*International Civil Aviation Organization*

**Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG)**

**Fourteenth Meeting**
***(Jeddah, Saudi Arabia, 15-19 December 2013)***

**Agenda Item 4: Performance Framework for Regional Air Navigation Planning and Implementation:**
**4.3 ATM/SAR**

# CONTINGENCY PLANNING IN THE MID REGION

*(Presented by the Secretariat)*

**SUMMARY**

This paper presents the MID Region Air Traffic Management Contingency Plan developed to ensure the continuity of Air Traffic Services in the event of disruption or potential disruption of ATS and supporting services in the MID Region.

Action by the meeting is at paragraph 3.

**REFERENCES**

- ARN TF/6 Report
- ATM/SAR/AIS SG/13 Report
- MIDANPIRG/13 Report

## 1. INTRODUCTION

1.1 The Thirteenth meeting of the MIDANPIRG ATM/AIM/SAR Sub-Group (ATM/AIM/SAR SG/13) held in Cairo, Egypt, 30 September to 3 October 2013, was attended by a total of forty seven (47) participants from twelve (12) States (Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Libya, Qatar, Saudi Arabia Sudan, UAE and Yemen) and one (1) International Organization/Agency (MIDRMA).

## 2. DISCUSSION

2.1 The meeting may wish to recall that the provisions regarding contingency arrangements are contained in Chapter 2 of Annex 11. Guidance material relating to the development, promulgation, and implementation of contingency plans is contained in Attachment C to Annex 11.

2.2 The ATM/AIM/SAR SG/13 meeting recognized that one of the challenges contributing to the low pace in implementation of contingency plans was the process of consultation and agreements with adjacent FIRs/States. However, it was noted that progress has been achieved, since a number of States have signed contingency planning agreements with adjacent FIRs/States.

2.3 The meeting may wish to note that as a follow-up action to the MIDANPIRG/13 Conclusion 13/9, the ICAO MID Regional Office issued State Letters Ref.: AN 6/1.2.1 – 12/166 and AN 6/1.2.1-13/194 dated 12 June 2012 and 21 July 2013, respectively, urging States and Users to review the MID Regional Contingency Plan and the revised version of the Contingency Routing Scheme Asia/Middle East/Europe 2003 (CRAME-03) and provide updates and comments to the ICAO MID Regional Office before 1 September 2012

2.4 The ATM/AIM/SAR SG/13 meeting reviewed and updated the Draft version of the MID Region ATM Contingency Plan at **Appendix A** to this working paper. This Plan is designed to provide alternative routes for the traffic flows between the MID Region and Asia, Africa, and Europe, which will allow aircraft operators to circumnavigate airspace(s) in the MID Region, as deemed necessary, or due to a perceived risk to the safety of flight with a minimum of disruption to flight operations.

2.5 The MID Region Air Traffic Management (ATM) Contingency Plan has been developed to ensure, to the extent possible, the continued safety of air navigation in the event of disruption or potential disruption of Air Traffic Services and related supporting services in the MID Region.

2.6 It is to be highlighted that the State(s) responsible for providing air traffic services and related supporting services in particular portions of airspace is (are) responsible, in the event of disruption or potential disruption of these services, for instituting measures to ensure the safety of international civil aviation operations and, where possible, for making provisions for alternative facilities and services. To that end the State(s) should develop, promulgate, and implement appropriate contingency plans. Such plans should be developed in consultation with other States and airspace users concerned and with ICAO, as appropriate, whenever the effects of the service disruption(s) are likely to affect the services in adjacent airspace.

2.7 States are encouraged to periodically review their national contingency plan and coordinate any amendments with neighbouring States and ICAO. The updated States' Contingency plans should be available at the ICAO MID Regional Office.

2.8 The meeting may wish to note that Bahrain and Egypt signed the contingency agreements with all their neighboring States. The status of contingency agreements in the MID Region is at **Table 2** of the MID ATM Contingency Plan at **Appendix A** to this working paper.

2.9 The meeting may wish to recall that MIDANPIRG/12, through Decision 12/72 tasked the ATM/AIM/SAR Sub-Group and MET Sub-Group with the development of a MID Region Volcanic Ash Contingency Plan, based on the Template developed by the International Volcanic Ash Task Force (IVATF).

2.10 Based on the outcome of the MET SG/4 meeting (Cairo, Egypt, 25-27 June 2013), the ATM/AIM/SAR SG/13 meeting reviewed the MID Region ATM Volcanic Ash Contingency Plan and agreed to attach it to the MID Region ATM Contingency Plan (Chapter 5).

2.11 Based on all the foregoing, the ATM/AIM/SAR SG/13 meeting agreed to the following Draft Conclusion:

| | |
|---|---|
| **Why** | To harmonise the MID Region ATM Contingency Planning |
| **What** | Endorse the MID Region ATM Contingency Plan |
| **Who** | MIDANPIRG |
| **When** | 19 December 2013 |

***DRAFT CONCLUSION 13/6: MID REGION ATM CONTINGENCY PLAN***

*That, the MID Region ATM Contingency Plan be endorsed as at Appendix 4B to the Report on Agenda Item 4(**Appendix A** to this working paper).*

## 3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) Review, update as appropriate, and endorse the MID Region ATM Contingency plan at **Appendix A** to this working paper;

b) Endorse the Draft Conclusion in para. 2.11; and

c) urge States to take necessary measures to finalize the signature of contingency agreements with their relevant neighboring States.

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**APPENDIX A**

# INTERNATIONAL CIVIL AVIATION ORGANIZATION

## MID REGION ATM CONTINGENCY PLAN

**Draft Version 1.0: December 2013**

**MID REGION AIR TRAFFIC MANAGEMENT CONTINGENCY PLAN**

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## FOREWORD

This Document is for guidance only. Regulatory material relating to the MID Regional aircraft operations is contained in relevant ICAO Annexes, PANS/ATM (Doc.4444), Regional Supplementary Procedures (Doc.7030), States AIPs and current NOTAMs, which should be read in conjunction with the material contained in this Document.

Guidelines for contingency measures for application in the event of disruptions of air traffic services and related supporting services were first approved by the Council on 27 June 1984 in response to Assembly Resolution A23-12, following a study by the Air Navigation Commission and consultation with States and international organizations concerned, as required by the Resolution. The guidelines were subsequently amended and amplified in the light of experience gained with the application of contingency measures in various parts of the world and in differing circumstances.

The purpose of the guidelines is to assist in providing for the safe and orderly flow of international air traffic in the event of disruptions of air traffic services and related supporting services and in preserving the availability of major world air routes within the air transportation system in such circumstances.

The MID Regional Air Traffic Management Contingency Plan is primarily for the information to operators and pilots planning and conducting operations in MID Region. The intent is to provide a description of the arrangements in place to deal with a range of contingency situations.

This Contingency Plan has been developed with the approval of the Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG); a MID Regional planning body established under the auspices of the International Civil Aviation Organization (ICAO). This Group is responsible for developing the required operational procedures; specifying the necessary services and facilities and; defining the aircraft and operator approval standards employed in the MID Region.

## RECORD OF AMENDMENTS

| Amendment Number | Effective Date | Initiated by | Paragraph/ Reference | Remarks |
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## INTRODUCTION

The MID Region Air Traffic Management (ATM) Contingency Plan has been developed to ensure, to the extent possible, the continued safety of air navigation in the event of disruption or potential disruption of Air Traffic Services and related supporting services in the MID Region, in accordance with the provisions of ICAO Annex 11 – Air Traffic Services, Chapter 2, paragraph 2.30 and its Attachment C.

The MID Region is fast growing continental airspace in the world. In 2010 in excess of **976400** flights transited the airspace. The ATS Route accommodates a high concentration of traffic which regularly sees traffic flows in excess of 100 flights per hour. Control of traffic in this vast and complex airspace is delegated to a number of states, with their Continental Control facilities geographically dispersed.

The table shows the aircraft movements forecast to the year 2030:

| | Actual | Forecast | Average Annual Growth |
|---|---|---|---|
| | | | 2010-2030 |
| | 2010 | 2030 | (per cent) |
| AFR-MEA | 68588 | 446722 | 9.8 |
| ASIA-MEA | 261359 | 1384191 | 8.7 |
| EUR-MEA | 276285 | 977855 | 6.5 |
| INTRA MEA | 349324 | 2287506 | 9.9 |
| NAM-MEA | 20843 | 107917 | 8.6 |
| TOTAL | 976399 | 5204191 | 8.7 |

Contingency Routing (CR) has been developed and contained in the Plan based on the major traffic flows through the MID Region, taking into consideration the movements' number between City Pairs.

This Plan is designed to provide alternative routes for the traffic flows between the MID Region and Asia, Africa, and Europe, which will allow aircraft operators to circumnavigate airspace(s) in the MID Region, as deemed necessary, or due to a perceived risk to the safety of flight.with a minimum of disruption to flight operations.

These alternative routes (Contingency Routing – CR) are based mainly on the existing route network. Establishment of temporary routes could be considered to relief traffic congestion resulting from the implementation of the Contingency plan.

It is recognized that operators may incur economic penalties during application of the contingency scenarios. Therefore, air traffic flow control measures will be implemented as required.

The ICAO MID Regional Office will coordinate with ICAO HQ and the concerned Regional Offices any amendment to the Regional Contingency Plan.

The appropriate ICAO Regional Office will distribute this contingency plan to all relevant States and international organizations within their regions.

This Document is available to users through the ICAO MID website http://www.icao.int/mid/

To assist in keeping this document up to date, Stakeholders are encouraged to provide the ICAO MID Regional Office (icaomid@icao.int) with their comments/suggestions.

***MID Region ATM Contingency Focal Points***

The List of the MID Region ATM Contingency Focal Points is at **Table 1.** This list should be reviewed and updated, as appropriate.

## Table 1

## MID Region ATM Contingency Focal Points

| NAMES | PHONE (WORK) | PHONE (HOME) | MOBILE PHONE | FAX | E-MAIL | OTHER CONTACT DETAILS |
|---|---|---|---|---|---|---|
| **BAHRAIN** | | | | | | |
| Mr. Ali Ahmed Mohammed | 973 17321116 | | 973 39969399 | 973 17321 9977 | aliahmed@caa.gov.bh | Bahrain ACC<br>Duty Supervisor<br>Tel: 973 1732 1081/1080<br>Fax: 973 1732 1029<br>Email : bahatc@caa.gov.bh |
| Mr. Saleem Mohammed Hasan | 9731732 1117 | | 973 39608860 | 973 17321 9966 | saleemmh@caa.gov.bh | |
| **EGYPT** | | | | | | |
| Mr. Moatassem Bellah Abd Elraheem Baligh | 202 265 7849 | 202 639 1792 | 01001695252 | 202 268 0627 | moatassem_5@hotmail.com | |
| Mr. Aly Hussien Aly | 202 637 3950 | 202 417 8460 | 201 01609 760 | 202 268 0627 | | |
| **IRAN** | | | | | | |
| Mr. Ebrahim Shoushtari Deputy CEO for Aeronautical Operations (IAC) | 982163148900 | | 989121861900 | 9821 63148906 | E_shoushtari@yahoo.com<br>E.shoushtari@airport.ir | *Note*.- During New Year Holidays in Iran (20 March – 5 April) or for any urgent message Contact Tehran ACC on +9821-44544116 |
| Mr. Ali- Arabi<br>DG of ATS Department | 98 21 445 44101 | | 98-9122967946 | 9821 44544102 | aarabi@airport.ir | |
| Mr. Javad – Pashaei<br>Deputy Director of ATS Dept. | 9821 44544103 | | 989122967946 | 9821 44544102 | aarabi@airport.ir | |
| Mr. Ramezan Ali Ziaee<br>Deputy Director of ATS Dept. | 9821-44544103 | | 989123874917 | 9821 44544102 | r.a.ziaee@airport.ir | |

| NAMES | PHONE (WORK) | PHONE (HOME) | MOBILE PHONE | FAX | E-MAIL | OTHER CONTACT DETAILS |
|---|---|---|---|---|---|---|
| **IRAQ** | | | | | | |
| Mr. Ali Mohsin Hashim<br>ATS Director | 96418133370 | 9647702997761 | 9647815762525 | | atc_iraqcaa@yahoo.com | |
| **JORDAN** | | | | | | |
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| **KUWAIT** | | | | | | |
| Mr. Adel S. Boresli | 965 24710268 | | 96599036556 | 965 24346221 | as.buresli@dgca.gov.kw | |
| **LEBANON** | | | | | | |
| Walid Al Hassanieh Chief Air Navigation Dept. | + 961 1 628178 | | +961 70474517 | +961 1 629023 | hassaniehw@beirutairport.gov.lb | AFTN OLBAZPZX |
| **LIBYA** | | | | | | |
| Issa Maaroug.<br>Air Navigation Director | 218 21 5630811 | 218 91 6827688 | 218 92 5439240 | 218.21.3605535 | airnav.director@caal.ly | LIBYAN C.A.A<br>P.O.BOX 14399 |
| **OMAN** | | | | | | |
| Mr. Abdullah Nasser Al-Harthy | 968519201 | | 9689476806 | 968519939<br>/519930 | Abdullah_nasser@dgcam.com.om | |
| Mr. Saud Al-Adhoobi | 968519305 | | 9689321664 | 968519939/519930 | saud@dgcam.com.om | |
| **SAUDI ARABIA** | | | | | | |
| Mr. Mohammad Al Alawi | 96626401005 | | 96655621582 | 9662 6401005 | alalawi_m@yahoo.com | |
| **SUDAN** | | | | | | |
| Abubakr Elsiddig Elamin | 249183784964 | | 249912146745 | 249183784964 | abubakratco@live.com | ATM Director ANS P.O. Box 137 code 11112, Khartoum, Sudan |
| **SYRIA** | | | | | | |
| Eng. Feras MohamadDirector General of Civil Aviation | 963 1133 33815 | | | 963 11 2232201 | dgca@scaa.sy | P.O.BOX:6257 Damascus, Syria |
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| NAMES | PHONE (WORK) | PHONE (HOME) | MOBILE PHONE | FAX | E-MAIL | OTHER CONTACT DETAILS |
|---|---|---|---|---|---|---|
| **UNITED ARAB EMIRATES (UAE)** | | | | | | |
| Mr. Ahmed Al Jallaf Executive Director, Air Navigation Service Provider | 9712 599 6888 | | 97150 614 9065 | 9712 599 6883 | aljallaf@szc.gcaa.ae | 9712 599 6999<br>SCZ |
| **YEMEN** | | | | | | |
| Mr.Abdullah Ahmed Al-Awlaqi | 9671 345 402 | 9671 506828 | 967777776830 | 967-1-344047 | ns@gmail.com | D.G ANS |
| Abdullah Abdulwareth Aleryani | 967-1-345403 | 967-1-344254 | 967777190602 | 967-1-345403 | ernlabd@gmail.com | D.G ACC/FIC |
| Ahmed Mohammed Al-Koobati | 967-1-344675 | 967-1-214375 | 967777241375 | 967-1-344047 | 70@yahoo.com | D.Air Navigation Operation |
| **IATA** | | | | | | |
| | | | | | | |
| **ICAO MID** | | | | | | |
| Elie El Khoury (RO ATM/SAR) | 202 267 4845 ext 104 | | | 202 267 4843 | ekhouryi@icao.int | |
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| **ICAO APAC** | | | | | | |
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| **ICAO ESAF** | | | | | | |
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| **ICAO WACAF** | | | | | | |
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| **ICAO Headquarters – Montreal** | | | | | | |
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# CHAPTER 1

## MID STATES' CONTINGENCY PLANS

Air traffic services authorities shall develop and promulgate contingency plans for implementation in the event of disruption, or potential disruption, of air traffic services and related supporting services in the airspace for which they are responsible for the provision of such services. Such contingency plans shall be developed with the assistance of ICAO as necessary, in close coordination with the air traffic services authorities responsible for the provision of services in adjacent portions of airspace and with airspace users concerned.

