APPENDIX M – DRAFT EUR+NAT Volcanic Ash Contingency Plan

(paragraph 4.5.4 refers)

Text only version ex COG review until 7 Nov 2014

changes based on UK comments incorporated

(final input to EANPG56)

Front Page	to be generated
Table of Content	to be generated
Abbreviations	to be added
Explanation of Terms	to be added

Foreword

10 Volcanic contaminants are a hazard for flight operations with volcanic ash being the most serious one.

20 To mitigate the hazards of volcanic contamination aircraft operators need to obtain information and support from many different sources including Air Traffic Management (ATM[1]). The management of air traffic will be impacted proportionally to the extent and nature of the contamination. The issue cannot be resolved by individual stakeholders in isolation but needs collaborative decision making (CDM) involving all entities concerned.

30 Contingency planning for major service disruptions, such as that caused by volcanic contamination, needs to encompass the whole ATM Community[2] as

[1] ATM is defined in Doc 4444 as „The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions."

[2] ATM Community is defined in Doc 9854 as „The aggregate of organizations, agencies or entities that may participate, collaborate and cooperate in the planning, development, use, regulation, operation and maintenance of the ATM system."

defined in ICAO's ATM Operational Concept (Doc 9854). While general provisions exist for ATM Contingency Planning in Annex 11 and Doc 4444 (PANS-ATM), and some aspects are addressed in Doc 9691 (Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds) and in Doc 9766 (Handbook on the International Airways Volcano Watch – IAVW), ICAO's International Volcanic Ash Task Force (IVATF) developed comprehensive Guidance Material for ATM Volcanic Ash Contingency Planning in the form of a template.

40 This document is based on all of these sources and the needs and experience of the members of the ATM community in the EUR and NAT Regions of ICAO. While it focuses on the provision of ATM related services to airspace users within the frameworks of IAVW and EUR Crisis Management, it also establishes the connection to all relevant interfaces, such as the International Airways Volcano Watch, Meteorological Services, Flight Operations and Aerodromes. Wherever possible, duplication of text from other ICAO and industry documents is avoided by reference to the source.

50 The EUR and NAT Volcanic Ash Contingency Plan (VCCP) is based on the following principles that are rooted in the Standards of various ICAO Annexes. States have the responsibility to establish and supervise the requirements on flight operations and the provision of the necessary services.

- The airspace users have (full and final) responsibility for the safety of flight operations in accordance with their SRA as accepted by their State's authority. This includes the decision about operation in airspace where volcanic contamination is present or forecast (Annexes 6 and 19; Doc 9974).
- The Air Navigation Service Providers act to achieve the objectives of the air traffic services (Annex 11), which are (inter alia) to:
    - prevent collisions between aircraft;
    - expedite and maintain an orderly flow of air traffic;
    - provide advice and information useful for the safe and efficient conduct of flights.

States are furthermore obliged to ensure, inter alia, appropriate Meteorological Services (Annex 3) and Aeronautical Information Services (Annex 15)

55 Further principles of this contingency plan are that a cautious approach in case of limited information is adopted; and responses are scaled proportionally to the prevailing conditions.

When limited information is available, the initial procedures are conservative. With increasing amount of and confidence in the information the constraints on flight operations can be relaxed based on appropriate risk management.

Small eruptions might only need a local response, while significant or major eruptions are likely to trigger national, sub-regional, regional or even inter-regional activities.

The contingency plan aims to ensure the highest level of service possible, to support safe flight operations in adverse conditions.

57 The contingency plan is written to give sufficient background information and guidance to operational personnel, describing the end-to-end processes and information flows and referencing relevant SARPs and Guidance Material.

58 While it is firmly rooted in the ICAO SARPs, the contingency plan is intended to provide the enabling support structure to implement best practices that serve the needs of the ATM Community.

59 Desired developments (e.g. an action plan on arrangements that still need to be implemented) may be listed as an attachment to support the planning of amendments and improvements.

60 The guidelines provided in this document assume that the operators have implemented the ICAO requirements regarding safety management systems. 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).

65 Volcanic ash can also affect the operation of aircraft at aerodromes. Volcanic ash deposition at an aerodrome, even in 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.

DEALING WITH THE HAZARD

70 During an eruption volcanic contamination can reach and exceed the cruising altitudes of turbine-powered aeroplanes within minutes and spread over vast geographical areas within a few days. Encounters with volcanic ash may result in one or more of the following and other problems:

- 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;
- blockage of pitot and static sensors resulting in unreliable airspeed indications and erroneous warnings;
- windscreens rendered partially or completely opaque;
- smoke, dust and/or toxic chemical contamination of cabin air requiring crew use of oxygen masks, thus impacting communications; electronic systems may also be affected;
- erosion of external and internal aircraft components;
- reduced electronic cooling efficiency leading to a wide range of aircraft system failures;
- aircraft need to be manoeuvred in a manner that conflicts with other aircraft;
- deposits of volcanic ash on a runway degrading braking performance, most significantly if the ash is wet; in extreme cases, this can lead to runway closure.

80 In this context it should be noted that some aircraft types or engine technologies are more vulnerable to volcanic contaminants; any specific measures to be applied would therefore need to take into account these differences.

90 Considering that a commercial turbine-engine aircraft travels about 150 km (80 NM) in 10 minutes and that volcanic ash can rise to flight levels commonly used by these aircraft in half that time, a timely response to volcanic eruptions

and volcanic ash in the atmosphere is essential. It is therefore imperative that information on the volcanic activity is disseminated as soon as possible.

95 In order to ensure the smooth implementation and effectiveness of the contingency plan in case of an actual volcanic eruption, volcanic ash exercises (VOLCEX) should be conducted at a frequency determined by the PIRG or its appropriate sub-group.

100 ICAO has set up the International Airways Volcano Watch (IAVW) to provide near-real-time information on the largest possible number of volcanic events that affect aviation. State volcano observatories shall monitor active or potentially active volcanoes and shall provide information to ACCs, MWOs and VAACs. It should be noted that currently not all active or potentially active volcanoes are actually monitored. VAACs detect the existence and extent of discernible volcanic ash in the atmosphere in their area of responsibility and issue advisory information regarding the extent and forecast movement of the volcanic ash cloud.

Special air-reports on volcanic activity (prescribed in ICAO Doc 4444 – PANS-ATM) and the information collected by the IAVW (detailed in ICAO Doc 9766 - IAVW Handbook) in accordance with SARPs of ICAO Annex 3 are elements of the input for the generation of volcanic ash advisories in alphanumeric (VAA) and graphic (VAG) form. VAAs/VAGs are used by

- MWOs to derive SIGMETs
- airspace users for flight planning
- ATS units for contingency planning

The VAACs London and Toulouse may provide supplementary information in addition to the Annex 3 requirements to support the SRA methodology applied by airspace users.

110 The complexity of ATM operations in the EUR and NAT Regions requires well-coordinated and controlled actions to deal effectively and efficiently with volcanic airspace contamination. Success of the contingency plan depends on the establishment of detailed local procedures, such as the assignment of responsibilities for air traffic services personnel within an ACC/FIC, e.g. the manager in charge, supervisors and air traffic controllers (ATCOs).

120 The local procedures 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.

130 The FIC/ACC unit serves during a volcanic eruption as the critical communication link between affected aircraft in flight and the information providers. Commercial operators will coordinate actions with their flight crews en-route and affected air traffic services units. As this all results in increased workload for the ATS personnel involved, the local contingency plan should contain recommendations how this situation should be handled.

140 Due to the density of EUR and NAT traffic permanent capacity and flow management arrangements are in place in some parts of the region. The contingency plan details the (additional) arrangements in case of volcanic contamination.

150 The provisions of Annexes 3 (Meteorological Services) and 15 (AIS) and related documents are the basis of the detailed instructions contained in this contingency plan. Airspace users need as much advance notification as possible on the status of a volcano and/or volcanic airspace contamination and/or volcanic ash deposition at airports for strategic planning and the execution of flights to ensure the safety of the flying public.

160 The contingency plan provides regional guidance on airspace management measures that might be taken by competent authorities (e.g. the establishment and withdrawal of Danger Areas); and the creation and dissemination of NOTAM/ASHTAM and special air-reports on volcanic activity.

170 The contingency plan contains the organisation of the information flow also for the required information according to Annex 3 (SIGMET/VAA/VAG) and supplementary information that supports the planning and execution of flights.

180 It is also essential that the local procedures/instructions form part of the basic training for all ATS, AIS, NOF, ATCFM and MET personnel whose jobs would require them to take action in accordance with the procedures.

ATCOs need to be trained and be made aware of the potential impacts of aircraft encounters with volcanic contamination.

REGIONAL PREPARATION

200 The successful operation of air traffic in case of significant impairment by volcanic contamination depends on well-prepared arrangements and adequate responses. This section lists the most important issues that need to be covered. Attachments to the Contingency Plan contain the current details and arrangements agreed in the respective region.

International Airways Volcano Watch (IAVW)

210 Annex 3, Chapter 3 obliges States to arrange the monitoring of active and potentially active volcanoes by selected State volcano observatories.

215 Doc9766 details the responsibilities of volcano observatories.

220 In areas where volcanoes are not adequately monitored by volcano observatories, remote sensing technologies, such as observation by satellites, and pilot reports serve as the main sources of information about eruptions and volcanic airspace contamination. Annex 3 paragraphs 4.8, 5.5 and 5.9 refer.

222 Flight crews are required to report observations of volcanic activity by means of a special air-report. Arrangements should be put in place to ensure that such information is transferred without delay to the appropriate aeronautical institutions responsible for subsequent action. Instructions for air reporting of volcanic activity and the special air-report of volcanic activity form (Model VAR) can be found in Appendix 1 of Doc 4444 (PANS-ATM).

225 Where special air-reports on volcanic activity (VAR) are necessary to improve the knowledge base of the VAACs, arrangements should be set up between the responsible VAAC and ATS units to ensure that pilots are reminded of their obligation to provide VARs. The communication and dissemination of pilot reports on volcanic activity is described in Appendix A-02.

230 Volcanic Ash Advisory Centres (VAAC) are established in the UK (London VAAC) and in France (Toulouse VAAC) serving the eastern part of the NAT and most of Europe; and in Montreal and Washington for the western part of the NAT; the far eastern part of the EUR Region is served by VAAC Tokyo. Their area of responsibility and cooperation with other VAACs is described in Doc 9766

(Handbook on the IAVW). The VAACs follow a best practices approach agreed among them, that aims to achieve global harmonisation of their services.

240 VAACs should publish information on the products supplied according to the requirements of Annex 3 and supplementary regional information, so that airspace users have a clear understanding of the usefulness and (geographical and other) limitations of these products in order to support their Safety Risk Assessments (SRA) and operational decisions. This information should include the sources used to derive the VAAC products.

250 To keep information about affected airspace as accurate as possible, so that restrictions to flight operations can be limited as much as possible, the VAACs should have arrangements with those States having suitable infrastructure (LIDAR networks, aircraft to provide in-situ measurements, etc) to allow the use of relevant data for the verification of actual contamination (horizontal and vertical extent).

260 VAAC products should be amended as appropriate based on the verification of information on actual contamination.

270 Attachment X1 contains the regional monitoring capabilities and arrangements.

Information Flow

280 Information on areas of observed and/or forecast volcanic contamination shall be disseminated by means of appropriate messages in accordance with Annex 3 – *Meteorological Service for International Air Navigation* and Annex 15 – *Aeronautical Information Services.*

285 The concrete details of all communication channels need to be established in advance and be available in local contingency arrangements. Telephone numbers, e-mail addresses, URLs of websites etc should be kept up-to-date and saved on electronic systems for easy use (e.g. electronic phone book, internet browser bookmarks).

290 Templates for required messages and all relevant information for their completion shall be available locally.

300 Regional arrangements and model templates are available in Attachment X2 (e.g. EVITA, EACCC, teleconference procedures).

Information Control

310 While the availability of required information is crucial for planning and execution of ATM operations and flight operations, recent events have shown that information overload can result from the inappropriate application of communication requirements.

320 The regional arrangements shall ensure availability of the necessary information without duplication. States shall ensure that the collection, creation and provision of information by the appropriate service providers is effective and efficient.

330 States shall ensure that ANSPs and airspace users have clear instructions for their personnel, which supplementary information shall or may be used for the planning and execution of their operations and how to deal with deviations from the planned operating conditions during actual operation.

340 Attachment X3 contains current regional arrangements and agreements for information service provisions.

Airspace Measures

350 The Chicago Convention *reserves each contracting State the right … in the interest of public safety … temporarily to restrict or prohibit flying over the whole or any part of its territory, …*

360 Annexes 11 and 15 define Restricted, Prohibited and Danger Areas and specify requirements for their identification and promulgation. Neither the Convention, nor any of the Annexes provide detailed guidance on the conditions that would necessitate the establishment of such areas, nor on specific procedures for their use. It is however apparent from the SARPs that the use of these areas was not conceived for temporary and dynamic reasons, such as volcanic airspace contamination. By inference of Article 12 of the Convention, over the High Seas

only Danger Areas can be established. This is based on the United Nations Convention on the Law of the Sea (Montego Bay 1982).

370 The competent authority for determining the need for and extent of Danger or Restricted Areas is the one regulating flight operations. If the competent authority is not on duty 24/7, States should implement arrangements to ensure the timely declaration of Danger or Restricted Areas by an appropriate authority according to pre-defined conditions.

380 Whereas Danger Areas traditionally were absolutely avoided by aircraft, current safety management practices might allow the operation of (certain) aircraft in accordance with an appropriate Safety Risk Assessment (SRA). ATM expects aircraft to avoid Danger Areas and would normally not clear aircraft through such areas, unless specifically 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.

390 The International Volcanic Ash Task Force (IVATF) recommended that States should not declare a danger or restricted area in respect of volcanic ash, except over and in proximity to an erupting volcano where considered appropriate.

400 The ATM Volcanic Ash Contingency Plan Template (AVACPT) developed by IVATF provides some general guidance on the establishment of precautionary Danger Areas in the Pre-Eruption Phase and of Danger Areas in the Start of Eruption Phase. The Regional ATM VC Contingency Plan (AVCCP; Chapter 4) and Attachment X4 specify the details agreed for the respective Region or Sub-Region.

Capacity and Flow Management

410 The ATM system shall aim to provide the capacity necessary to satisfy airspace user demand. Annex 11 (paragraph 3.7.5) requires that Air traffic flow management (ATFM) shall be implemented for airspace where air traffic demand at times exceeds, or is expected to exceed, the declared capacity of the air traffic control services concerned.

420 Volcanic airspace contamination might shift large portions of flight operations into adjacent, non-affected areas. Regional arrangements should aim to provide sufficient capacity to safely and efficiently accommodate the revised traffic flow. The regional ATM Volcanic Contamination Contingency Plan (AVCCP) uses therefore the expression "Air Traffic Capacity and Flow Management" (ATCFM).

430 Regional ATCFM units might be the ideal information pools and communication nodes for contingency situations and could be set up to support collaborative decision making (CDM) between ANSPs, VAACs, Meteorological Watch Offices (MWO) and airspace users.

440 Where permanent ATCFM arrangements do not exist or cannot cope with significant volcanic airspace/airport contamination, contingency measures should be developed, agreed between the ANSPs and the airspace users and published in Attachment X5 together with the permanent arrangements.

Crisis Management Arrangements

450 The nature of extraordinary contingency situations might require decision-making on a higher level than that of normal operations and beyond ATM. Arrangements should be in place to share information with national and regional disaster management services that may have been implemented to address "the whole picture". Potential applications are to assure the delivery of essential goods through alternative means of transport in case of prolonged non-availability of airspace or airports, or the evacuation of humans from hazardous areas.

460 Regional and/or sub-regional crisis management arrangements are detailed in Attachment X6.

Education, Training and Exercises

470 It is important to educate and train all personnel that are involved in volcanic contamination contingency operations, so that they have the necessary understanding not only of their own area of responsibility, but also of the problems and needs of their partners within the ATM Community. The quick and correct response of people in important functions shall be supported by

appropriate means, such as Quick Reference Instructions, Check Lists and Templates.

480 System-wide response to volcanic contamination events shall be tested by the conduct of regular exercises. Doc 9766 contains *Guidance for conducting volcanic ash exercises in ICAO regions* in Appendix F. The analysis of exercises and actual events should be used to develop improvements to the regional and global volcanic contamination procedures. The collection, documentation and analysis of relevant data on system performance should be facilitated by appropriate arrangements and procedures.

490 Attachment X7 contains information on the regional and/or sub-regional volcanic contamination exercise arrangements.

Regulations, Means of Compliance and guidance material

500 States need to determine which Regulations and Directives they need to implement to ensure compliance with the global and regional requirements.

510 Attachment X8 contains references to relevant regional (non-ICAO) regulations and guidance material.

Extra-regional airspace users

520 Regional contingency planning should be aware of and accommodate the needs of extra-regional airspace users as far as practical.

THE ATM VOLCANIC ASH CONTINGENCY PLAN

PHASES OF AN EVENT

600 The response to a volcanic event that impacts air traffic has been divided into four distinct phases in this document — a Pre-Eruption Phase, a Start of Eruption Phase, an On-going Eruption Phase, and a Recovery Phase — as follows:

a) PRE-ERUPTION PHASE: The initial response, "raising the alert", commences when a volcanic eruption is expected. It should be noted that sometimes volcanoes erupt unexpectedly without any alert being raised; hence the pre-eruption phase may be omitted.

b) START OF ERUPTION PHASE: The start of eruption phase commences when information about the outbreak of a volcanic eruption with volcanic airspace Ash becomes available.

c) ON-GOING ERUPTION PHASE: The on-going eruption phase commences with the issuance of the first complete volcanic ash advisory (VAA) containing information on the extent and forecast movement of the volcanic ash cloud.

d) RECOVERY PHASE: The recovery phase commences with the issuance of the first VAA containing the statement "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 non-eruptive state.

605 The Handbook on the International Airways Volcano Watch (Doc 9766) does not differentiate consistently between these different phases, which are functionally quite different. The regional VA Contingency Plan lists the appropriate actions in the respective sections.

610 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.

PRE-ERUPTION PHASE

General

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

635 If volcano observatories, VAACs or MWOs suspect volcanic activity in an area, they should request the appropriate ATS unit(s) to solicit VARs from suitable aircraft (route and altitude) at appropriate time intervals (e.g. every half hour).

640 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, and there is therefore a requirement to promulgate 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.

650 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, volcanological or other 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 early warning to aircraft in flight.

655 Volcano observatories should assess the information on the state of the volcano showing pre-eruptive activity and provide notification to their associated ACC, MWO and VAAC in form of the *Volcano Observatory Notice for Aviation* (VONA), as described in Appendix E of Doc 9766 (IAVW Handbook); Annex 3, Appendix 2 para 4.1 refers.

656 VAACs should consider, whether the information warrants the issuance of an initial Volcanic Ash Advisory (VAA).

660 Emphasis is placed on raising awareness of the potential hazard and to protect aircraft in flight. The actions shall be based on well-prepared, well-exercised contingency plans and standard operating procedures.

665 Flight crews are expected to consider the potential effect of an eruption based on the operator's Safety Risk Assessment and standard operating procedures or to avoid the affected area.

Originating ACC/FIC Actions (eruption expected in its own FIR)

670 In the event of significant pre-eruption volcanic activity (Aviation Volcano Colour Code: ORANGE or RED), which could pose a hazard to aviation, an area control centre (ACC) or flight information centre (FIC) when appropriate, 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;

1) if no such procedures have been established, the danger area should be defined as a circle with a radius of 110 km (60 NM). The circle should be centred on the estimated or known location of the volcanic activity; in case of wind speeds exceeding 30 kts the danger area should be extended downwind by maximum half an hour of wind influence;

2) ATC 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 MWO and MET service provider(s) in accordance with national/regional arrangements (unless the initial notification originated from such provider(s)), who will then inform the associated Volcanic Ash Advisory Center (VAAC);

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.

e) immediately notify other affected ACCs/FICs of the event and the location and dimensions of the area concerned. The ACC should provide information on potential implications on traffic flow and its capability to handle the expected traffic. Adjacent ACCs may be asked to reroute flights not yet coordinated to keep them clear of the area. It should be noted that flight crews make the decision whether or not to completely avoid the area based on, for example, visual observations.

f) review the local contingency plan

g) advise the appropriate air traffic capacity and flow management (ATCFM) unit(s) and coordinate and implement capacity and flow management measures if necessary to maintain the required level of safety; and

h) relax airspace restrictions when possible to facilitate efficient traffic flow.

Note.— 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.

680 In addition to sending the relevant AIS messages to the normal distribution list, they will be sent to the relevant MWO(s) and the SADIS WIFS gateway at EGZZVANW.

Adjacent ACC/FIC actions

690 During the pre-eruption phase, ATS units will inform aircraft about the potential hazard and continue to provide normal services. Adjacent ACCs/FICs should take the following action to assist:

a) gain and maintain awareness of the affected area and inform pilots that will or might be affected;

b) when requested by pilots of aircraft advised that they will be affected by the area, re-clear flights to which control services are being provided after coordination with other affected ACCs; and

c) unless otherwise instructed, continue normal operations and:

d) if future traffic is affected by the area, consider the potential impact and the necessity for capacity and flow management measures.

ATCFM Unit actions

700 Where an ATCFM unit is established, it should upon reception of preliminary information on volcanic activity from an ACC or the lead VAAC 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.

START OF ERUPTION PHASE

General

710 This phase commences when information about the outbreak of a volcanic eruption becomes available, 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 associated with the eruption through the collection and use of relevant information.

Note: *When an eruption does not impact the airspace above and around the volcano (e.g. lava flow) the processes described in the pre-eruption phase will be applicable.*

715 Volcano observatories should assess the information on the state of the volcano showing eruptive activity and provide notification to their associated ACC, MWO and VAAC in form of the *Volcano Observatory Notice for Aviation* (VONA), as described in Appendix E of Doc 9766 (IAVW Handbook; Annex 3, Appendix 2 para 4.1 refers).

716 VAACs should collect all relevant information and act in accordance with paragraph 4.5 of Doc 9766 (IAVW Handbook).

720 Major activities of the start of eruption phase are: issuance of relevant AIS and MET messages in accordance with Annexes 15 and 3 respectively (as detailed in Doc 9766 paragraphs 4.3 and 4.4); as well as provision of information and assistance to airborne traffic.

725 As appropriate, danger areas may be declared by the appropriate authority and published via NOTAM (in accordance with the "Airspace Measures" section of this contingency plan).

Originating ACC/FIC actions (eruption in its own FIR)

730 The ACC/FIC providing services in the FIR within which the volcanic eruption takes place should act in accordance with the ATS contingency procedures contained in Doc 4444, paragraph 15.8 and the guidance in paragraph 4.2 of Doc 9766 (IAVW Handbook) and inform flights about the existence, extent and forecast movement of volcanic ash and provide information useful for the safe and efficient conduct of flights.

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

750 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.

760 During the start of eruption phase the ACC/FIC should:

a) ensure that a NOTAM is originated by the International Notam Office (NOF) in accordance with paragraph 4.2 lit a) of Doc 9766 giving details of the eruption and ash cloud. When the appropriate authority defines a danger area it should be delineated cautiously so as to encompass a volume of airspace in accordance with the limited information available. Until reliable information on the extent of the eruption is available, the guidance for precautionary Danger Areas should be followed. In determining the area, information on upper winds should be taken into account. The address list for ASHTAMs or NOTAMs concerning volcanic activity (including airspace measures) should include the associated MWO, all VAACs and the SADIS WIFS gateway at EGZZVANW. The purpose is to ensure safety of flight in the absence of any prediction from a competent authority of the extent of Ash;

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

c) solicit as far as practicable special air-reports on volcanic activity from aircraft in the area concerned to enlarge the knowledge about the airspace Ash; and

d) devise, implement and update ATCFM measures when necessary to ensure safe and efficient flight operations, based on MET observations and forecasts in cooperation with aircraft operators and the adjacent ACCs using the CDM process;

e) 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 revision of incorrect information and its dissemination to all concerned;

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

g) initiate appropriate AIS messages in accordance with Annex 15 and Doc 9766 (IAVW Handbook), should significant reductions in intensity of volcanic activity take place during this phase and evidence confirms that the airspace is no longer contaminated by volcanic ash. Otherwise, begin CDM planning for the on-going eruption phase in conjunction with aircraft operators, the appropriate ATCFM unit and the affected ACCs.

Adjacent ACC/FIC actions

770 In the start of eruption phase, adjacent ACCs/FICs should take the following actions:

a) gain and maintain awareness of the affected area and inform pilots that will or might be affected; and

b) maintain a close liaison with the appropriate ATCFM unit, aircraft operators and the originating ACC/FIC to devise, implement and update ATCFM measures (including relaxation of airspace restrictions) which will enable safe and efficient flight operations; and

c) begin planning for the on-going eruption phase in conjunction with the aircraft operators, the appropriate ATCFM unit and ACCs/FICs concerned.

ATCFM Unit actions

780 During the start of eruption phase, depending on the impact and/or extent of the volcanic Ash, the appropriate ATCFM 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.

790 The ATCFM unit will apply ATCFM measures on request of the ANSPs concerned. The measures should be reviewed and updated in accordance with latest information. Airspace measures should be relaxed as soon as the situation allows.

ON-GOING ERUPTION PHASE

General

800 The on-going eruption phase commences with the issuance of the first complete (i.e. including forecasts) volcanic ash advisory (VAA) by the responsible VAAC that contains information on the extent and expected movement of the volcanic ash cloud in accordance with Annex 3 provisions.

Note. — Volcanic ash advisory information in graphical format (VAG) should also be issued by the VAAC, containing the same information as its text-based VAA equivalent. (Doc 9766, paragraph 4.5.1).

810 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 the provision of air traffic services, including the application of appropriate ATCFM measures.

ACC/FIC Actions

820 The volcanic Ash 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/FIC. The following guidance therefore may prove useful during the on-going eruption phase, but should not be considered mandatory or exhaustive:

a) The ACC/FIC will continue to act in accordance with the ATS Contingency Procedures contained in paragraph 15.8 of Doc 4444 (PANS-ATM);

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

c) the ACC/FIC should solicit special air-reports on volcanic activity if so requested by the appropriate VAAC;

d) ACCs/FICs and ATCFM units should be aware that for the purposes of flight planning and execution, 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

e) any reported differences between published information and observations (pilot reports, airborne measurements, etc.) should be forwarded as soon as possible to the appropriate authorities to ensure revision of any incorrect information and its dissemination to all concerned.

ATCFM Unit actions

830 The ATCFM unit will continue to apply ATCFM measures on request of the ANSPs concerned. The measures should be reviewed and updated (including relaxation of airspace measures) in accordance with latest information. Depending on the impact and/or extent of the volcanic ash, the appropriate ATCFM 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.

RECOVERY PHASE

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

850 ACCs/FICs and ACTFM units should revert to normal operations as soon as practical.

Appendices and Attachments

EUR_NAT VA Contingency Plan Appendices and Attachments

version for EANPG/56

APPENDICES

APPENDIX-01 Anticipated Flight Crew Issues when encountering volcanic ash (information for ATS personnel)

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 or complete failure of one or more engines, causing an immediate departure from assigned altitude and reduced speed; engines might have to be shut down by the flight crew due to EGT limit exceedance or unstable operation;

d) when engines have failed or had been shut down, the flight crew will attempt to restart them when out of the ash cloud; engines will likely 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 opaque, 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; this will result in a need to descend (but most likely with less rate of descent than during an emergency descent caused by loss of cabin pressure);

b) exit volcanic ash cloud as quickly as possible. The shortest distance/time out of the ash may require an immediate, descending 180-degree turn (terrain permitting);

c) don flight crew oxygen masks, resulting in difficulty to communicate (transmissions may sound strange);

d) unreliable airspeed or a complete loss of airspeed indication (volcanic ash may block the pitot system): the flight crew will establish the appropriate pitch attitude and power setting; this may result in departure from assigned altitude (up or down);

e) land at the nearest suitable aerodrome; and

f) upon landing, thrust reversers may be used as lightly as feasible to avoid blowing up ash from the runway surface; this will result in longer than usual landing distance, also due to reduced braking efficiency on an ash covered runway.

APPENDIX-02 Pilot Reports

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 *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 (VAR) form in Appendix 1. The Special Air Report for Volcanic Activity has two sections: the first one is the information to be provided immediately to the ATS unit currently responsible for the reporting aircraft; this is to be recorded on the VAR form together with the second section containing supplementary information.

- VAAC requirements
    - London: Special Air Reports shall be made by pilots and transmitted according to the standard ICAO provisions. [Example text. Actual version to be provided by VAAC London]
    - Toulouse: Special Air Reports are important to be quickly transmitted to VAAC Toulouse in the following areas:
        - Africa
        - EUR Region east of 020 West

      [Example text. Actual version to be provided by VAAC Toulouse]
- Ad-hoc Special Air Report
    - ACCs shall send Special Air Reports on Volcanic Activity to their respective MWO, which ensures forwarding to the associated VAAC and …
- Solicited Special Air Report
    - VAAC Toulouse will request the ACCs listed in Attachment nn to solicit Special Air Reports from aircraft flying in areas of suspected volcanic activity
    - it is preferable that aircraft in cruise flight are targeted, if possible
- Doc 4444 vs EASA report form

  - Pilots should be aware that EASA requires slightly different information on volcanic ash encounters then ICAO
- Contents of Special Air Reports on Volcanic Activity
  - NO VA: Pilots should be aware that Special Air Reports on Volcanic Activity reporting "NO VA" are important to verify information about airspace contamination from various sources, so that restrictions can be kept to the minimum.
  - 4D VAR: When a flight is observing volcanic activity or contamination over a prolonged period during flight, a series of Special Air Reports shall be made, so that a four-dimensional representation of the situation is created.
  - limited credibility: pilots should be trained for airborne observations of volcanic activity/contamination to avoid an erosion of the credibility of Special Air Reports. Improved instructions on the use of the Volcanic Activity Report forms are required to achieve high quality of information for the VAR users.
-
- Desired future development: harmonized VAR form (ICAO + EASA)

Appendix-03 State Checklist

States need to implement provisions in their national legislation to ensure compliance with global, regional and national requirements for ATM and flight operations and creating cooperation with all entities involved, including these from non-aviation sectors, as appropriate.

The following checklist indicates areas that might need to be covered, but is not necessarily exhaustive:

- Volcano Observatories and Volcanoes monitored
- IAVW requirements (Doc 9766)
- VONA
- VAR
- MWO(s) established (ANP Vol II)
- Verification infrastructure in use (and future implementation plan)
    - LIDAR networks
    - aircraft for in-situ measurements
    -
- Contingency Information Flow
    - Info Requirements for ANSPs and instructions for personnel: What? When? How?
    - