skills – flight operations, air traffic control and CNS – represented in the Group ensures that LHDs arising from a wide range of causes can be addressed competently.

These considerations lead to:

Conclusion 3 of the Safety Assessment

The conclusion of this safety assessment is that the establishment and operation of the Baghdad FIR RVSM Scrutiny Group provides assurance that MID RVSM Safety Objective 3 will be supported when the RVSM is introduced into the airspace of the Baghdad FIR.

6. SUMMARY AND CONCLUSIONS

The safety assessment presented in this document has employed the methodology recommended in ICAO guidance material as the basis for examining the safety of implementing the RVSM in the airspace of the Baghdad FIR. The safety assessment has also taken into account the three MID RVSM Safety Objectives.

Consistent with the ICAO guidance material, the safety assessment has employed relevant data collected in the Baghdad FIR to develop estimates of technical risk and to examine operational risk. In using these data, the safety assessment has been careful to note where post-implementation changes in operational practices may make conclusions drawn from the data subject to further examination.

The safety assessment has concluded that the two ICAO safety goals will be met when the RVSM is introduced into the airspace of the Baghdad FIR. Specifically, the safety assessment has concluded that:

a. the TLS value applicable to technical risk, 2.5 x 10-9 fatal accidents per flight hour, will be met, and

b. the TLS value applicable to risk from all causes, 5 x 10-9 fatal accidents per flight hour, will be met

The safety assessment has also concluded that satisfaction of MID RVSM Safety Objectives 1 through 3 will be supported when the RVSM is implemented in the airspace of the Baghdad FIR.

The safety assessment recommends that careful attention be paid to instances of crossing-route passing occurring after RVSM implementation. In particular, the safety assessment recommends that, if additional routes are opened after implementation, resulting passing frequencies be assessed.

References

1. Report of the First Meeting of the Baghdad FIR RVSM Working Group (BFRI WG/1), International Civil Aviation Organization, Cairo, 18 -20 January 2010.

2. *Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL410 Inclusive*, International Civil Aviation Organization, Doc 9574 AN 934, Second Edition – 2002.

3. The MID RVSM Safety Monitoring Report 2010, MIDRMA Board 10 Edition (Ver. 0.1), MIDRMA, Bahrain, 29 April 2010.

4. "Estimate of Passing Frequencies Associated with Implementation of the Reduced Vertical Separation Minimum in the Baghdad Flight Information Region," Second Meeting of the Baghdad FIR RVSM Implementation Working Group (BFRI WG/2), International Civil Aviation Organization, Cairo, 13-15 December 2010, IP/4.

5. "Status of the Communications, Navigation and Surveillance (CNS) Systems Infrastructure Upgrades in Iraq," Second Meeting of the Baghdad FIR RVSM Implementation Working Group (BFRI WG/2), International Civil Aviation Organization, Cairo, 13-15 December 2010, IP/5.

Risk Models Used in Assessment of Technical and Operational Risk

A.1. General

The collision risk models (CRMs) used to estimate technical and operational risk were developed during the initial years of RVSM development within the ICAO Review of the General Concept of Separation Panel. They were subsequently refined and enhanced during initial RVSM implementation programs in the North Atlantic and Asia/Pacific Regions during the latter 1990s.

The CRM forms for technical risk evaluation differ depending upon the basic scenario being analyzed. There are two such scenarios:

a. aircraft assigned to adjacent RVSM flight levels on the same route; and

b. aircraft assigned to adjacent RVSM flight levels on routes which intersect.

The CRM used to evaluate operational risk takes into account aircraft operation at incorrect flight levels, that is, flight levels for which a valid ATC clearance has not been granted, and transition between flight levels during operational errors. Based on the fact that no Altitude Deviation Reports have been filed by the Baghdad FIR, there is no need to take into account aircraft transitioning incorrectly between flight levels. Thus, only that portion of the model which evaluates risk arising from time at incorrect flight level will be presented.

A.2. Models for Evaluating Technical Risk

Technical Risk Associated with Aircraft Operating at Adjacent RVSM Flight Levels on the Same Route

The risk model used to evaluate technical risk for aircraft assigned to adjacent RVSM flight levels is:

$$N_{az} = P_z(S_z) \cdot P_y(0) \cdot \left[n_z(same) \cdot \left[1 + \frac{\lambda_x}{\lambda_y} \cdot \frac{|\overline{\dot{y}}|}{|\overline{\Delta V}|} + \frac{\lambda_x}{\lambda_z} \cdot \frac{|\overline{\dot{z}}|}{|\overline{\Delta V}|} \right] + n_z(opp) \cdot \left[1 + \frac{\lambda_x}{\lambda_y} \cdot \frac{|\overline{\dot{y}}|}{2\overline{V}} + \frac{\lambda_x}{\lambda_z} \cdot \frac{|\overline{\dot{z}}|}{2\overline{V}} \right] \right]$$

(Equation A-1)

Definitions of CRM parameters are presented in Table A-1. The term “longitudinal overlap” appears in the table. With respect to risk models, the term “overlap” means that two aircraft are so close together that their centers of mass are closer together in a dimension (for example, the longitudinal dimension) than the size of an aircraft in that

dimension. Thus, to say that two aircraft overlap in the longitudinal dimension is to say that they are closer together along route than the length of an aircraft. The terms overlap and collision are related. From the standpoint of risk modeling, when two aircraft are in simultaneous longitudinal, lateral and vertical overlap, a collision occurs. It is quite normal, however, that overlap in only a single dimension (which is not a collision) occurs in normal system operation, as for example, when aircraft assigned to adjacent RVSM flight levels overlap in the longitudinal dimension.

CRM Parameter	Description
N_{az}	Number of fatal accidents per flight hour due to loss of vertical separation.
S_Z	Vertical separation minimum.
$P_z(S_Z)$	Probability that two aircraft nominally separated by the vertical separation minimum S_Z are in vertical overlap.
$P_y(0)$	Probability that two aircraft on the same track are in lateral overlap.
λ_x	Average aircraft length.
λ_y	Average aircraft wing-span.
λ_z	Average aircraft height with undercarriage retracted.
$n_z(same)$	The frequency with which same-direction aircraft on adjacent RVSM flight levels of the same route are in longitudinal overlap
$n_z(opp)$	The frequency with which opposite-direction aircraft on adjacent RVSM flight levels of the same route are in longitudinal overlap.
$\overline{\lvert\Delta V\rvert}$	Average relative along track speed between aircraft on same direction routes.
$\overline{\lvert V\rvert}$	Average absolute aircraft ground speed.
$\overline{\lvert\dot{y}\rvert}$	Average absolute relative cross track speed for an aircraft pair nominally on the same track.
$\overline{\lvert\dot{z}\rvert}$	Average absolute relative vertical speed of an aircraft pair that have lost all vertical separation

Table A-1 Definitions of Parameters for Model Used to Estimate Technical Risk for Aircraft Assigned to the Same Route at Adjacent RVSM Flight Levels

Technical Risk Associated with Aircraft Operating at Adjacent RVSM Flight Levels on Intersecting Routes

The risk model used to evaluate technical risk for aircraft assigned to adjacent RVSM flight levels on intersecting routes is:

$$N_{az} = P_z(S_z) \cdot n_z(\theta) \left[1 + \frac{\left(\frac{\pi}{2}\right) \cdot \lambda_{xy}}{2\lambda_z} \cdot \frac{\left|\bar{\dot{z}}\right|}{V_{rel}(\theta)} \right]$$

(Equation A-2)

where the relative speed, $V_{rel}(\theta)$, is defined by $V_{rel}(\theta) = \bar{V} \cdot \sqrt{2 \cdot (1 - \cos(\theta)}$

Definitions of parameters particular to the interesting-route model are presented in Table A-2.

CRM Parameter	Description
θ	The angle of intersection between two routes
λ_{xy}	The average diameter of a standing cylinder representing a typical aircraft
$n_z(\theta)$	The frequency with which aircraft on adjacent flight levels of two routes intersecting at an angle of θ are in horizontal overlap
$V_{rel}(\theta)$	The average relative horizontal speed between aircraft flying at adjacent flight levels of two routes intersecting at an angle of θ

Table A-2 Definitions of Parameters for Model Used to Estimate Technical Risk for Aircraft Assigned to the Intersecting Routes at Adjacent RVSM Flight Levels

Technical risk for a system is determined as the sum of the risks for the same-route and crossing-route cases.

A.3. Model for Evaluating Operational Risk

As noted above, only the model used to estimate the operational risk associated with time at incorrect flight level will be discussed. This model is very similar in form to the model used to evaluate the technical risk existing between aircraft assigned to adjacent RVSM

flight levels on the same route. The key parameter change in the model form is the proportion of the total flying time spent at incorrect levels, P_i. This parameter is estimated by summing the individual times for each operation at incorrect flight level and dividing by the total system flight time. The total system flight time is estimated as the number of movements in the airspace under examination multiplied by the average time spent by each flight in the airspace.

The proportion of total flying time spent at incorrect levels, P_i may be interpreted as the probability that an aircraft is flying at an incorrect level. To convert P_i to the probability of vertical overlap, it must be multiplied by the probability that two aircraft nominally flying at the same level are in vertical overlap, $P_z(0)$. The vertical overlap probability arising from errors resulting in deviations of integral numbers of flight levels is, therefore, given by:

$$P_z(n \times S_z) = P_z(0)\, P_i$$

Having determined $P_z(S_z)$, the collision risk can be determined in the normal way using the CRM shown in Equation A-1. Before using that CRM, however, it is necessary to estimate the frequency with which pairs of aircraft at the assigned level and the incorrect level pass. This can be done easily from data describing traffic movements in the airspace.

Baghdad FIR Coordination Failure Reports

The ICAA has been providing CFRs to the MIDRMA since May 2010. The summary counts of these reports are provided in Table C-1 below:

Month During 2010	Number of CFRs Reported for Baghdad FIR
May	23
June	21
July	178
August	50

Table C-1 Baghdad FIR Coordination Failure Reports Forwarded to MIDRMA

Baghdad FIR RVSM Scrutiny Group (BF/RSG)
Terms of Reference

A) TERMS OF REFERENCE

With a view to support implementation and continued safe use of the Reduced Vertical Separation Minimum (RVSM) in the Baghdad Flight Information Region (FIR), the Baghdad FIR RVSM Scrutiny Group (BF/RSG) is established to:

1) review, analyze and evaluate all reports of large height deviations of 300 ft or more in magnitude occurring between flight levels (FLs) 290 and 410, inclusive, in Baghdad FIR airspace,

2) determine/validate estimates of the duration and magnitude of deviations from cleared levels and provide them as inputs to estimations of risk carried out in order to assess compliance of performance with RVSM safety goals in Baghdad FIR airspace;

3) identify systematic causes of large height deviations

4) recommend remedial actions to remove systematic causes of large height deviations, thereby reducing risk and enhancing the prospect of meeting RVSM safety goals

B) COMPOSITION

The BF/RSG shall consist of experts from the Flight Safety, Air Traffic Services and Communications/Navigation/Surveillance departments of the Iraqi Civil Aviation Authority and shall be assisted by representatives of organizations supporting the Authority. Representatives of organizations external to the Authority and its supporting elements may also be invited to attend meetings of the BF/RSG, either as participants or as observers.

C) WORKING ARRANGEMENTS

The BF/RSG should report to the Baghdad RVSM Project Manager.

Meetings of the BF/RSG should be organized by the Group's Chair, who may designate a Member of the Group or an organization supporting the Authority to discharge administrative duties – such as issuing letters of invitation, preparing a draft agenda and distributing reports – in connection with a meeting.

The BF/RSG should meet with sufficient frequency that its contributions to implementation and continued safe use of the RVSM in the airspace of the Baghdad FIR are timely and effective.

Definitions and Explanations of Terms

Note: The following definitions are taken from ICAO Document 9574 (2nd Edition) – *Manual on Implementation of a 300m (1000ft) vertical separation minimum between FL290 and FL410 inclusive*.

Aberrant aircraft

Those aircraft which exhibit measured height-keeping performance that is significantly different from the core height-keeping performance measured for the whole population of aircraft operating in RVSM airspace.

Aircraft type groupings

Aircraft are considered to belong to the same group if they are designed and assembled by one manufacturer and are of nominally identical design and build with respect to all details which could influence the accuracy of height-keeping performance.

Airworthiness approval

The process of assuring the State authority that aircraft meet RVSM MASPS. Typically, this would involve an operator meeting the requirements of the aircraft manufacturer service bulletin for that aircraft and having the State authority verify the successful completion of that work.

Altimetry system error (ASE)

The difference between the altitude indicated by the altimeter display, assuming a correct altimeter barometric setting, and the pressure altitude corresponding to the undisturbed ambient pressure.

Altimetry system error stability

Altimetry system error for an individual aircraft is considered to be stable if the statistical distribution of altimetry system error is within agreed limits over an agreed period of time.

Altitude-keeping device

Any equipment which is designed to automatically control the aircraft to a referenced pressure altitude.

Assigned altitude deviation (AAD)

The difference between the transponded Mode C altitude and the assigned altitude/flight level.

Automatic altitude-keeping device

Any equipment which is designed to automatically control the aircraft to a referenced pressure-altitude.

Collision risk

The expected number of mid-air aircraft accidents in a prescribed volume of airspace for a specific number of flight hours due to loss of planned separation.

Note.— One collision is considered to produce two accidents.

Flight technical error (FTE)

The difference between the altitude indicated by the altimeter display being used to control the aircraft and the assigned altitude/flight level.

Height-keeping capability

The aircraft height-keeping performance that can be expected under nominal environmental operating conditions with proper aircraft operating practices and maintenance.

Height-keeping performance

The observed performance of an aircraft with respect to adherence to cleared flight level.

Non-compliant aircraft

An aircraft configured to comply with the requirements of RVSM MASPS which, through height monitoring, is found to have a total vertical error (TVE) or an assigned altitude deviation (AAD) of 90 m (300 ft) or greater or an altimetry system error (ASE) of 75 m (245 ft) or more.

NOTAM

A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

Occupancy

A parameter of the collision risk model which is twice the count of aircraft proximate pairs in a single dimension divided by the total number of aircraft flying the candidate paths in the same time interval.

Operational error

Any vertical deviation of an aircraft from the correct flight level as a result of incorrect action by ATC or the aircraft crew.

Overall risk

The risk of collision due to all causes, which includes the technical risk (see definition) and all risk due to operational errors and in-flight contingencies.

Passing frequency

The frequency of events in which two aircraft are in longitudinal overlap when travelling in the opposite or same direction on the same route at adjacent flight levels and at the planned vertical separation.

RVSM approval

The term used to describe the successful completion of airworthiness approval and operational approval (if required).

Target level of safety (TLS)

A generic term representing the level of risk which is considered acceptable in particular circumstances.

Technical risk

The risk of collision associated with aircraft height-keeping performance.

Total vertical error (TVE)

The vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

Track

The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (true, magnetic or grid).

Vertical separation

The spacing provided between aircraft in the vertical plane to avoid collision.

Vertical separation minimum (VSM)

VSM is documented in the Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444) as being a nominal 300 m (1 000 ft) below FL 290 and 600 m (2 000 ft) above FL 290 except where, on the basis of regional agreement, a value of less than 600 m (2 000 ft) but not less than 300 m (1 000 ft) is prescribed for use by aircraft operating above FL 290 within designated portions of the airspace

-END-

REPORT ON AGENDA ITEM 6: ACTION PLAN FOR THE IMPLEMENTATION OF RVSM WITHIN THE BAGHDAD FIR

6.1 The meeting recalled that a series of actions which would need to be completed in order to support RVSM implementation were developed during the BFRI WG/1 meeting. The ICAA has been addressing specific items of this Action Plan throughout 2010. The results of this activity were presented to the BFRI SCM meeting which further updated the Action Plan.

6.2 The meeting recalled that in addition to the assessment of Operators readiness, ATC readiness and RVSM pre-implementation safety assessment, the requirements to support RVSM implementation include also the Organizational readiness. In this respect, the meeting noted that all necessary documentation and regulations to enable the implementation of RVSM in the Baghdad FIR have been, or will be, published in a timely manner. In particular, the meeting noted that an Aeronautical Information Circular (AIC) addressing RVSM has been published as an advance notice to users of Baghdad FIR airspace. The National RVSM Safety Plan (final draft) was developed. It covers the following topics:

- Introduction;
- Aircraft and Operator Approvals;
- ATS Training;
- ATS Equipment;
- ATS Procedures;
- Airspace Design;
- RVSM Switchover; and
- RVSM Operational Safety Monitoring and Review.

6.3 However, it was highlighted that the switchover date/time is not specifically reflected in the current version of the National Safety Plan, which does not contain also any information about the establishment of an emergency cell during the RVSM switchover, publication of Trigger NOTAM related to RVSM implementation and associated coordination with adjacent ACCs, especially during the switchover period. Accordingly, Iraq was requested to include the missing information into the final version of the National Safety Plan which should be submitted to the ICAO MID Regional Office and the MIDRMA by 15 January 2011.

6.4 In connection with the above, the meeting agreed that the list of RVSM Focal Points in Iraq and the neighbouring States should be reflected also in the National Safety Plan to facilitate the coordination of all issues related to RVSM implementation within Baghdad FIR, especially during the switchover period. Accordingly, the following Table containing the contact details of the RVSM focal points in Bahrain, Iraq, Jordan, Kuwait, Saudi Arabia, Syria and Turkey was developed/updated by the meeting:

State	RVSM FOCAL POINT(S)
Bahrain	Mr. Saleem Mohamed Hassan Chief Air Traffic Management Civil Aviation Affairs KINGDOM OF BAHRAIN Fax: (973) 17 329 966 Tel: (973) 17 321 117 Mobile: (973) 39 608 860 Email: saleemmh@caa.gov.bh
	Mr. Fareed Abdullah Al Alawi MIDRMA Manager Fax: (973) 17 329 160 Tel: (973) 17 329 150 Mobile: (973) 39 651 596 Email: falalawi@caa.gov.bh midrma@midrma.com
Iran	Mr. Fax: (98) Tel: (98) Mobile: E-mail:
Iraq	Mr. Ali Khalil Ibrahim Deputy Director General/ Director ATS Iraqi Civil Aviation Authority Fax: Tel: (964) 18 132 570 Mobile: (964-790)1568252 Email: alikhalil@iraqcaa.com
	Mr. Fadel Gata Deputy Director of ATS Fax: (964) 790233550 Tel: (964) 1 8132541 Mobile: Email: fadelarubae@iraqcaa.com
	Mr. Thamir H. Zabar Manager Baghdad ACC Fax: (964) 7901215423 Tel: (964) 1 8132541 Mobile: E-mail: thamerhamza@iraqcaa.com

State	RVSM FOCAL POINT(S)
Jordan	Mr. Mr. Ahmad Al-Jarrah ANS Director/ QAIA, CARC- JORDAN Fax: (962) 6 44 51 619 Tel: (962) 6 44 51 666 Mobile: (962-79) 9573290 Email: dans-qa@carc.gov.jo
Kuwait	Mr. Dawood A. Awad Chief of Radar Operations Directorate General of Civil Aviation, Kuwait Fax: (965-2) 4315349 Tel: (965 2) 4319231 Mobile: 965 6335115 Email: david.awad@hotmail.com
Saudi Arabia	Mr. Adel A. Makki ATM, Planning Specialist, Air Traffic Management General Authority of Civil Aviation KINGDOM OF SAUDI ARABIA Fax: (966-2) 671 7717Ext 1801 Tel: (966-2) 6717717 ext 1816 Mobile: (966- 50) 459 1030 Email: adel_makki@yahoo.com
Syria	Mr. Ousama Safi Chief ATC Damascus Airport, SYRIA Fax: (963-11) 5400 312 Tel: (963 11) 5400 312 Mobile: (963-94) 4672 817 Email: ousafi@mail.sy ousafi@hotmail.com
Turkey	Mr. Celalettin Bozkurt Chief of Ankara ACC TURKEY Fax: (90-312) 398 09 61 Tel: (90-312) 398 0296 Mobile: (90-505) 392 9439 Email: celatettin.bozkurt@dhmi.gov.tr

6.5 The meeting noted that the ICAA published the Civil Aviation Publication (CAP) 1 RVSM on 20 September 2010. This guidance material provides information on the implementation plan, required equipment, the approval process, as well as guidance on operational procedures and training. CAP 1 RVSM also provides the acceptable methods for determining compliance with ICAO, the European Joint Aviation Authorities and the United States Federal Aviation Administration requirements. The ICAA procedures for processing applications are also provided.

6.6 The meeting noted that Iraq Civil Aviation Law is currently under review by the Iraqi Parliament and that regulatory provisions related to RVSM will be incorporated into the Civil Aviation Law after the completion of its review by the Parliament. Until that time, the AIP will serve as the regulatory document for RVSM. The En-Route Section of the AIP will be amended on the AIRAC date 13 Jan 2011 to include procedures for RVSM that will be effective on the AIRAC date 10 March 2011.

6.7 As part of the Action Plan for the implementation of RVSM in the Baghdad FIR (Action 22), the meeting reviewed the draft proposal for amendment of the MID/ASIA Regional Supplementary Procedures (Doc 7030) at **Appendix 6A** to the Report on Agenda Item 6 and agreed that the ICAO MID Regional Office proceeds with its processing in accordance with standard procedure.

6.8 Based on all the foregoing, the meeting recognized the good progress made towards the implementation of RVSM within Baghdad FIR and concluded that conditions would be favorable for RVSM implementation on 10 March 2011. However, the meeting urged the ICAA to take necessary measures to implement the pending actions as reflected in the updated Action Plan for RVSM implementation within Baghdad FIR at **Appendix 6B** to the Report on Agenda Item 6 and to spare no efforts in ensuring that all requirements are met in a timely manner, for the safe implementation of RVSM in the Baghdad FIR.

6.9 The meeting recalled that MIDANPIRG/12, through Decision 12/19, delegated the authority to take the Go/No-Go Decision for RVSM implementation within Baghdad FIR to the BFRI Working Group. Accordingly, the meeting agreed to the following Draft Conclusion:

DRAFT CONCLUSION 2/1: GO DECISION FOR RVSM IMPLEMENTATION WITHIN BAGHDAD FIR

That, considering that:

i) operator readiness has been assessed through traffic sampling and is found to be sufficient for safe and efficient implementation of RVSM;

ii) ATC readiness has been assessed and evidences were provided for the completion of pending actions (training of ATCOs, simulations, etc) before the 10 March 2011;

iii) RVSM pre-implementation safety assessment has been developed and demonstrated that the 3 Safety Objectives endorsed by MIDANPIRG will be met;

iv) organizational readiness has been assessed and evidences were provided to demonstrate that all necessary documentation and regulations to enable the implementation of RVSM in the Baghdad FIR have been, or will be, published in a timely manner;

v) operators have been given due notice through an Aeronautical Information Circular (AIC); and

vi) Iraq has committed to complete all outstanding tasks in due time for implementation.

*a) a Reduced Vertical Separation Minimum (RVSM) is to be implemented on an exclusive basis between FL 290 and FL 410 on **10 March 2011 at 00:01 UTC** within the Baghdad Flight Information Region (FIR); and*

b) all concerned parties take necessary actions to support the implementation of RVSM within Baghdad FIR on 10 March 2011.

BFRI WG/2
Appendix 6A to the Report on Agenda Item 6

PROPOSAL FOR AMENDMENT OF THE REGIONAL SUPPLEMENTARY PROCEDURES, MID REGION (Doc 7030/5)

(Serial No.: MID-S 10/02 – MID/ASIA)

a) **Regional Supplementary Procedures:**

Doc 7030/5 – MID/ASIA

b) **Proposed by:**

Iraq

c) **Proposed amendment:**

Editorial Note: Amendments are arranged to show deleted text using strikeout (~~text to be deleted~~), and added text with grey shading (text to be inserted).

1. *Modify* the following in MID/ASIA SUPPs, Chapter 4.

Chapter 4. NAVIGATION

. . .

4.2 REDUCED VERTICAL SEPARATION MINIMUM (RVSM)

Area of applicability

4.2.1 RVSM shall be applicable in that volume of airspace between FL 290 and FL 410 inclusive in the following FIRs/UIRs:

Amman, Auckland Oceanic, Baghdad, Bahrain, Bangkok, Beijing, Beirut, Brisbane, Cairo, Chennai, Colombo, Damascus, Delhi, Dhaka, Emirates, Fukuoka, Guangzhou, Hanoi, Ho Chi Minh, Hong Kong, Honiara, Incheon, Jakarta, Jeddah, Karachi, Kathmandu, Kolkata, Kota Kinabalu, Kuala Lumpur, Kunming, Kuwait, Lahore, Lanzhou, Male, Manila, Melbourne, Mumbai, Muscat, Nauru, New Zealand, Phnom Penh, Port Moresby, Pyongyang, Sana'a, Sanya, Shanghai, Shenyang, Singapore, Taibei, Tehran, Ujung Pandang, Urumqi, Vientiane, Wuhan and Yangon.

. . .

d) **Date when proposal received:**

29 September 2010

e) **Proposers reason for amendment:**

1. Work has been carried out over the past year by a team of experts under the auspices of the Baghdad FIR RVSM Implementation Working Group (BFRI) to oversee planning for the implementation of RVSM in Baghdad FIR in accordance with the *Manual on Implementation of a 300m (1000ft) Vertical Separation minimum Between FL290 and FL410 Inclusive* (Doc 9574).
2. The BFRI Special Coordination meeting (Bahrain, 29-30 September 2010) concluded that conditions would be favourable for meeting the RVSM safety goals associated with RVSM implementation in Baghdad FIR.

f) **Proposed implementation date of the amendment:**

10 March 2011.

g) **Action by the Secretary General:**

The proposal has been circulated to the following States and international organizations.

Afghanistan	Israel	Singapore
Algeria	Italy	Somalia
Armenia	Japan	South Africa
Australia	Jordan	Spain
Austria	Kazakhstan	Sudan
Azerbaijan	Kenya	Sweden
Bahrain	Kuwait	Switzerland
Bulgaria	Kyrgyzstan	Syrian Arab Republic
China	Lebanon	Tajikistan
Croatia	Libyan Arab Jamahiriya	Thailand
Cyprus	Luxembourg	Tunisia
Czech Republic	Malaysia	Turkey
Denmark	Malta	Turkmenistan
Djibouti	Mauritius	United Arab Emirates
Egypt	Morocco	United Kingdom
Eritrea	Netherlands	United States
Ethiopia	New Zealand	Uzbekistan
Finland	Oman	Yemen
France	Pakistan	
Georgia	Philippines	Eurocontrol
Germany	Qatar	IACA
Greece	Republic of Korea	IAOPA
Hungary	Republic of Moldova	IATA
India	Romania	IBAC
Indonesia	Russian Federation	IFALPA
Iran (Islamic Republic of)	Saudi Arabia	
Iraq (for information)	Seychelles	

h) **Secretariat's comments:**

The implementation of RVSM in Baghdad FIR will complete the RVSM implementation programme in the MID Region. It will also close the non-RVSM airspace gap between the MID and EUR Regions facilitating transitions, increasing airspace capacity and efficiency.

MIDANPIRG, at its 12th Meeting (Amman, 17-21 October 2010), endorsed the proposed implementation plan and delegated the authority to take the Go/No-Go Decision for RVSM implementation within Baghdad FIR to the BFRI Working Group (Decision 12/19 refers).

The BFRI WG/2 meeting (Cairo, 13-15 December 2010) took the Go decision for RVSM implementation on 10 March 2011 (Draft Conclusion 2/1 refers).

BFRI WG/2
Appendix 6B to the Report on Agenda Item 6

ACTION PLAN FOR RVSM IMPLEMENTATION IN BAGHDAD FIR

ID	ACTION	TO BE DELIVERED BY	TARGET DATE	STATUS	Remarks
1	Nomination of RVSM Focal Point	Iraq	19 Jan 2010	Completed	Ali Khalil Ibrahim is RVSM Focal Point
2	Nomination of Baghdad FIR RVSM Programme Manager	Iraq	1 Mar 2010	Completed	Ali Khalil Ibrahim is Baghdad FIR RVSM Program Manager
3	Promulgation of national regulation to enable the implementation of RVSM	Iraq	13 Jan 2011	On Schedule	Iraq Civil Aviation Law currently under review; RVSM amendments will be incorporated into Law after review completed. Until review is complete, AIP will serve as regulatory document. The En-Route Section of Iraq AIP will be amended on AIRAC date of 13 Jan 2011. Initially, an AIC has been published as advance notification to airspace users on 15 Oct 2010.
4	Provide the MIDRMA with traffic data for the month of February 2010 (including A/C REG)	Iraq	15 Mar 2010	Completed	Submitted as required.
5	Submission of the latest airways structure for Baghdad FIR to the MIDRMA	Iraq	15 Apr 2010	Completed	Latest Baghdad FIR airways structure published in AIP. There will be no airspace changes to the ATS route network within Baghdad FIR affecting the current prospects of meeting the Target Level of Safety on RVSM implementation date.

ID	ACTION	TO BE DELIVERED BY	TARGET DATE	STATUS	Remarks
6	Calculating the passing frequency for all Bagdad FIR airways	Iraq MIDRMA	15 Nov 2010	Completed	Addressed in the pre-implementation safety assessment. Passing frequency associated with heavily used portion of current route structure is 0.
7	Conclusions of the passing frequency results, evaluation of the need for ATS Route Network amendments related to RVSM and follow up implementation of the proposals with Iraq	Iraq MIDRMA	30 Sep 2010	Completed	
8	Submit RVSM approvals to the MIDRMA for all Iraqi registered aircraft or any airline operators certified by Iraq and to continue updating these approvals as necessary	Iraq	On monthly basis	Ongoing	Information submitted on regular basis as required.
9	Submit Coordination Failure Reports (CFR) and Altitude Deviation Reports (ADR) to the MIDRMA on a monthly basis	Iraq	On Monthly basis	Ongoing	Reports are being submitted as required
10	Develop ATC operational policy & procedures for normal RVSM operations	Iraq	15 Jan 2011	On Schedule	Action initiated and will be completed in accordance with the plan to meet the implementation date.

ID	ACTION	TO BE DELIVERED BY	TARGET DATE	STATUS	Remarks
11	Assess the impact of RVSM implementation on controller automation systems, plan for upgrades/modifications and effectively implement necessary changes.	Iraq	31 Jan 2011	Completed	
12	Develop ATC procedures for non-approved State aircraft to transit RVSM airspace	Iraq	15 Jan 2011	On Schedule	See comments under Item 10 for current status.
13	Develop procedures for handling non-compliant civil aircraft	Iraq	15 Jan 2011	On Schedule	See comments under Item 10 for current status.
14	Develop procedures for suspension of RVSM	Iraq	15 Jan 2011	On Schedule	See comments under Item 10 for current status.
15	Development of Iraq National Safety Plan (NSP)	Iraq	15 Jan 2011	On schedule	The NSP Final Draft reviewed by the BFRI WG/2 meeting. The final version of the NSP would include the specific switch over date/time and an additional Section on the establishment of an emergency cell during the RVSM implementation switch-over , associated Trigger NOTAM and coordination with adjacent ACCs.
16	Simulations to support ATC training needs and assess ATC workload, identify eventual need for additional training and/or amendment of RVSM procedures	Iraq	Feb 2011	On Schedule	

ID	ACTION	TO BE DELIVERED BY	TARGET DATE	STATUS	Remarks
17	ATC training plan	Iraq	1 Dec 2010	Completed	
18	Update of LOAs between Iraq and all adjacent FIRs	Iraq and neighboring States	15 Feb 2011	On Schedule	Draft LOAs presented by Iraq at BFRI WG/2 meeting. Signed LOAs required not later than 15 Feb 2011.
19	ATCOs trained for RVSM operation	Iraq	15 Feb 2011	On schedule	Training to be completed near implementation date.
20	Carry out pre-implementation safety analysis	Iraq and MIDRMA	15 Jan 2011	On Schedule	A pre-implementation safety assessment reviewed by the BFRI WG/2 meeting. Few fine tunings are required. The final version of the pre-implementation safety assessment will be sent to the MIDRMA and ICAO MID Office by 15 Jan 2011.
21	Carry out pre-implementation readiness assessment	Iraq	15 Feb 2011	Completed	ICAA has conducted internal RVSM readiness assessment in accordance with established ICAO criteria and reported to the BFRI WG/2 meeting the results.
22	Prepare necessary proposal for amendment to Doc 7030 related to RVSM implementation within Baghdad FIR	ICAO MID Office	31 Dec 2010	On schedule	Proposal for Amendment will be circulated to States on 16 December 2010.
23	Go/No-Go Decision for RVSM Implementation effective 10 March 2011	BFRI WG	15 Dec 2010	Completed	Go decision taken by BFRI WG/2 meeting

RVSM IMPLEMENTATION-DEPENDENT CNS REQUIREMENTS

ID	ACTION	TO BE DELIVERED BY	TARGET DATE	STATUS	Remarks
	Integration of Basrah and Kirkuk radars at Baghdad ACC	Iraq	Oct 2010	Completed	
	Ground-Ground Communications with adjacent FIRs	Iraq	Apr 2011	Ongoing	-The current CNS facilities provide necessary infrastructure support for the implementation of RVSM within Bagdad FIR on 10 March 2011. - Future improvements for the Ground-Ground Communications are ongoing: VSAT-based satellite relay of communications exists in portions of FIR; funds have been allocated for expansion of VSAT system to meet communications requirements. -A contract has been signed to connect Baghdad ACC to the existing fiber-optic backbone in Iraq; funds also have been allocated for connections of adjacent FIRs to this backbone. -Bi-lateral meetings between Iraq and neighboring States planned for beginning of 2011 to address, inter-alia, ground-ground communications.

REPORT ON AGENDA ITEM 7: FUTURE WORK PROGRAMME

7.1 The meeting recalled that MIDANPIRG/11, through Decision 11/23, agreed to the establishment of the Baghdad FIR RVSM Implementation Working Group (BFRI WG), for the development of necessary planning materials related to RVSM implementation in Baghdad FIR and for assisting the Iraqi Civil Aviation Authority in expediting the implementation of such an important project.

7.2 The meeting noted with appreciation the progress achieved for the preparation of RVSM implementation within Baghdad FIR on 10 March 2011. The meeting was of the view that the BFRI Working Group has completed all the Tasks listed in its Terms of Reference (TOR) as approved by MIDANPIRG. However, the meeting recognized that some work related to Post RVSM implementation within Baghdad FIR, is still needed and agreed that this could be managed by Iraq in coordination with the MIDRMA and that a report should be presented to the ATM/SAR/AIS SG/12 meeting (Cairo, 21-24 November 2011) on the subject.

7.3 Based on the above, the meeting congratulated all the participants of the Working Group for their contributions and agreed to the dissolution of the BFRI Working Group. Accordingly, the meeting agreed to the following Draft Decision:

DRAFT DECISION 2/2: DISSOLUTION OF THE BFRI WORKING GROUP

That, recognizing that the Baghdad FIR RVSM Implementation Working Group (BFRI WG) has successfully completed the tasks assigned to it, the BFRI WG is dissolved.

REPORT ON AGENDA ITEM 8: ANY OTHER BUSINESS

8.1 Nothing has been discussed under this agenda item.

BFRI WG/2
Attachment A to the Report

LIST OF PARTICIPANTS

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STATES	
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