The State(s) responsible for providing air traffic services and related supporting services in particular portions of airspace is (are) also responsible, in the event of disruption or potential disruption of these services, for instituting measures to ensure the safety of international civil aviation operations and, where possible, for making provisions for alternative facilities and services. To that end the State(s) should develop, promulgate and implement appropriate contingency plans. Such plans should be developed in consultation with other States and airspace users concerned and with ICAO, as appropriate, whenever the effects of the service disruption(s) are likely to affect the services in adjacent airspace.

The responsibility for appropriate contingency action in respect of airspace over the high seas continues to rest with the State(s) normally responsible for providing the services until, and unless, that responsibility is temporarily reassigned by ICAO to (an) other State(s).

States should periodically review their national contingency plan and coordinate any amendments with neighbouring States and ICAO.

MID States' Contingency Plans are available at the ICAO MID Regional Office and the status of contingency agreements in the MID Region is at **Table 2**.

**Status of Contingency Agreements in the MID Region**

| STATE | CORRESPONDING STATES | | | REMARKS |
|---|---|---|---|---|
| **BAHRAIN** | ☒ IRAN<br>☒ KUWAIT | ☒ OMAN<br>☒ QATAR | ☒ SAUDI ARABIA<br>☒ UAE | Completed |
| **EGYPT** | ☒ GREECE<br>☒ JORDAN | ☒ LYBIA<br>☒ CYPRUS | ☒ SAUDI ARABIA<br>☒ SUDAN | Completed |
| **IRAN** | ☐ ARMENIA<br>☐ AZERBAIJAN<br>☐ TURKMANISTAN<br>☐ AFGHANISTAN | ☒ BAHRAIN<br>☐ IRAQ<br>☐ KUWAIT<br>☒ OMAN | ☒ PAKISTAN<br>☐ TURKEY<br>☐ UAE | 3/11 |
| **IRAQ** | ☐ IRAN<br>☐ JORDAN | ☐ KUWAIT<br>☐ SAUDI ARABIA | ☐ SYRIA<br>☐ TURKEY | 0/6 |
| **JORDAN** | ☒ EGYPT<br>☐ IRAQ | ☐ ISRAEL<br>☒ SAUDI ARABIA | ☐ SYRIA | 2/6 |
| **KUWAIT** | ☒ BAHRAIN<br>☐ IRAN | ☐ IRAQ | ☒ SAUDI ARABIA | 2/6 |
| **LEBANON** | ☐ CYPRUS | ☐ SYRIA | | 0/2 |
| **LIBYA** | ☐ ALGERIA<br>☐ CHAD<br>☒ EGYPT | ☐ MALTA<br>☐ NIGER | ☐ SUDAN<br>☐ TUNIS | 1/7 |
| **OMAN** | ☒ BAHRAIN<br>☐ INDIA | ☒ IRAN<br>☐ PAKISTAN | ☒ UAE<br>☒ YEMEN | 4/6 |
| **QATAR** | ☒ BAHRAIN | ☐ SAUDI ARABIA | ☐ UAE | 1/3 |
| **SAUDI ARABIA** | ☒ BAHRAIN<br>☒ EGYPT<br>☐ ERITREA | ☐ IRAQ<br>☒ JORDAN<br>☒ KUWAIT | ☐ SUDAN<br>☐ YEMEN | 4/8 |
| **SUDAN** | ☐ CENTRAL AFRICAN<br>☐ CHAD<br>☒ EGYPT | ☐ ERITREA<br>☐ ETHIOPIA<br>☐ LIBYA | ☐ SAUDI ARABIA<br>☐ SOUTH SUDAN | 1/8 |
| **SYRIA** | ☐ IRAQ<br>☐ JORDAN | ☐ LEBANON<br>☐ CYPRUS | ☐ TURKEY | 0/5 |
| **UAE** | ☒ BAHRAIN<br>☐ IRAN | ☒ OMAN | ☐ QATAR | 2/4 |
| **YEMEN** | ☐ DJIBOUTI<br>☐ ERITREA<br>☐ ETHIOPIA | ☐ INDIA<br>☒ OMAN<br>☐ SAUDI ARABIA | ☐ SOMALIA | 1/7 |

☒ Agreement Signed ☐ Agreement NOT Signed Signed Agreements / Total No. of required Agreements

**Table 2**

## CHAPTER 2

## COMMON PROCEDURES

**Implementation of the plan**

A Contingency Coordination Team (CCT) to be established from the following members:

- ICAO (HQ and Regional Offices Focal points) and IATA as permanent members;
- States concerned as essential members; and
- Other organizations, Agencies etc., when deemed necessary, as temporary members.

The main tasks of the CCT are as follows:

- monitor continuously information from all relevant sources;
- initiate action for the activation/deactivation of the Contingency Plan;
- arrange for the constant supply of relevant aeronautical information to the ICAO Regional Office and Headquarters;
- liaise with international/regional organizations as appropriate; and
- exchange up-to-date information with States directly concerned and States which are potential participants in contingency arrangements.

In the event of adoption of contingency procedures States/ANSPs will notify all affected agencies and operators appropriately.

In **Limited Service situations:** the individual States/ANSP will decide upon the level of notification necessary and take action as required to cascade the information.

In **No Service situations**: it is likely that the ATC facility involved will be subject to evacuation. In this instance the States/ANSP will issue NOTAMs and broadcast on appropriate frequencies that contingency procedures have been initiated. The notification process employed by individual States/ANSPs is detailed in their national plan. However the general format will be as the following example of the type of information which may be promulgated:

NOTAM

*"Due to emergency evacuation of (States ACC) all ATC services are terminated. Flights within (States ACC) FIR should continue as cleared and contact the next ATC agency as soon as possible. Flights not in receipt of an ATC clearance should land at an appropriate airfield or request clearance to avoid (State) FIR. Flights should monitor (defined frequencies)."*

Broadcast an evacuation message on appropriate frequencies:

*"Emergency evacuation of (Sates ACC) is in progress. No air traffic control service will be provided by (States ACC). Use extreme caution and monitor (control frequencies), emergency frequencies and air to air frequencies. Contact the next air traffic control unit as soon as possible".*

**Traffic Information Broadcast by Aircraft (TIBA) procedures**

The following communications procedures have been developed in accordance with the Traffic Information Broadcast by Aircraft (TIBA) procedures recommended by ICAO (Annex 11 – Air Traffic Services, Attachment C). These procedures should be applied when completing an altitude change to comply with the ATC clearance.

At least 3 minutes prior to the commencement of a climb or descent the flight should broadcast on the last assigned frequency, 121.5, 243.0 and 123.45 the following:

*"ALL STATION (callsign) (direction) DIRECT FROM (landfall fix) TO (oceanic entry point) LEAVING FLIGHT LEVEL (number) FOR FLIGHT LEVEL (number) AT (distance)(direction) FROM (oceanic entry point) AT (time)"*

When the level change begins, the flight should make the following broadcast:

*"ALL STATIONS (callsign) (direction) DIRECTION FROM (landfall fix) TO (oceanic entry point) LEAVING FLIGHT LEVEL (number) NOW FOR FLIGHT LEVEL (number)."*

When level, the flight should make the following broadcast:

*"ALL STATIONS (callsign) MAINTAINING FLIGHT LEVEL (number)."*

## CHAPTER 3

## AIR TRAFFIC MANAGEMENT

### ATS Responsibilities

Tactical ATC considerations during periods of overloading may require re-assignment of routes or portions thereof.

Alternative routes should be designed to maximize the use of existing ATS route structures and communication, navigation and surveillance services.

In the event that ATS cannot be provided within the (*XXX*) CTA/UTA/FIR, the Civil Aviation Authority shall publish the corresponding NOTAM indicating the following:

a) Time and date of the beginning of the contingency measures;

b) Airspace available for landing and overflying traffic and airspace to be avoided;

c) Details of the facilities and services available or not available and any limits on ATS provision (e.g., ACC, APP, TWR and FIS), including an expected date of restoration of services if available;

d) Information on the provisions made for alternative services;

e) ATS contingency routes;

f) Procedures to be followed by neighbouring ATS units;

g) Procedures to be followed by pilots; and

h) Any other details with respect to the disruption and actions being taken that aircraft operators may find useful.

In the event that the CAA is unable to issue the NOTAM, the (alternate) CTA/UTA/FIR will take action to issue the NOTAM of closure airspace upon notification by corresponding CAA or the ICAO MID Regional Office.

### Separation

Separation criteria will be applied in accordance with the *Procedures for Air Navigation Services-Air Traffic Management* (PANS-ATM, Doc 4444) and the *Regional Supplementary Procedures* (Doc 7030).

### Level Restrictions

Where possible, aircraft on long-haul international flights shall be given priority with respect to cruising levels.

**Other measures**

Other measures related to the closure of airspace and the implementation of the contingency scheme with the (*XXX*) CTA/UTA/FIR may be taken as follows:

a) Suspension of all VFR operations;

b) Delay or suspension of general aviation IFR operations; and

c) Delay or suspension of commercial IFR operations.

**Transition to Contingency Plan**

During times of uncertainty when airspace closures seem possible, aircraft operators should be prepared for a possible change in routing while en-route, familiarization of the alternative routes outlined in the contingency plan as well as what may be promulgated by a State via NOTAM or AIP.

In the event of airspace closure that has not been promulgated, ATC should, if possible, broadcast to all aircraft in their airspace, what airspace is being closed and to stand by for further instructions.

ATS providers should recognize that when closures of airspace or airports are promulgated, individual airlines might have different company requirements as to their alternative routings. ATC should be alert to respond to any request by aircraft and react commensurate with safety.

During the contingency operations, States concerned should take necessary measures to grant special over flight permissions to those flights avoiding the affected Airspace(s).

**Transfer of Control and Coordination**

The transfer of control and communication should be at the common FIR boundary between ATS units unless there is mutual agreement between adjacent ATS units. ATS providers should also review current coordination requirements in light of contingency operations or short notice of airspace closure.

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## CHAPTER 4

## AIRSPACE AND ALTERNATIVE ROUTINGS

This Contingency Plan has been developed based on existing ATS routes and making use of appropriate contingency routes in the MID Region. Priority has been given to safety considerations and to ensuring that to the extent possible, ATC operations are not complicated. Temporary routes may be established where necessary.

The contingency routings are designed to take into consideration that disruptions to normal traffic flows have the potential to create an additional burden and complexity to ATC. Therefore, temporary contingency routes would be designed to be safe and instantly manageable by ATC. This may require additional track miles to be flown by the aircraft operator.

The alternative routings were given "CR" designators based on various scenarios that may be implemented. It is to be highlighted that the scenarios drawn on the charts were developed based on the existing route network, and do not reflect new routes. Furthermore, one scenario could be used to avoid different FIRs, subject to users' requirements. The scenarios are detailed in the **Table 3** below:

| **CR** | **FIR(s) to be Avoided** | ***Traffic Flows through the MID Region*** **Alternative routings/FIRs** | **Remarks** |
|---|---|---|---|
| CR 1 | Amman | ***Eastern Europe from/to Asia***<br>▪ Ankara, Baghdad, Jeddah<br>▪ Ankara, Tehran<br>▪ Ankara, Damascus, Baghdad, Jeddah<br>***Western Europe from/to Asia***<br>▪ Nicosia, Cairo, Jeddah<br>▪ Nicosia, Beirut, Damascus, Baghdad, Jeddah<br>***Northern Africa from/to Asia***<br>▪ Cairo, Jeddah<br>***Southern Africa from/to Asia***<br>Not Applicable | |
| CR 2 | Baghdad | ***Eastern Europe from/to Asia***<br>▪ Ankara, Tehran, (Kuwait) or (Bahrain) or (UAE)<br>▪ Ankara, Damascus, Amman, Jeddah<br>***Western Europe from/to Asia***<br>▪ Nicosia, Beirut, Damascus, Amman, Jeddah<br>▪ Nicosia, Damascus, Amman, Jeddah<br>▪ Nicosia, Cairo, Jeddah<br>***Northern Africa from/to Asia***<br>▪ Cairo, Jeddah<br>***Southern Africa from/to Asia***<br>▪ Addis Ababa, (Asmara, Jeddah) or (Mogadishu, Sana'a) | |
| CR 3 | Bahrain | ***Eastern Europe from/to Asia***<br>▪ Ankara, (Baghdad), Tehran, UAE, Muscat<br>▪ Ankara, Baghdad, Jeddah, Sana'a, Muscat<br>***Western Europe from/to Asia***<br>▪ Nicosia, Beirut, Damascus, Amman, Jeddah, Sana'a; Muscat<br>▪ Nicosia, Damascus, Amman, Jeddah<br>▪ Nicosia, Cairo, Jeddah, Sana'a, Muscat | |

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| | | ***Northern Africa from/to Asia***<br>▪ Cairo, Jeddah, Sana'a, Muscat<br>***Southern Africa from/to Asia***<br>▪ Khartoum, Jeddah, Sana'a, Muscat<br>▪ Addis Ababa, Mogadishu, Sana'a, Muscat | |
| CR 4 | Beirut, Damascus | ***Eastern Europe from/to Asia***<br>▪ Ankara, Baghdad Jeddah or Kuwait;<br>▪ Ankara, Tehran<br>***Western Europe from/to Asia***<br>▪ Nicosia, Cairo, Jeddah<br>***Northern Africa from/to Asia***<br>▪ Cairo, Jeddah<br>***Southern Africa from/to Asia***<br>▪ Khartoum Addis Ababa, Mogadishu, Sana'a<br>▪ Khartoum, Jeddah | |
| CR 5 | Cairo | ***Eastern Europe from/to Asia***<br>Not Applicable<br>***Western Europe from/to Asia***<br>▪ Nicosia, Beirut, Damascus, Amman, Jeddah<br>▪ Nicosia, Damascus, Baghdad; Kuwait, Bahrain, UAE<br>▪ Malta, Tripoli, Khartoum, Jeddah<br>▪ Malta, Tripoli, Khartoum, Asmara, Jeddah or Sana'a<br>***Northern Africa from/to Asia***<br>▪ Tripoli, Khartoum, Jeddah<br>▪ Tripoli, Khartoum, Asmara, Jeddah or Sana'a<br>▪ Algiers, Niamey, N'djamena, Khartoum, Asmara, Jeddah or Sana'a<br>***Southern Africa from/to Asia***<br>▪ Khartoum, Jeddah, Sana'a, Muscat<br>▪ Addis Ababa, (Asmara, Jeddah) or (Mogadishu, Sana'a) | |
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| CR 6 | Iran | ***Eastern Europe from/to Asia***<br>▪ Baku, Turkmenbashi, Ashgabat, Turkmenabat, Kabul, Karachi, Muscat or Delhi<br>▪ Baghdad, Kuwait, Bahrain, UAE, Muscat<br>▪ Nicosia Damascus Amman, Jeddah<br>***Western Europe from/to Asia***<br>▪ Nicosia, Beirut, Damascus, Amman, Jeddah<br>▪ Nicosia, Cairo, Jeddah<br>***Northern Africa from/to Asia***<br>Not Applicable<br>***Southern Africa from/to Asia***<br>Not Applicable | |
| CR 7 | Jeddah | ***Eastern Europe from/to Asia***<br>▪ Ankara, Baghdad, Kuwait, Bahrain, UAE, Muscat<br>▪ Ankara, Damascus, Amman, Baghdad, Kuwait, Bahrain, UAE<br>***Western Europe from/to Asia***<br>▪ Nicosia, Beirut, Damascus, Amman, Baghdad, Kuwait, Bahrain,<br>▪ Athens or Nicosia, Cairo, Amman, Baghdad, Kuwait, Bahrain<br>***Northern Africa from/to Asia***<br>▪ Cairo, Khartoum, Asmara, Sana'a | |

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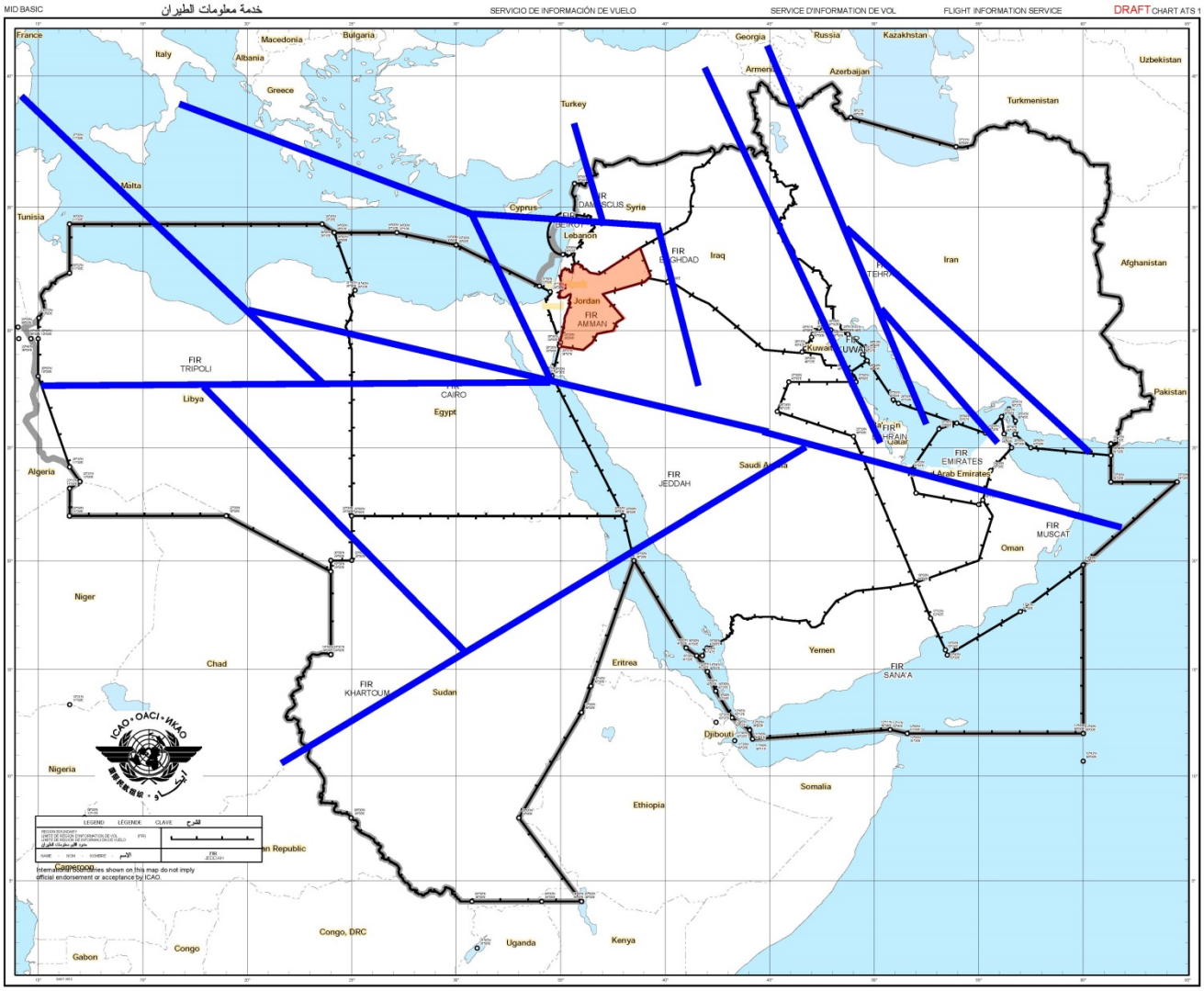
| | | ***Southern Africa from/to Asia***<br>▪ Khartoum, Asmara, Sana'a<br>▪ Addis Ababa, Mogadishu, Sana'a, Muscat | |
| CR 8 | Khartoum | ***Eastern Europe from/to Asia***<br>Not Applicable<br>***Western Europe from/to Africa***<br>Not Applicable<br>***Northern Africa from/to Asia***<br>▪ Cairo, Jeddah<br>▪ Tripoli, N'djamena, Brazzaville, Kinshasa, Entebbe, Nairobi Addis Ababa, Mogadishu, Sana'a, Jeddah or Muscat.<br>***Southern Africa from/to Asia***<br>▪ Kinshasa, Entebbe, Nairobi Addis Ababa, Mogadishu, Sana'a, Jeddah or Muscat | |
| CR 9 | Muscat, UAE | ***Eastern Europe from/to Asia***<br>▪ Ankara, Baghdad, Jeddah, Sana'a<br>***Western Europe from/to Asia***<br>▪ Nicosia, Beirut, Damascus, Amman, Jeddah, Sana'a<br>▪ Nicosia, Damascus, Amman, Jeddah<br>▪ Nicosia, Cairo, Jeddah, Sana'a<br>***Northern Africa from/to Asia***<br>▪ Cairo, Jeddah, Sana'a<br>***Southern Africa from/to Asia***<br>▪ Khartoum, Jeddah, Sana'a<br>▪ Addis Ababa, (Asmara Jeddah) or (Mogadishu, or Sana'a) | |
| CR 10 | Sana'a | ***Eastern Europe from/to Asia***<br>▪ Ankara, Baghdad, Tehran, UAE, Muscat<br>▪ Ankara, Baghdad, Jeddah, Bahrain, Muscat<br>***Western Europe from/to Asia***<br>▪ Nicosia, Beirut, Damascus, Amman, Jeddah, Bahrain; Muscat<br>▪ Nicosia, Damascus, Amman, Jeddah, Bahrain; Muscat<br>▪ Nicosia, Cairo, Jeddah, Bahrain; Muscat<br>***Northern Africa from/to Asia***<br>▪ Cairo, Jeddah, Bahrain; Muscat<br>***Southern Africa from/to Asia***<br>▪ Khartoum, Jeddah, Bahrain; Muscat<br>▪ Addis Ababa, (Asmara Jeddah) or (Mogadishu, Mumbai, Muscat | |
| CR 11 | Tripoli | ***Eastern Europe from/to Asia***<br>Not Applicable<br>***Western Europe from/to Africa***<br>▪ Cairo, Khartoum<br>***Northern Africa from/to South Africa or Middle East***<br>▪ Athens, or Nicosia to Cairo, Khartoum or Jeddah<br>▪ Tunis, Algiers, Niamey, N'djamena<br>***Southern Africa from/to Asia***<br>Not Applicable | |

**Table 3**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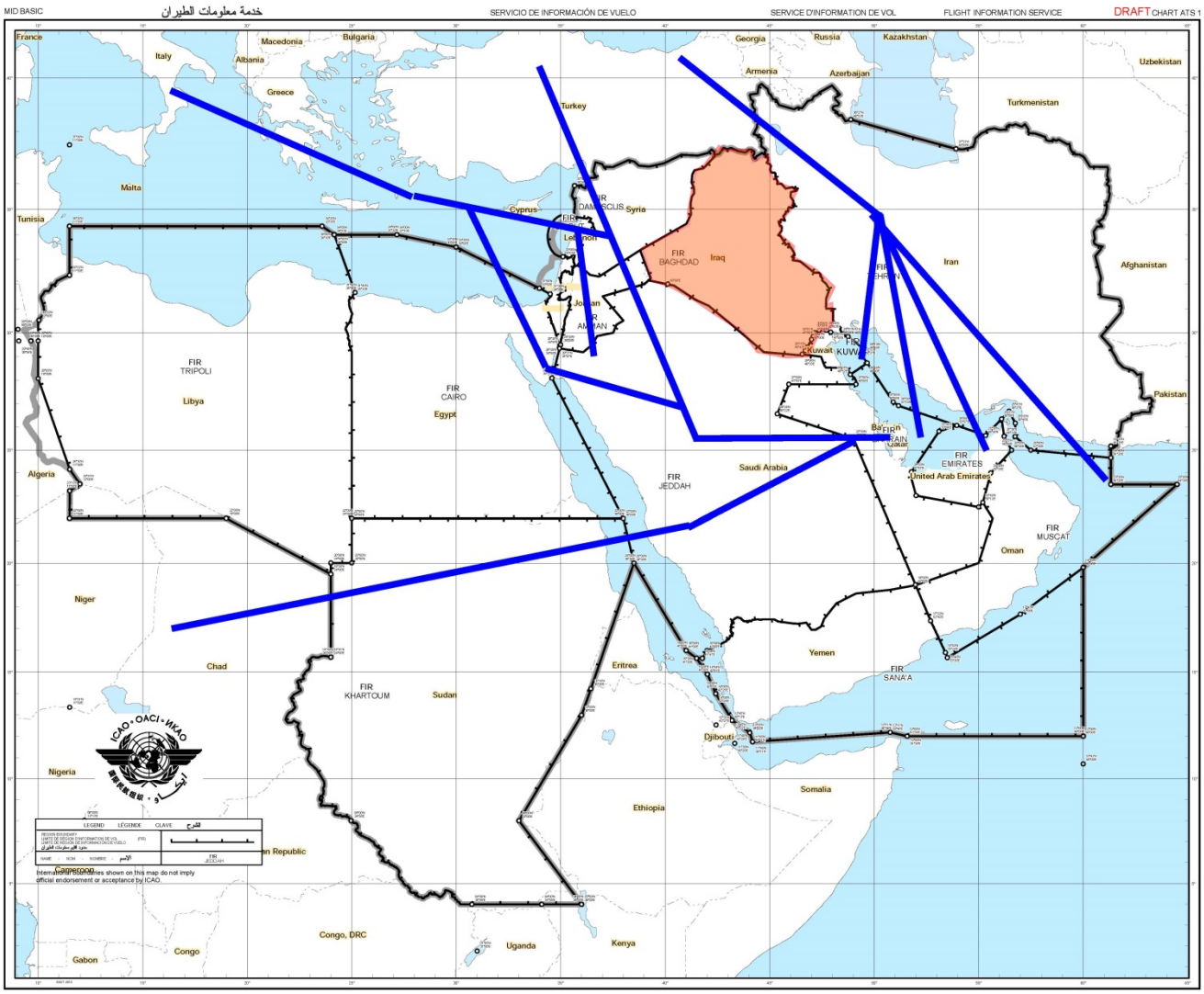
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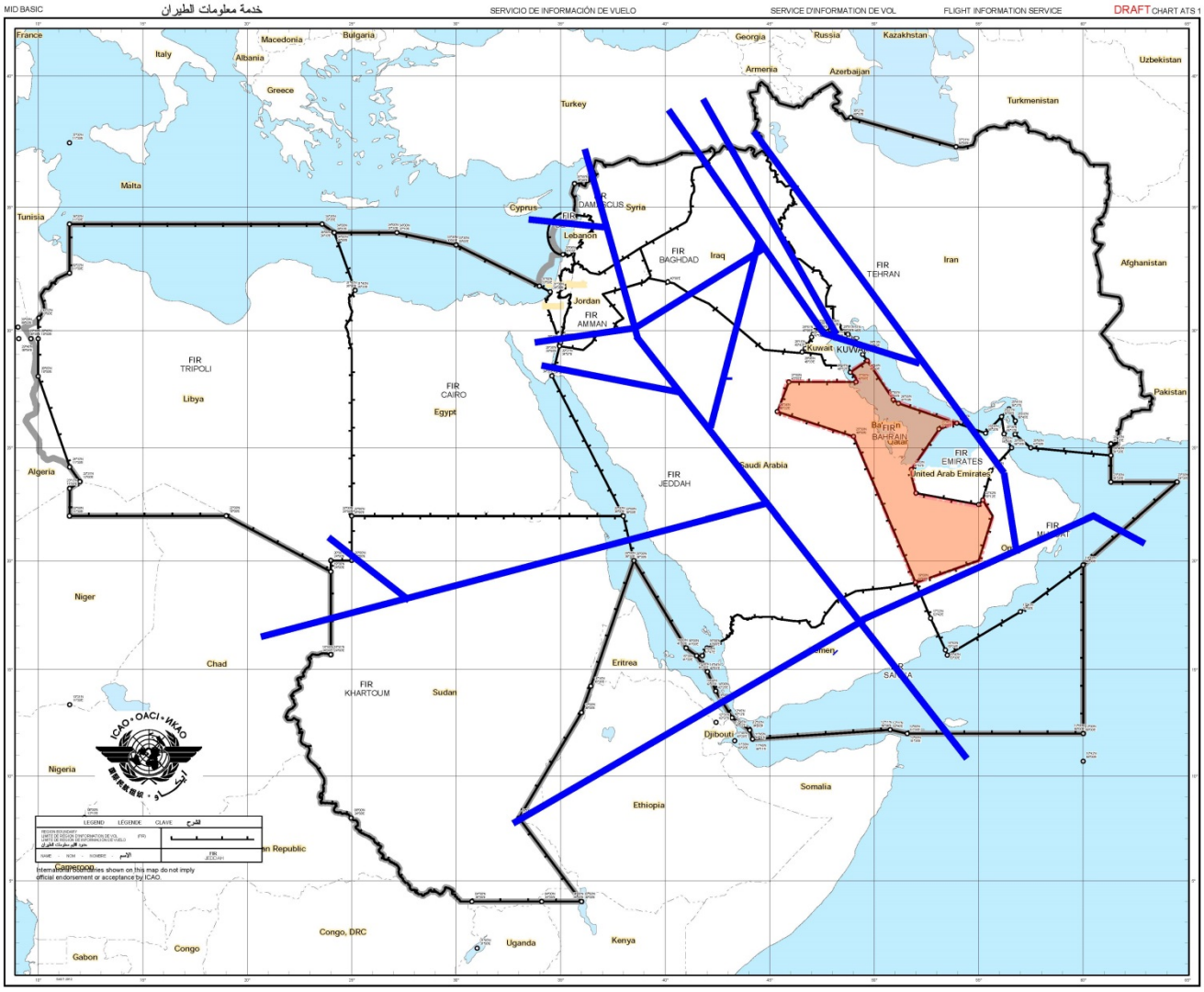
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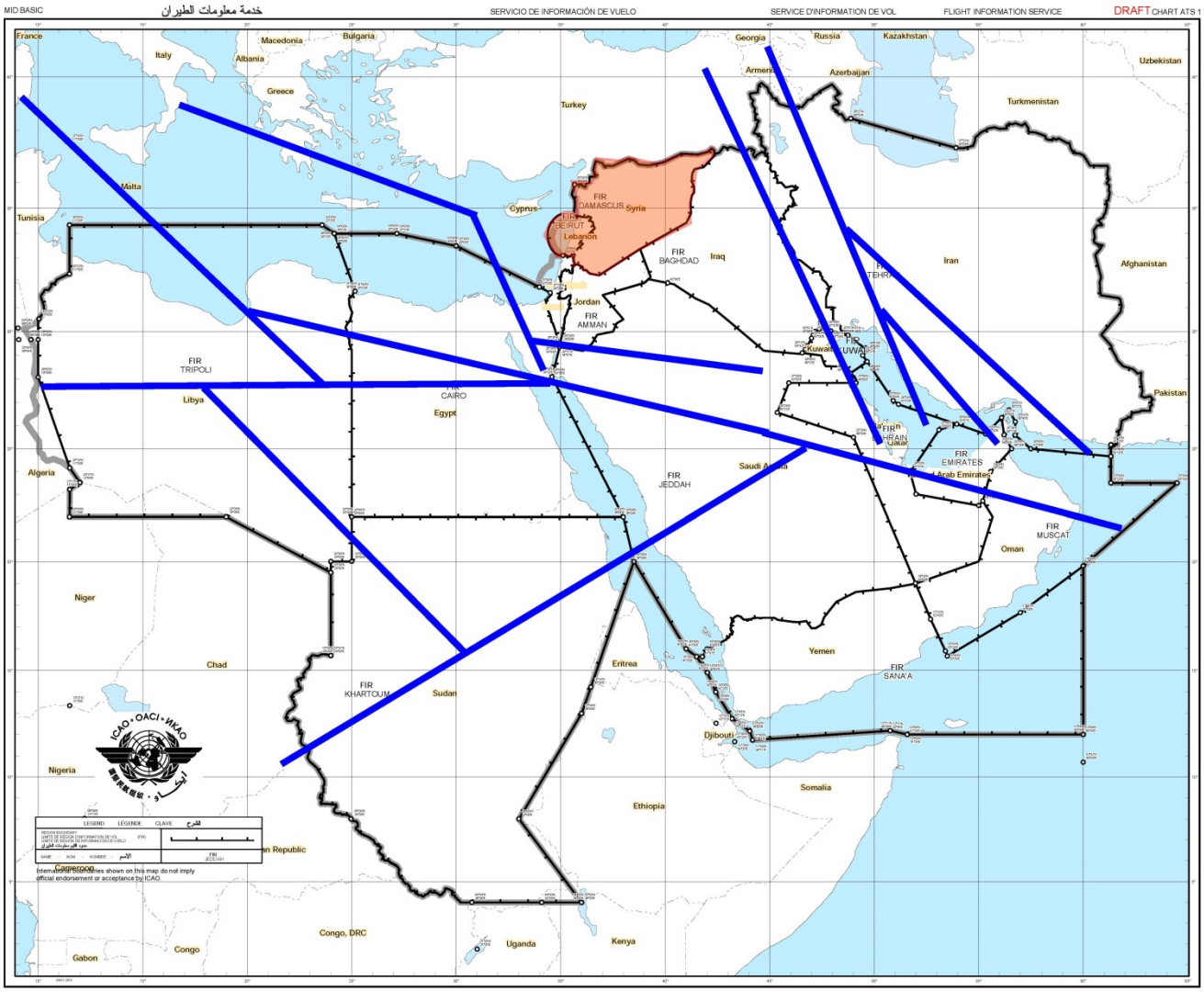
**CR 3**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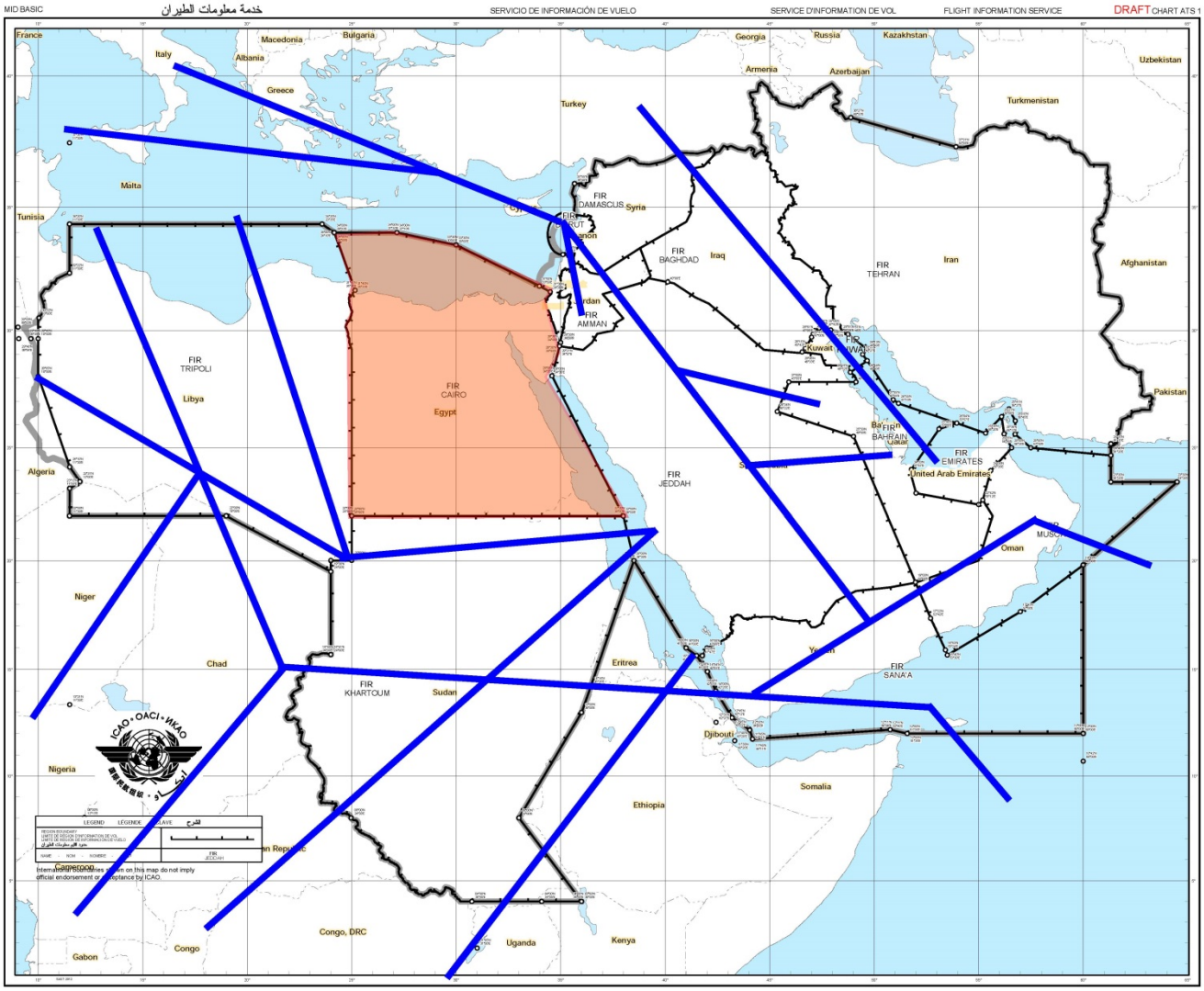
**CR 4**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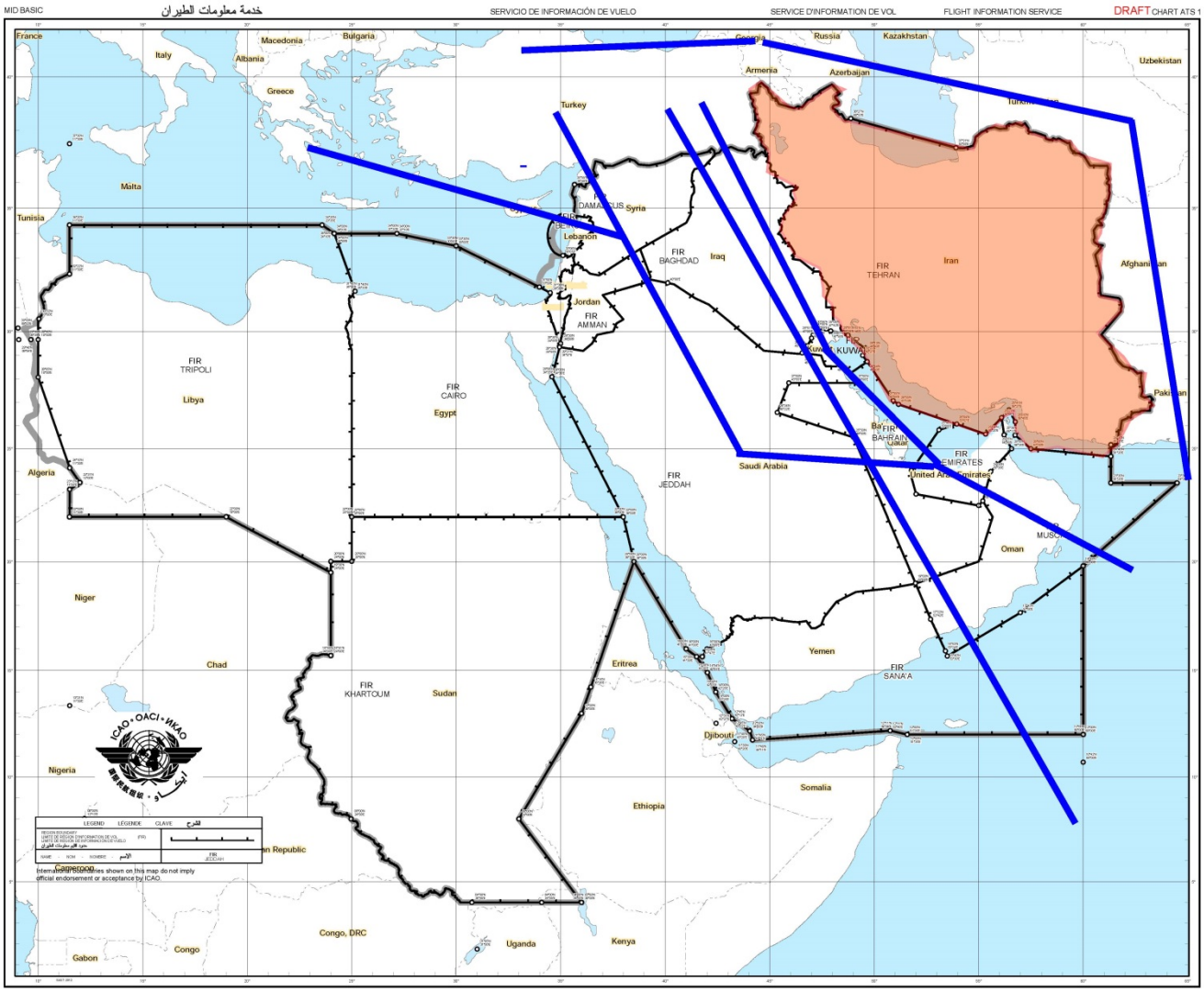
The boundaries and names shown on this map do not imply official endorsement or acceptance by ICAO.

**CR 5**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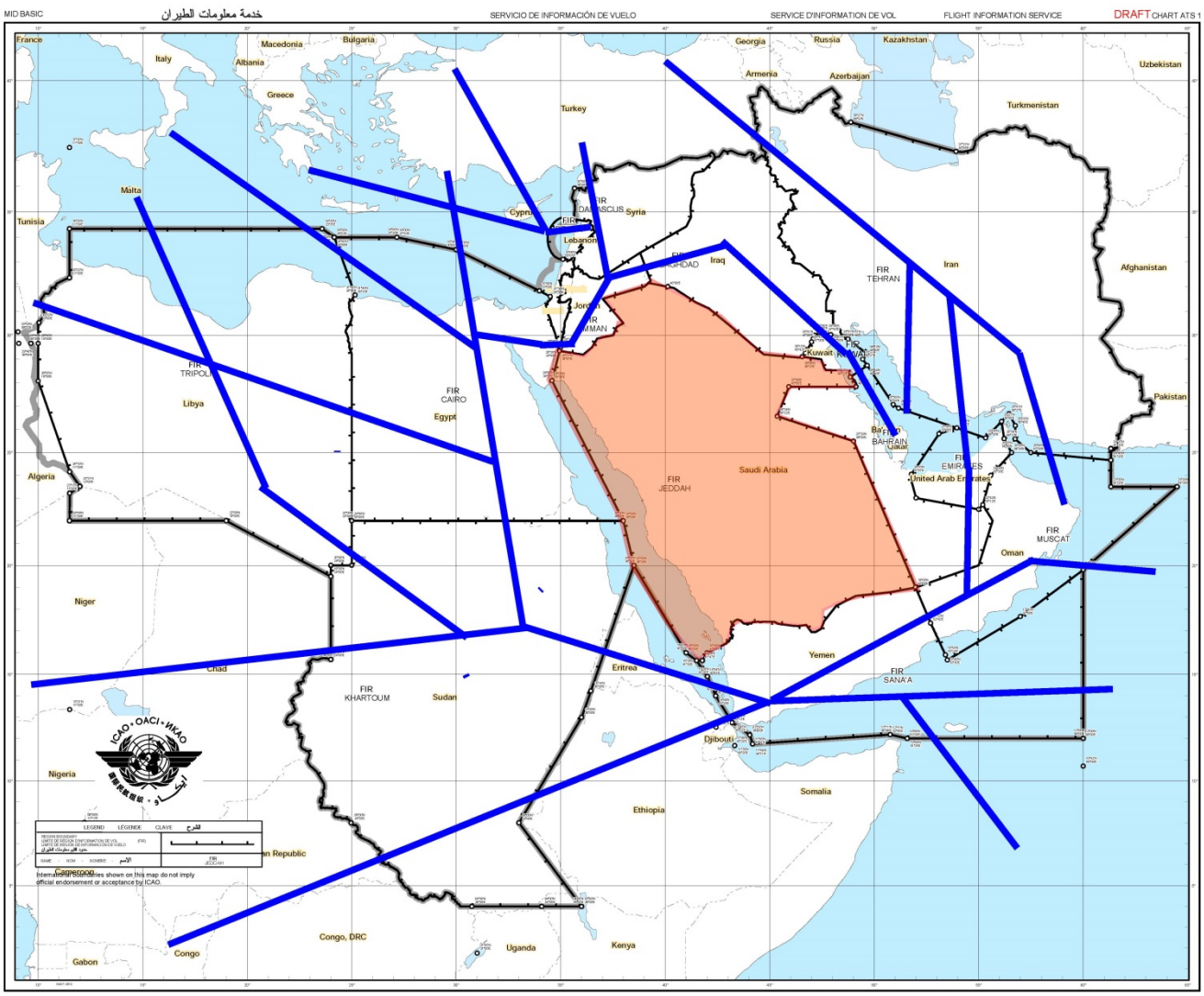
**CR 6**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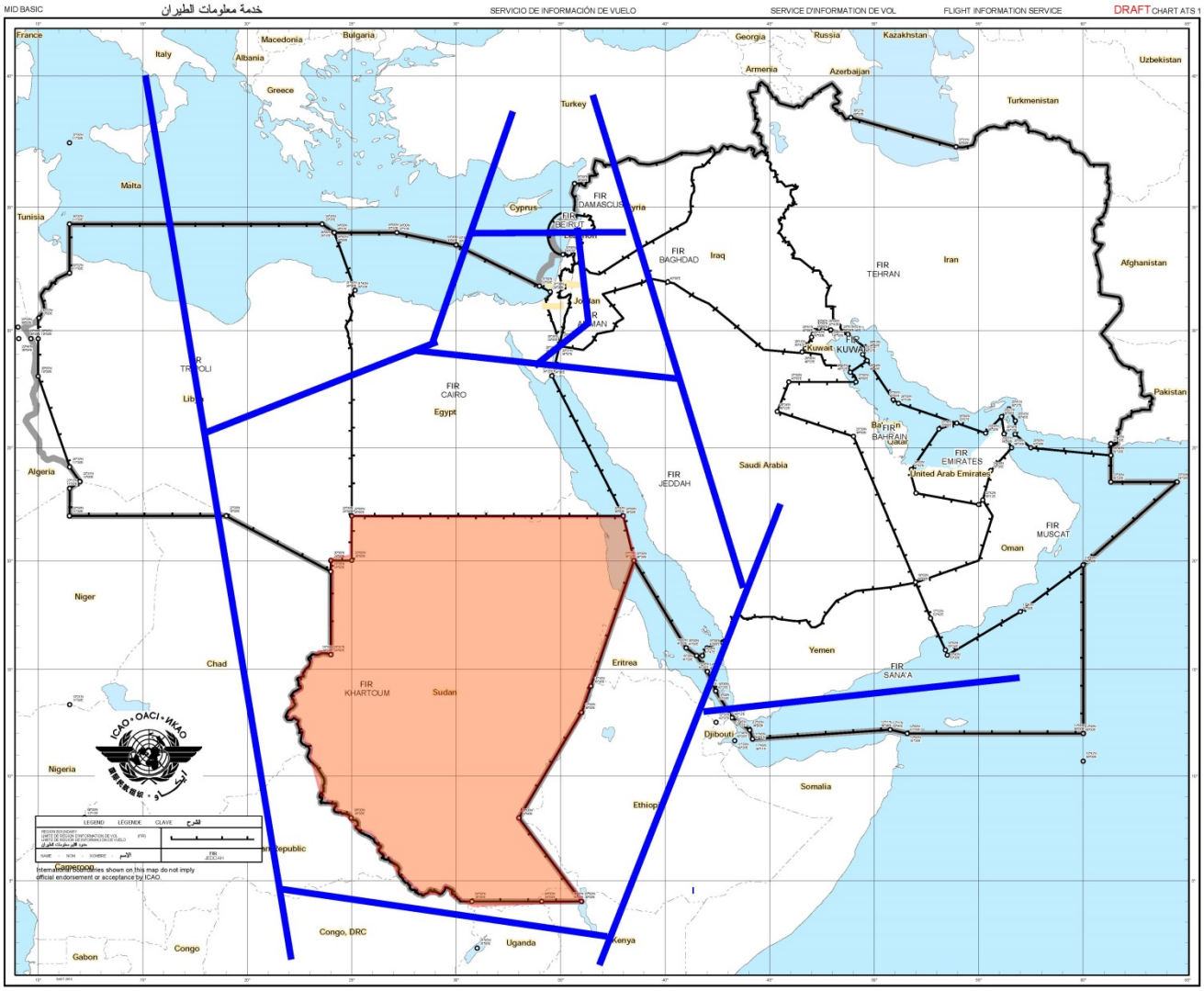
**CR 7**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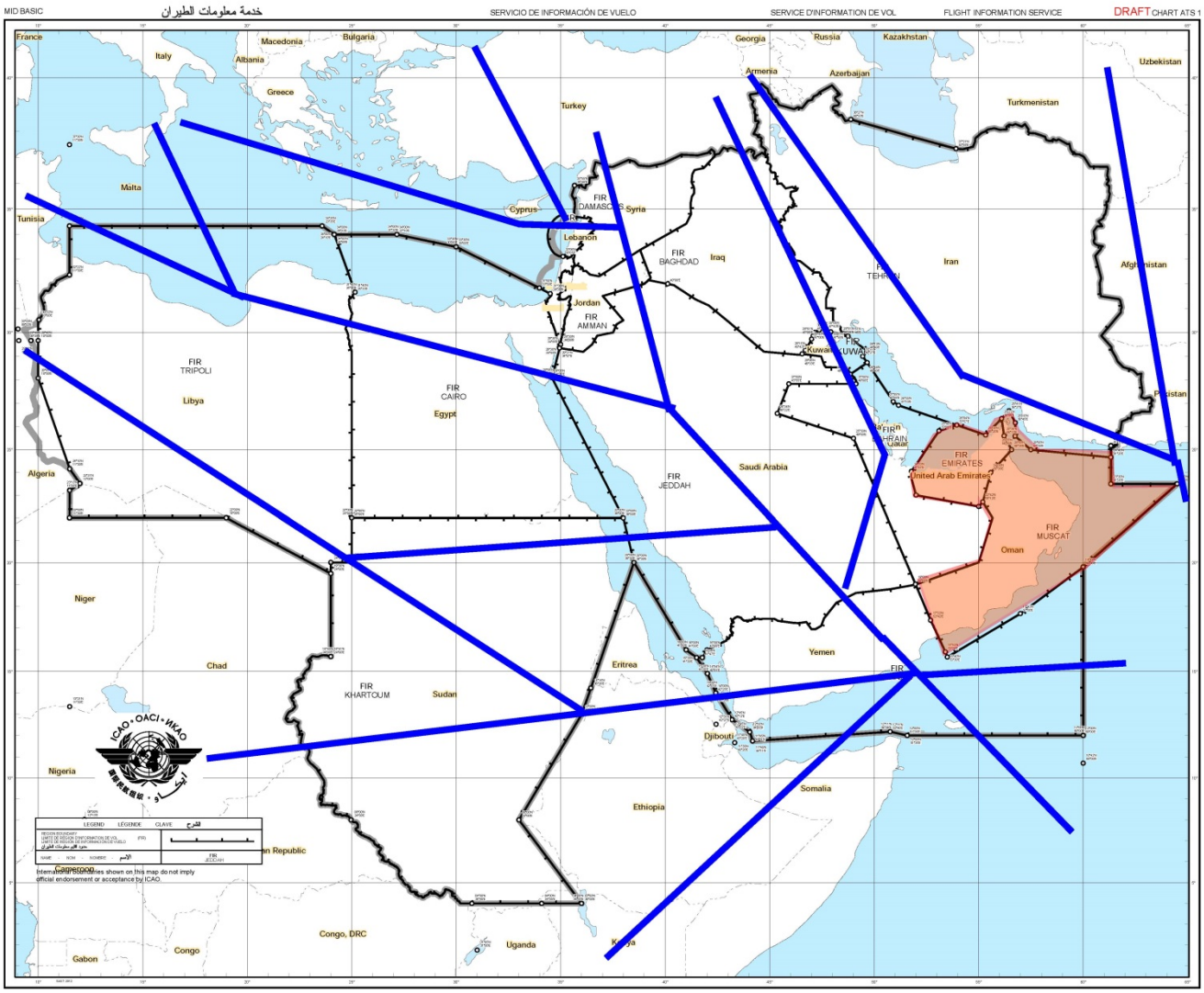
**CR 8**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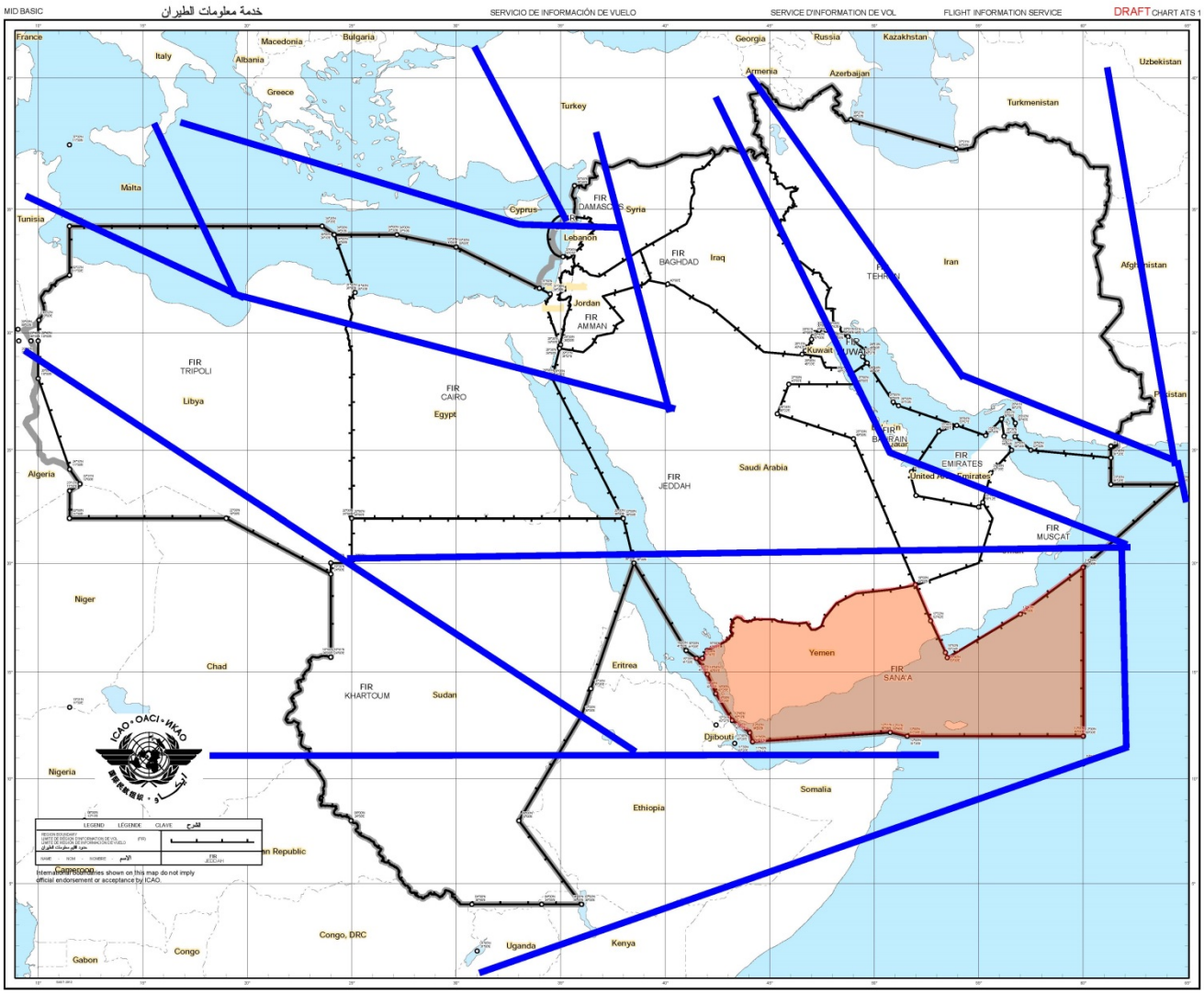
**CR 9**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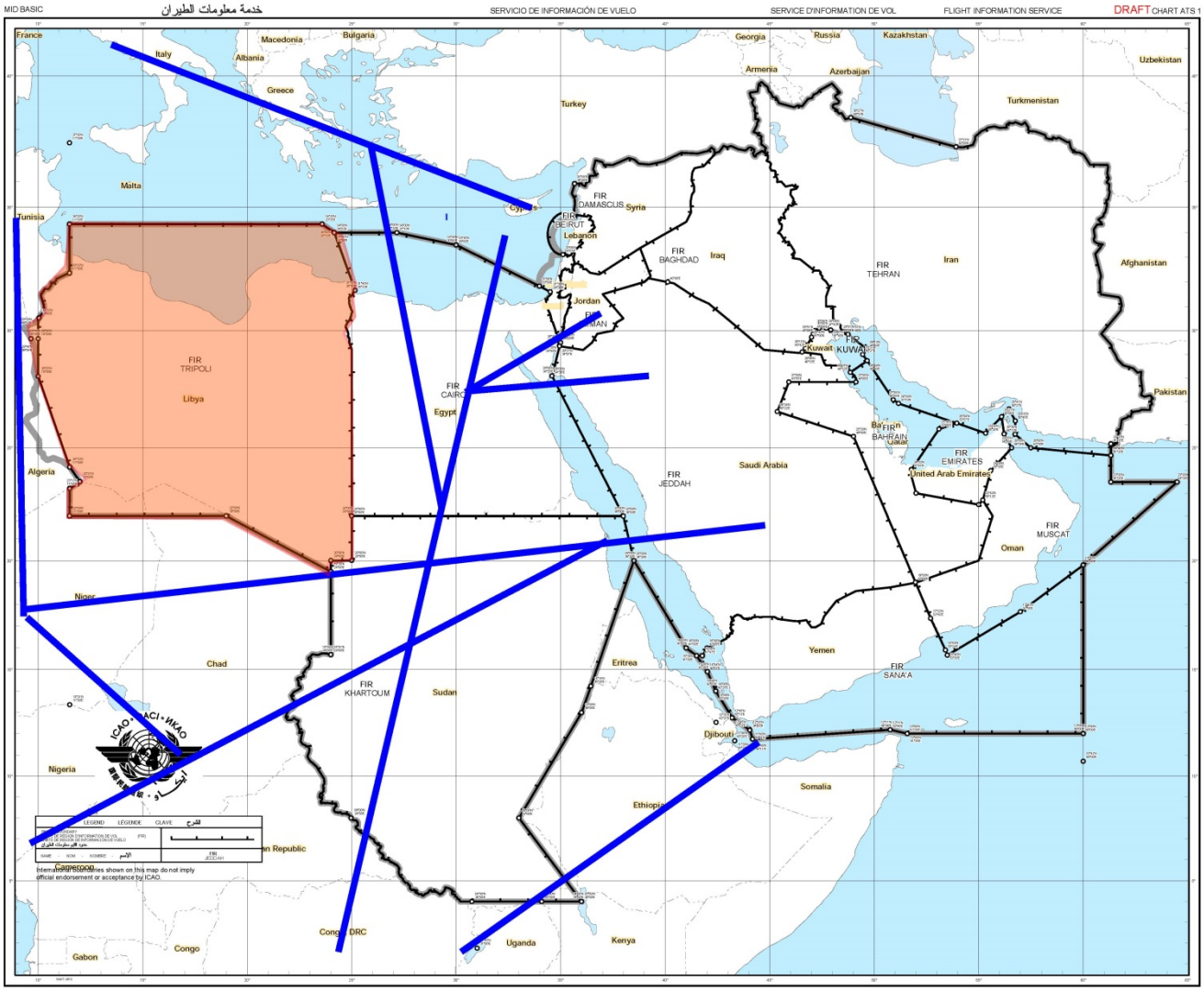
**CR 10**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**CR 11**

## CHAPTER 5

## MID REGION ATM VOLACANIC ASH CONTINGENCY PLAN

The MID Region ATM Volcanic Ash Contingency Plan (MID ATM VACP) was developed based on the VACP prepared by the International Volcanic Ash Task Force (IVATF) in August 2012. The MID ATM VACP sets out standardised guidelines and procedures for the provision of information to airlines and en-route aircraft before and during a volcanic eruption. The plan and its appendices are at **Attachment A** to this Document.

The MID ATM VACP includes the **pre-eruption**, **start of eruption**, **ongoing**; and **recovery** phases.It is to be highlighted that most MID States would practice the **ongoing** and **recovery** phases only as the **pre-eruption** and **start of eruption** phases would only apply to the States where volcanoes erupt. Furthermore, the MID Region would receive volcanic ash advisories and volcanic ash advisories in graphic form from the Volcanic Ash Advisory Center (VAAC) Toulouse.

Volcanic contamination, of which volcanic ash is the most serious, is a hazard for safe flight operations. Mitigating the hazards posed by volcanic ash in the atmosphere and/or at the aerodrome cannot be resolved in isolation but through collaborative decision making (CDM) involving all stakeholders concerned. During an eruption, volcanic contamination can reach and exceed the cruising altitudes of turbine-powered aircraft within minutes and spread over vast geographical areas within a few days. Encounters with volcanic ash may result in a variety of hazards including one or more of the following:

a) the malfunction, or failure, of one or more engines leading not only to reduction, or complete loss of thrust but also to failures of electrical, pneumatic and hydraulic systems;
b) the blockage of pitot and static sensors resulting in unreliable airspeed indications and erroneous warnings;
c) windscreens rendered partially or completely opaque;
d) smoke, dust and/or toxic chemical contamination of cabin air requiring crew to don oxygen masks, thus impacting verbal communication; electronic systems may also be affected;
e) the erosion of external and internal aircraft components;
f) reduced electronic cooling efficiency leading to a wide range of aircraft system failures;
g) the aircraft may have to be manoeuvred in a manner that conflicts with other aircraft; and
h) volcanic ash deposition on a runway may degrade aircraft braking performance, most significantly if the volcanic ash is wet; and in extreme cases, this can lead to runway closure.

Operators are required by ICAO Annex 6 – *Operation of Aircraft* to implement appropriate mitigation measures for volcanic ash in accordance with their safety management system (SMS), as approved by the State of the Operator/Registry. The guidelines provided in the MID ATM VACP document assume that the ICAO requirements regarding safety management systems have been implemented by the operators. Detailed guidance on Safety Risk Assessments (SRAs) for flight operations with regard to volcanic ash contamination can be found in the manual on *Flight Safety and Volcanic Ash – Risk Management of Flight Operations with Known or Forecast Volcanic Ash Contamination* (ICAO Doc 9974).

Distribution of applicable Aeronautical Information Services (AIS) and Meteorological (MET) messages related to volcanic ash are set out in relevant ICAO Annexes, specifically Annex 15–*Aeronautical Information Services* and Annex 3 – *Meteorological Service for International Air Navigation.*

Volcanic ash can also affect the operation of aircraft at aerodromes. Volcanic ash deposition at an aerodrome, even in very small amounts, can result in the closure of the aerodrome until all the deposited ash has been removed. In extreme cases, the aerodrome may no longer be available for operation at all, resulting in repercussions on the ATM system, e.g. diversions, revised traffic flows, etc.

Some aircraft types or engine technologies are more vulnerable to volcanic ash contaminants than others; therefore, any specific mitigation measures to be applied would have to take into account any such variance. Considering that a commercial aircraft travels about 150 km (80 NM) in 10 minutes and that volcanic ash can rise to flight levels commonly used by turbine-engine aircraft in half that time, a timely response to volcanic eruptions and volcanic ash in the atmosphere is essential.

It is imperative that information on the volcanic activity is disseminated as soon as possible. In order to assist staff in expediting the process of originating and issuing relevant AIS and MET messages, a series of templates should be available for different stages of the volcanic activity. For the list of ICAO registered volcanoes see the *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds (ICAO Doc 9691)*. Volcanoes name, number and nominal position should be available at the State's International NOTAM office. Volcanic ash exercises (VOLCEX) should be conducted at a frequency determined by the ICAO Region concerned, in order to ensure the smooth implementation and effectiveness of the contingency plan in case of an actual volcanic eruption.

This document has been prepared, and is in line with a proposal for amendment to the *Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444)* paragraph 15.8 *Procedures for an ATC unit when a volcanic ash cloud is reported or forecast* — which is expected to become applicable in November 2014.

General considerations during the development of an ATM contingency plan for volcanic ash and anticipated flight crew issues when encountering volcanic ash are provided in Appendices A and B respectively.

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**ATTACHMENT A**

# INTERNATIONAL CIVIL AVIATION ORGANIZATION

# MID REGION ATM VOLCANIC ASH CONTINGENCY PLAN

**Draft Version 1.0: December 2013**

**MID REGION AIR TRAFFIC MANAGEMENT VOLCANIC ASH CONTINGENCY PLAN**

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# 1. TERMINOLOGY

## 1.1. Areas of Contamination

1.1.1. Information on areas of observed and/or forecast volcanic ash in the atmosphere is provided by means of appropriate MET messages in accordance with Annex 3 – *Meteorological Service for International Air Navigation*.[1]

## 1.2. Danger Areas

1.2.1. If it is considered that the volcanic event could pose a hazard to aviation, a danger area[2] may be declared by NOTAM. However, this option should only be applied over and in the proximity of the volcanic source. Normally, clearances will not be issued through the danger area unless explicitly requested by the flight crew. In this context it should be noted that the final responsibility for aircraft safety rests with the flight crew. Therefore, the final decision regarding route, whether it will be to avoid or proceed through an area of volcanic activity, is the flight crew's responsibility. Wherever this document discusses the possible establishment of danger areas, States are not prevented from establishing restricted or prohibited areas over the sovereign territory of the State if considered necessary by the State concerned.

1.2.2. Although it is the prerogative of the Provider State to promulgate a danger area in airspace over the high seas, it should be recognized that restrictions to the freedom of flight over the high seas cannot be imposed in accordance with the United Nations Convention on the Law of the Sea (Montego Bay 1982).

## 1.3. Phases of An Event

1.3.1. The response to a volcanic event that affects air traffic has been divided into four distinct phases in this document: Pre-Eruption, Start of Eruption, On-going Eruption and Recovery Phases as follows:

**Pre-Eruption Phase (**when applicable)**:** The initial response, "raising the alert", commences when a volcanic eruption is expected.

Appropriate AIS and MET messages may be issued in accordance with Annex 15 and Annex 3 respectively, and disseminated to affected aircraft in flight by the most expeditious means. It should be noted that, sometimes volcanoes erupt unexpectedly without any alert being raised; hence the pre-eruption phase may be omitted.

**Start of Eruption Phase** (when applicable)**:** The start of eruption phase commences at the outbreak of the volcanic eruption and entrance of volcanic ash into the atmosphere and mainly pertains to aircraft in flight. Appropriate AIS and MET messages may be issued as appropriate in accordance with Annex 15 and Annex 3 respectively, and a danger area may be declared by NOTAM. Normally, clearances will not be issued through the danger area unless explicitly requested by the flight crew.

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[1] Principally this will include volcanic ash advisory messages (issued by volcanic ash advisory centres) and SIGMET information on volcanic ash (issued by meteorological watch offices).

[2] Depending on the State's regulation, the area may be established as a "danger area", "restricted area "or "prohibited area". Over the high seas only "danger area" may be established.

**On-Going Eruption Phase:** The on-going eruption phase commences with the issuance of the first Volcanic Ash Advisory (VAA) containing information on the extent and movement of the volcanic ash cloud following completion of the previous reactive responses. Appropriate AIS and MET messages may be issued as appropriate in accordance with Annex 15 and Annex 3, respectively.

**Recovery Phase:** The recovery phase commences with the issuance of the first VAA containing a statement that "NO VA EXP" (i.e. "no volcanic ash expected") which normally occurs when it is determined that no volcanic ash is expected in the atmosphere and the volcanic activity has reverted to its pre-eruption state.

*Note: These descriptions are amplified in Chapter 3 of this document.*

1.3.2. Although the four distinct phases herein describe actions to be undertaken during an actual volcanic event, they are based on a theoretical scenario. Actual eruptions may not always be distinct with respect to ATM actions to be undertaken. Similarly, an eruption may occur without any pre-eruptive activity, or may cease and restart more than once. Hence, the first observation may be the presence of an ash cloud which is already some distance away from the volcano. It is essential that the contingency planning prepares the ATM system for an appropriate response depending on the actual conditions. Therefore, the "Pre-Eruption Phase" and "Start of Eruption Phase" described in this document are annotated "when applicable" in order to provide for flexibility in the application of the contingency plan in those parts of the world with insufficient volcano monitoring and alerting.

1.3.3. Flight crews are required to report observations of volcanic activity by means of a special air-report (Special AIREP). Arrangements should be put in place to ensure that such information is transferred without delay to the appropriate aeronautical institutions responsible for subsequent action. The communication and dissemination of pilot reports on volcanic activity is described in Appendix C.

## 2. PRE-ERUPTION PHASE

### 2.1. General

2.1.1. Where flight operations are planned in areas that are susceptible to volcanic eruptions, ATS units may expect to receive from flight crews the ICAO Volcanic Activity Report (VAR) form (published in the *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444, Appendix 1).

2.1.2. The focus of this phase is to gain early recognition of volcanic events. This phase is frequently characterised by a very limited availability of information on the potential extent and severity of the impending eruption. The priority is to ensure the continued safety of aircraft in flight; this requires promulgating information as a matter of urgency. Notwithstanding the potentially limited extent of information available, the pre-eruption phase actions described below should be carried out for every expected eruption.

2.1.3. The initial response, "raising the alert", commences when a volcanic eruption is expected. Initial awareness of the event may be by means of a Special AIREP/VAR and/or from information provided by meteorological or volcano-logical agencies. Arrangements in each State between designated volcano observatories, meteorological and air traffic management agencies

should ensure that alerting information is provided expeditiously by the most appropriate means to provide continued safety of flight.

2.1.4. Emphasis is placed on raising awareness of the hazard and to protect aircraft in flight. The actions are based on well-prepared, well-exercised contingency plans and standard operating procedures. Aircraft are expected to clear or avoid the volcanic ash affected area based on standard operating procedures.

## 2.2. Originating ACC Actions *(eruption expected in its own flight information region)*

2.2.1. In the event of significant pre-eruption volcanic activity, which could pose a hazard to aviation, an area control centre (ACC)[3], on receiving information of such an occurrence, should carry out the following:

a) ensure that appropriate AIS messages are originated in accordance with Annex 15. These must provide as precise information as is available regarding the activity of the volcano. It is imperative that this information is issued by the international NOTAM office and disseminated as soon as possible in accordance with the provisions of Annex 15;

b) when so required by the State, define an initial, precautionary danger area in accordance with established procedures. The size of the danger area should encompass a volume of airspace in accordance with the information available, aiming to avoid undue disruption of flight operations;

   i. if no such procedures have been established, the danger area should be defined as a circle with a radius of xxx km (xx NM)[4]. The circle should be centred on the estimated or known location of the volcanic activity;

   ii. although ATC would not normally initiate a clearance through a danger area, it will inform aircraft about the potential hazard and continue to provide normal services. It is the responsibility of the pilot-in-command to determine the safest course of action.

c) advise the associated MET service provider(s) in accordance with national/regional arrangements unless the initial notification originated from such provider(s), who will then inform the appropriate air traffic flow management (ATFM) units;

d) alert flights already within the area concerned and offer assistance to enable aircraft to exit the area in the most expeditious and appropriate manner. Flight crews should be provided with all necessary information required to make safe and efficient decisions in dealing with the hazards in the defined area. Aircraft that are close to the area should be offered assistance to remain clear of the area. Flights which would be expected to penetrate the area should be re-cleared onto routes that will keep them clear;

[3] Where the term "ACC" is used throughout this document, it is intended to also include all ATS facilities.
[4] The size of the area is to be agreed in the region concerned and should be based on local knowledge as regards the volcano concerned.

e) immediately notify other affected ACCs of the event and the location and dimensions of the area concerned. The ACC should also negotiate any re-routings necessary for flights already coordinated but still within adjacent Flight Information Regions (FIRs) and provide any information on potential implications on traffic flow and its capability to handle the expected traffic. It is also expected that adjacent ACCs will be asked to reroute flights not yet coordinated to keep them clear of the area. It should be noted that flight crews may make the decision not to completely avoid the area based on, for example, visual observations; and

f) implement flow management measures if necessary to maintain the required level of safety.

*Note 1. — In order to assist staff in expediting the process of composing the AIS messages, a series of templates should be available for this stage of the volcanic activity.*

2.2.2. In addition to sending the relevant AIS messages to the normal distribution list, it will be sent to the relevant meteorological facilities.

### 2.3. Adjacent ACC Actions

2.3.1. During the pre-eruption phase, ATC will not normally initiate clearances through a danger area; however, it will inform aircraft about the potential hazard and continue to provide normal services. Adjacent ACCs should take the following action to assist:

a) when advised, re-clear flights to which services are being provided and which will be affected by the area; and

b) unless otherwise instructed, continue normal operations and:

i. if one or more routes are affected by the area, suggest re-routings to the affected aircraft onto routes clear of the area; and

ii. maintain awareness of the affected area.

### 2.4. ATFM Unit Actions

2.4.1. The ATFM unit and the associated Volcanic Ash Advisory Centre (VAAC) will determine how their initial communications will take place on the basis of bilateral agreements. Upon reception of preliminary information on volcanic activity from the lead VAAC, the ATFM unit should initiate actions in accordance with its procedures to ensure exchange of information in order to support CDM between air navigation service providers (ANSPs), Meteorological Watch Offices (MWOs), VAACs and aircraft operators concerned.

## 3. START OF ERUPTION PHASE

### 3.1. General

3.1.1. This phase commences at the outbreak of a volcanic eruption, with volcanic ash being ejected into the atmosphere. The focus of the processes in this phase is to protect aircraft in

flight and at aerodromes from the hazards of the eruption through the collection and use of relevant information.

3.1.2. In addition to relevant actions described under the pre-eruption phase, major activities of the start of eruption phase such as the issuance of relevant AIS and MET messages in accordance with Annex 15 and Annex 3, respectively and provision of information and assistance to airborne traffic. Danger areas will be declared via NOTAM, as appropriate. This phase will last until such time as the on-going eruption phase can be activated.

**3.2. Originating ACC Actions** (eruption in its own FIR)

3.2.1. The ACC providing services in the FIR within which the volcanic eruption takes place should inform flights about the existence, extent and forecast movement of volcanic ash and provide information useful for the safe and efficient conduct of flights.

3.2.2. If necessary, rerouting of traffic should commence immediately or may be in progress if the alerting time has been sufficient to facilitate activation of the pre-eruption phase. The ACC should assist in rerouting aircraft around the danger area as expeditiously as possible. Adjacent ACCs should also take the danger area into account and give similar assistance to aircraft as early as possible.

3.2.3. During the start of eruption phase, although ATC will not normally initiate a clearance through a danger area, it will inform aircraft about the hazard and will continue to provide normal services. It is expected that aircraft will attempt to remain clear of the danger area. However, it is the responsibility of the pilot-in-command to determine the safest course of action.

3.2.4. During the start of eruption phase the ACC should:

a) ensure that a NOTAM is originated to define a danger area delineated cautiously so as to encompass a volume of airspace in accordance with the limited information available. In determining the area, information on upper winds should be taken into account, if available. The purpose is to ensure safety of flight in the absence of any prediction from a competent authority of the extent of contamination;

b) maintain close liaison with MET facilities, who should issue appropriate MET messages in accordance with Annex 3;

c) devise and update ATFM measures when necessary to ensure safety of flight operations, based on these forecasts and in cooperation with aircraft operators and the adjacent ACCs using the CDM process;

d) ensure that reported differences between published information and observations (pilot reports, airborne measurements, etc.) are forwarded as soon as possible to the appropriate authorities to ensure its dissemination to all concerned;

e) begin planning for the on-going eruption phase in conjunction with the aircraft operators, the appropriate ATFM unit and ACCs concerned; and

f) issue appropriate AIS messages in accordance with Annex 15. Significant reductions in intensity of volcanic activity should take place during this phase and the airspace no longer is contaminated by volcanic ash. Otherwise, begin CDM planning for the on-going eruption phase in conjunction with aircraft operators, the appropriate ATFM unit and the affected ACCs.

### 3.3. Adjacent ACC Actions

3.3.1. During the start of eruption phase, adjacent ACCs should take the following actions:

a) maintain a close liaison with the appropriate ATFM unit and the originating ACC to design, implement and keep up to date ATFM measures which will enable aircraft to ensure safety of flight operations;

b) the adjacent ACC, in cooperation with the originating ACC and aircraft operators, should impose as required additional tactical measures to those issued by the appropriate ATFM unit;

c) maintain awareness of the affected area; and

e) begin planning for the on-going eruption phase in conjunction with the aircraft operators, the appropriate ATFM unit and ACCs concerned.

### 3.4. ATFM Unit Actions

3.4.1. During the start of eruption phase, depending on the impact and/or extent of the volcanic ash, the appropriate ATFM unit should organise the exchange of latest information on the developments with the associated VAACs, ANSPs, MWOs and operators concerned in order to support CDM.

## 4. ON-GOING ERUPTION PHASE

**4.1.** The on-going eruption phase commences with the issuance of the first volcanic ash advisory (VAA) by the lead VAAC which contains information on the extent and movement of the volcanic ash cloud in accordance with Annex 3 provisions.

*Note 2 - Volcanic ash advisory information in graphical format (VAG) may also be issued by the VAAC, containing the same information as its text-based VAA equivalent.*

**4.2.** The VAA/VAG should be used to:

a) prepare appropriate AIS and MET messages in accordance with Annex 15 and Annex 3 provisions, respectively; and

b) plan and apply appropriate ATFM measures.

**4.3.** The volcanic contamination may affect any combination of airspace; therefore, it is not possible to prescribe measures to be taken for all situations. Furthermore, it is not possible to detail the actions to be taken by any particular ACC. The following guidance therefore may

prove useful during the on-going eruption phase but should not be considered mandatory or exhaustive:

a) ACCs affected by the movement of the volcanic ash should ensure that appropriate AIS messages are originated in accordance with Annex 15. ACCs concerned and the appropriate ATFM unit should continue to publish details on measures taken to ensure dissemination to all concerned;

b) depending on the impact and/or extent of the volcanic ash, the appropriate ATFM unit may take the initiative to organize teleconferences to exchange the latest information on the developments, in order to support CDM, with the VAACs, ANSPs and MWOs and operators concerned;

c) ACCs and ATFM units should be aware that for the purposes of flight planning, operators could treat the horizontal and vertical extent of the volcanic ash contaminated area to be over-flown as if it were mountainous terrain; and

d) any reported differences between published information and observations (pilot reports, airborne measurements, etc.) should be forwarded as soon as possible to the appropriate authorities (see Appendix C).

## 5. RECOVERY PHASE

**5.1.** The recovery phase commences with the issuance of the first VAA/VAG containing a statement that "NO VA EXP" (i.e. "no volcanic ash expected") — which normally occurs when it is determined that the volcanic activity has reverted to its pre-eruption state and the airspace is no longer affected by volcanic ash contamination. Consequently, appropriate AIS messages should be issued in accordance with Annex 15.

**5.2.** ACCs and ATFM units should revert to normal operations as soon as practical.

## 6. AIR TRAFFIC CONTROL PROCEDURES

**6.1.** If a volcanic ash cloud is reported or forecasted in the FIR for which the ATS unit is responsible, the following actions should be taken:

a) relay all pertinent information immediately to flight crews whose aircraft could be affected to ensure that they are aware of the ash cloud's position and levels affected;

b) request the intention of the flight crew and endeavour to accommodate requests for re-routing or level changes;

c) suggest appropriate re-routing to the flight crew to avoid an area of reported or forecast ash clouds; and

d) request a special air-report when the route of flight takes the aircraft into or near the forecast ash cloud and provide such special air-report to the appropriate agencies.

*Note 3.— The recommended escape manoeuvre for an aircraft which has encountered an ash cloud is to reverse its course and begin a descent if terrain permits.*

*Note 4. — The final authority as to the disposition of the aircraft, whether to avoid or proceed through a reported or forecast volcanic ash cloud, rests with the flight crew.*

**6.2.** When advised by the flight crew that the aircraft has inadvertently entered a volcanic ash cloud, the ATS unit should:

a) take such action applicable to an aircraft in an emergency situation; and

b) do not initiate modifications of route or level assigned unless requested by the flight crew or necessitated by airspace requirements or traffic conditions.

*Note 5.— General procedures to be applied when a pilot reports an emergency situation are contained in Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444, *Chapter 15, 15.1.1 and 15.1.2).*

*Note 6.— Guidance material concerning the effect of volcanic ash and the impact of volcanic ash on aviation operational and support services is provided in Chapters 4 and 5 of the Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds (Doc 9691).*

## 7. ATFM PROCEDURES

**7.1.** Depending on the impact and/or extent of the volcanic ash and in order to support CDM, the appropriate ATFM unit should organize the exchange of the latest information on the developments with the associated VAACs, ANSPs, MWOs and operators concerned.

**7.2.** The ATFM unit will apply ATFM measures on request of the ANSPs concerned. The measures should be reviewed and updated in accordance with updated information. Operators should also be advised to maintain watch for relevant AIS and MET messages for the area.

# APPENDIX A

## GENERAL CONSIDERATIONS DURING THE DEVELOPMENT OF AN ATM CONTINGENCY PLAN FOR VOLCANIC ASH

1. In a contingency plan relating to volcanic ash contamination, certain steps need to be taken to provide a coordinated and controlled response for dealing with an event of this nature. Responsibilities should be clearly defined to ATS personnel. The plan should also identify the officials who need to be contacted, the type of messages that are to be created, the proper distribution of the messages and how to conduct business.

2. ATS personnel need to be trained and be made aware of the potentially hazardous effects if an aircraft encounters a volcanic ash cloud. Some particular aspects include:

a) volcanic ash contamination may extend for hundreds, or even thousands of miles horizontally and reach the stratosphere vertically;

b) volcanic ash may block the pitot-static system of an aircraft, resulting in unreliable airspeed indications;

c) braking conditions at aerodromes where volcanic ash has recently been deposited on the runway will affect the braking ability of the aircraft. This is more pronounced on runways contaminated with wet ash. Flight crews and ATS personnel should be aware of the consequences of volcanic ash being ingested into the engines during landing and taxiing. For departure, it is recommended that pilots avoid operating in visible airborne ash; instead they should allow sufficient time for the particles to settle before initiating a take-off roll, in order to avoid ingestion of ash particles into the engine. In addition, the movement area to be used should be carefully swept before any engine is started;

d) volcanic ash may result in the failure or power loss of one or all engines of an aircraft; and

e) aerodromes with volcanic ash deposition may be declared unsafe for flight operations. This may have consequences for the ATM system.

4. The area control centre (ACC) in conjunction with ATFM units serves as the critical communication link between affected aircraft in flight and the providers of information during a volcanic eruption. During episodes of volcanic ash contamination within the FIR, the ACC has two major communication roles. First and most important is its ability to communicate directly with aircraft enroute which may encounter the volcanic ash. Based on the information provided in SIGMET information for volcanic ash and volcanic ash advisories (VAAs), and working with MWOs, ATS personnel should be able to advise the flight crew of which flight levels are affected by the volcanic ash and the forecast movement of the contamination. Through various communication means, ATS units have the capability to coordinate with the flight crew alternative routes which would keep the aircraft away from the volcanic ash cloud.

5. Similarly, through the origination of a NOTAM/ASHTAM for volcanic activity the ACC can disseminate information on the status and activity of a volcano even for pre-eruption increases in volcanic activity. NOTAM/ASHTAM and SIGMET, together with AIREPs, are critical to dispatchers for flight planning purposes. Operators need as much advance notification as possible on the status of a volcano for strategic planning of flights and the safety of the flying

public. Dispatchers need to be in communication with flight crew enroute so that a coordinated decision can be made between the flight crew, the dispatcher and ATS regarding alternative routes that are available. The ACC should advise the ATFM unit concerning the availability of alternative routes. However, it cannot be presumed that an aircraft which is projected to encounter ash will be provided with the most desirable route to avoid the contamination. Other considerations have to be taken into account such as existing traffic levels on other routes and the amount of fuel reserve available for flights which may have to be diverted to other routes to allow for the affected aircraft to divert.

6. The NOTAM/ASHTAM for volcanic activity provides information on the status of activity of a volcano when a change in its activity is, or is expected to be, of operational significance. They are originated by the ACC and issued through the respective international NOTAM office based on the information received from any one of the observing sources and/or advisory information provided by the associated VAAC. In addition to providing the status of activity of a volcano, the NOTAM/ASHTAM also provides information on the location, extent and movement of the ash contamination and the air routes and flight levels affected. NOTAM can also be used to limit access to the airspace affected by the volcanic ash. Complete guidance on the issuance of NOTAM and ASHTAM is provided in Annex 15 — *Aeronautical Information Services*. Included in Annex 15 is a volcano level of activity colour code chart. The colour code chart alert may be used to provide information on the status of the volcano, with "red" being the most severe, i.e. volcanic eruption in progress with an ash column/cloud reported above flight level 250, and "green" at the other extreme being volcanic activity considered to have ceased and volcano reverted to its normal pre-eruption state. It is very important that NOTAM for volcanic ash be cancelled and ASHTAM be updated as soon as the volcano has reverted to its normal pre-eruption status, no further eruptions are expected by volcanologists and no volcanic ash is detectable or reported within the FIR concerned.

7. It is essential that the procedures to be followed by ATS personnel during a volcanic eruption, as well as supporting services such as MET, AIS and ATFM, should be translated into local staff instructions (adjusted as necessary to take account of local circumstances). It is also essential that such local staff instructions form part of the basic training for all ATS, AIS, ATFM and MET personnel whose jobs would require them to take action in accordance with the procedures. Background information to assist the ACC or Flight Information Centre (FIC) in maintaining an awareness of the status of activity of volcanoes in their FIR(s) is provided in the monthly Scientific Event Alert Network Bulletin published by the United States Smithsonian Institution and sent free of charge to ACCs/FICs requesting it.

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# APPENDIX B

## ANTICIPATED FLIGHT CREW ISSUES WHEN ENCOUNTERING VOLCANIC ASH

1. ATS personnel should be aware that flight crews will be immediately dealing with some or all of the following issues when they encounter volcanic ash:

a) smoke or dust appearing in the cockpit which may prompt the flight crew to don oxygen masks (could interfere with the clarity of voice communications);

b) acrid odour similar to electrical smoke;

c) multiple engine malfunctions, such as stalls, increasing exhaust gas temperature (EGT), torching, flameout, and thrust loss causing an immediate departure from assigned altitude;

d) on engine restart attempts, engines may accelerate to idle very slowly, especially at high altitudes (could result in inability to maintain altitude or Mach number);

e) at night, St. Elmo's fire/static discharges may be observed around the windshield, accompanied by a bright orange glow in the engine inlet(s);

f) possible loss of visibility due to cockpit windows becoming cracked or discoloured, due to the sandblast effect of the ash;

g) because of the abrasive effects of volcanic ash on windshields and landing lights, visibility for approach and landing may be markedly reduced. Forward visibility may be limited to that which is available through the side windows; and/or

h) sharp distinct shadows cast by landing lights as compared to the diffused shadows observed in clouds (this affects visual perception of objects outside the aircraft).

2. Simultaneously, ATS personnel can expect flight crews to be executing contingency procedures such as the following:

a) if possible, the flight crew may immediately reduce thrust to idle;

b) exit volcanic ash cloud as quickly as possible. The shortest distance/time out of the ash may require an immediate, descend and/or 180 degrees turn (if terrains permit);

c) don flight crew oxygen masks at 100 per cent (if required);

d) monitor airspeed and pitch attitude. If unreliable airspeed is suspected, or a complete loss of airspeed indication occurs (volcanic ash may block the pitot system), the flight crew will establish the appropriate pitch attitude;

e) land at the nearest suitable aerodrome; and

f) upon landing, thrust reversers may be used as lightly as feasible.

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# APPENDIX C

# COMMUNICATION AND DISSEMINATION OF PILOT REPORTS OF VOLCANIC ACTIVITY

## 1. INTRODUCTION

1.1. ICAO Annex 3-*Meteorological Service for International Air Navigation* (paragraph 5.5, g and h) prescribes that volcanic ash clouds, volcanic eruptions and pre-eruption volcanic activity, when observed, shall be reported by all aircraft. The ICAO *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444) contain detailed provisions on this special air report requirement in paragraphs 4.12.3 and 4.12.5, and the Volcanic Activity Report form in Appendix 1.

1.2. Experience has shown that reporting and sharing of information on volcanic ash encounters in accordance with the above mentioned provisions (in-flight and post-flight) varies across the world. The efficiency and quality of reporting currently depends heavily on regional characteristics and the level of regional integration. A high level of global harmonization is essential to achieve the desired level of implementation and consistency of the information.

## 2. PURPOSES OF VOLCANIC ASH REPORTING AND DATA COLLECTION

2.1. The main purposes for volcanic ash reporting and data collection are to:

a) locate the volcanic hazards;
b) notify immediately other aircraft (in-flight) about the hazard;
c) notify other interested parties: ANSPs (ATC, AIS, ATFM), VAACs, MWO, etc to ensure the consistent production of appropriate information and warning products in accordance with existing provisions; and
d) analyse collected reports from the post-flight phase in order to:
   - identify areas of concern;
   - validate and improve volcanic ash forecasts;
   - improve existing procedures;
   - assist in defining better airworthiness requirements; and
   - share lessons learned, etc.

## 3. PHASE OF OPERATIONS

3.1. The roles and responsibilities of the participants in the collection, exchange and dissemination of the volcanic information are distinctly different in two distinct phases:

a) in-flight; and
b) post-flight.

3.2. The following section analyses these separately.

## 4. PARTICIPANTS IN THE REPORTING PROCESS, THEIR ROLES AND RESPONSIBILITIES

4.1. Identification of the participants as well as their roles and responsibilities in general, but specifically during the two different phases of operations, is an important element in improving collection, exchange and dissemination of volcanic information. The number of participants and their roles and responsibilities depends on the phase of operations (in-flight, post-flight), their position in the information chain within one of these two phases and national/regional arrangements. One of the main issues regarding participants' roles and

responsibilities is that each of them is, at one time or another, both a data/information provider and user of the information.

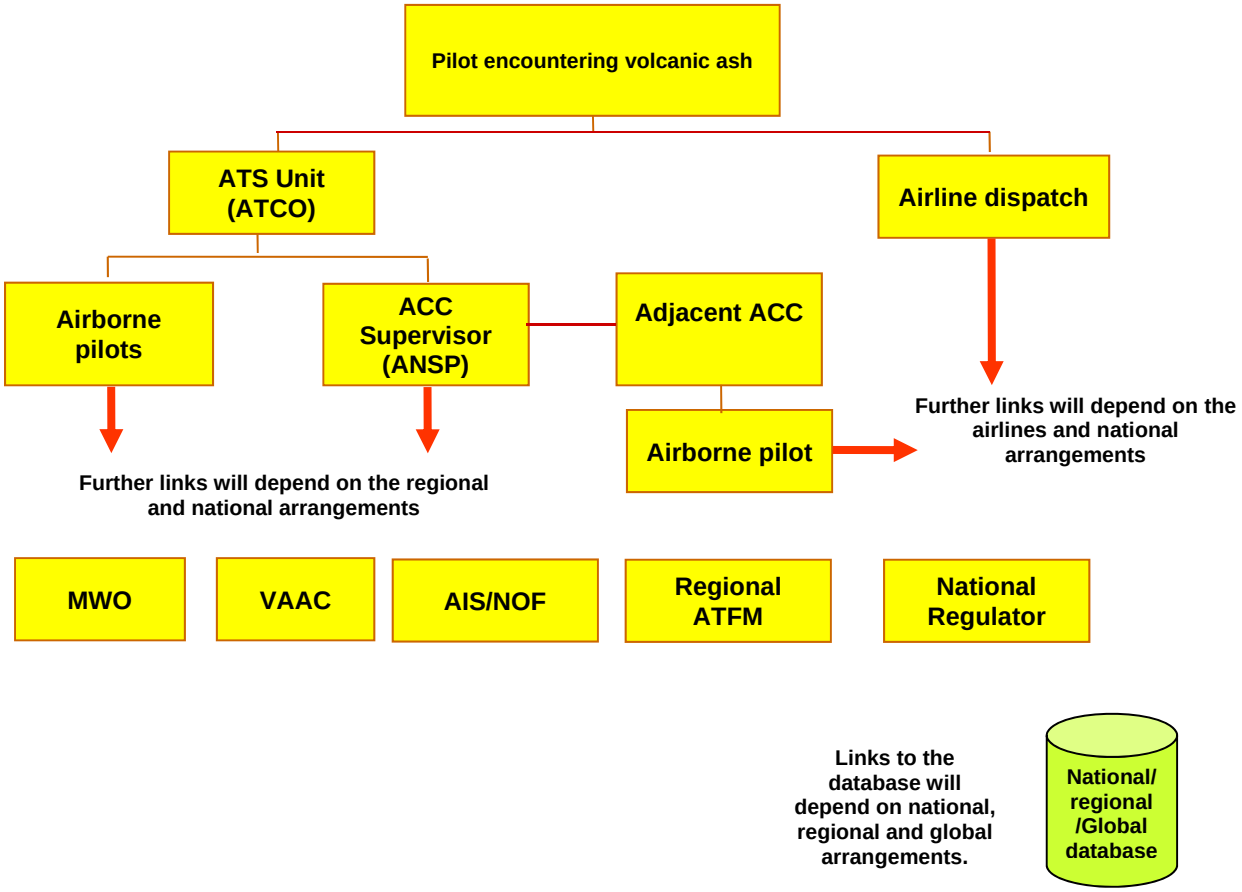
4.2. *In-Flight Phase*

4.2.1 Participants, Roles & Responsibilities:

| Participants | Roles & Responsibilities |
|---|---|
| Pilots, civil and/or military, observing and/or encountering volcanic activity | To provide as much detailed information as possible about the type, position, colour, smell, dimensions of the volcanic contamination, level and time of the observation and forward VAR Part I immediately to the ATS unit with which the pilot is in radiotelephony (R/T) communication.<br>Record the information required for VAR Part II on the appropriate form as soon as possible after the observation or encounter and file the report via data link, if available. |
| ATS unit receiving the information from the pilot encountering volcanic event | To ensure that information received by an air traffic controller from the pilot has been copied, clarified (if necessary), and disseminated to other pilots as well as to the ACC Supervisor. In addition, air traffic controllers could ask other pilots flying within the same area if they have observed any volcanic activity. |
| ATS unit/ACC Supervisor (if applicable) or other Air Navigation Service Provider responsible person | To use all means of communication and available forms to ensure that the information received from the air traffic controller has been:<br>- passed on to the associated Meteorological organizations in accordance with national/regional arrangements;<br>- fully and immediately disseminated across the organization, in particular to adjacent sectors and the associated NOTAM Office (NOF);<br>- passed on to the neighbouring sectors and ACCs (if necessary);<br>- passed on to the regional ATFM centre if existing (e.g. CFMU in Europe);<br>- passed on to the national/regional authority responsible for the handling of contingency situations. |
| Neighbouring ANSPs (ACCs) | To ensure that information is provided to flight crews flying towards the area affected by the volcanic contamination; disseminated across the organization and the system prepared to cope with the possible changes of the traffic flows; and that the information is provided to the national authority responsible for the handling of contingency situations and passed on to the NOF and MWO as required. |
| MET Watch Office | To use the information originated by flight crews and forwarded by the ATS unit, in accordance with Annex 3. |
| VAAC | To use the information originated by flight crews, MWOs and other competent sources in accordance with Annex 3 |
| AIS / NOF | To publish appropriate AIS messages in accordance with Annex 15 |
| ATFM unit or centre (if existing) | To ensure that information received is stored and made available for information to all partners in its area of responsibility (ANSPs, airlines, VAAC, MET etc.).<br>As part of the daily activity, coordinate ATFM measures with ACCs concerned. |

4.2.2 *In-flight reporting – Sample Flow Chart of the volcanic ash information*

4.2.2.1 The chart below is a graphical representation of a possible path of the in-flight volcanic ash information and may differ between regions depending on regional arrangements. It also gives the position of the volcanic ash participants in the reporting chain. The flow chart is not exhaustive and the path of the information can be extended and new participants could be added depending of the national and regional requirements:




4.3 *Post-Flight Operations Roles & Responsibilities and order of reporting*

| Participants | Roles & Responsibilities |
|---|---|
| Civil and/or military pilots/airlines having observed or encountered an eruption or volcanic contamination | To file the volcanic ash report with as much detailed information as possible about the volcanic activity and/or encounter (position, colour, smell, dimensions, FL, time of observation, impact on the flight, etc.). Ensure that the VAR is filed and transmitted to the relevant recipients as soon as possible after landing (if not filed via data link already during the flight). Make an entry into the Aircraft Maintenance Log (AML) in case of an actual or suspected encounter with volcanic contamination. |
| ANSP | To provide a summary report of effects of the volcanic activity that affected its operations at least once per day to the national authority with as much detailed information as possible about the number of encounters, impact on air traffic management, etc.). |
| AOC Maintenance - Post flight Inspection | To report about the observation of the aircraft surfaces, engine, etc., and to provide the information to the national, regional or global central data repository, where applicable. |

| | |
|---|---|
| Investigation authority | All aeronautical service providers (including operators, ANSPs, airports, etc.) shall investigate the effects of a volcanic activity, analyse the information, search for conclusions, and report the investigation results and relevant information to the national supervisory authority and any central data repository. |
| National Authority | To handle the national central data repository and report to the regional/global central data repository if any.<br>To analyse reports from its aeronautical service providers and take action as appropriate. |
| Regional Central Data Repository | To collect the national data and make them available to interested stakeholders under agreed conditions. |
| MWO | To use the national and regional information coming from national and regional central data repositories. |
| VAAC | To use the information originated by flight crews, and other competent sources to:<br>a) validate its products accordingly and;<br>b) improve the forecast. |
| Global Data Repository (and research institutes - where appropriate) | To analyse the information stored in the regional central data repository and provide the research outcomes for lessons learnt process. |
| Knowledge management (e.g. SKYbrary) | To use the post-flight lessons learnt and disseminate them to interested stakeholders. |
| ICAO | To review/revise ATM volcanic ash contingency plans. |

4.4 *Tools for presenting and sharing the volcanic ash information*

4.4.1 To report, transmit and disseminate the volcanic ash encounter information, different types of tools can be used. The list below is provided to give ideas as to what tools can be used. It could also be split into regulatory and general information tools. At any case, it is not an exhaustive list and can be updated with new elements depending on regional experiences.

a) Radiotelephony and Data link Communications;
b) VAR;
c) NOTAM/ASHTAM;
d) SIGMET;
e) VAA/VAG;
f) Central data repository e.g. CFMU Network Operations Portal (NOP);
g) Centralized web based sites with the regularly updated information and maps – e.g. http://www.eurocontrol.int/
h) Teleconferences;
i) Periodic Bulletins with the set of information defined by the data providers and data users; e.g. Smithsonian Institution Weekly Bulletin; and/or
j) Centralized internet-based sites for the sharing of lessons learnt (Knowledge management – e.g. SKYbrary http://www.skybrary.aero/index.php/Main_Page).

# APPENDIX D

SIGMET and NOTAM EXAMPLES DURING VOLCANIC ASH

**Volcanic Ash (VA) Cloud (CLD) in Kuwait FIR**

WSKW31 OKBK 030900
OKBK SIGMET 1 VALID 030900/031500 OKBK-
OKAC KUWAIT FIR VA CLD OBS AT 0840Z W OF E48 FL180/320 MOV E 45KT NC FCST1500Z VA CLD APRX E OF E4730=

**Cancellation SIGMET as volcanic ash cloud exits Kuwait FIR into Tehran FIR (sooner than expected)**

WSKW31 OKBK 031400
OKBK SIGMET 2 VALID 031400/031500 OKBK-
OKAC KUWAIT FIR CNL SIGMET 1 030900/031500 VA MOV TO OIIX FIR=

**VA CLD in Cairo FIR**

WSEG31 HECA 030900
HECA SIGMET 1 VALID 030900/031500 HECA-
HECC CAIRO FIR VA CLD OBS AT 0840Z N OF LINE N3140 E2510 - N29 E30 W OF LINE N3150 E3359 – N29 E30 FL100/290 MOV SE 35KT NC FCST1500Z VA CLD APRX N OF LINE N3140 E2510 – N2806 E3435=

**Cancellation SIGMET as volcanic ash cloud exits Cairo FIR into Jeddah FIR (sooner than expected)**

WSEG31 HECA 031330
HECA SIGMET 2 VALID 031330/031500 HECA-
HECC CAIRO FIR CNL SIGMET 1 030900/031500 VA MOV TO OEJD FIR=

**Example NOTAM based on SIGMET issued for Cairo FIR**

Q) HECC/QWWXX/IV/NBO/W/100/290/999
A) HECC B) 1311030900 C) 1311031500
E) ATM AND ACFT TAKE NECESSARY ACTION DUE TO VOLCANIC ASH AREA OF HIGH/MEDIUM CONTAMINATION (FROM VOLCANO ETNA 211060, 37.734N 015.004E) AS FOLLOWS:
3400N 2410E – 3140N 2510E – 2900N 3000E – 3150N 3359E – 3330N 3000E – 3400N 2710E – 3400N 2410E
F) FL100 G) FL290

**Special Air-Reports on Volcanic Ash**

Special air-reports on volcanic ash sent to ACCs should then be sent via AFTN to the relevant Meteorological Watch Office (MWO) which is forwarded to the relevant Volcanic Ash Advisory Centre (VAAC) – for MID Region that is VAAC Toulouse.

SPECIAL AIREP → ACC → MWO → VAAC

Pilots should use the special air-reports format on volcanic ash as at Table A4-1 in Appendix 4 of ICAO Annex 3.

- END -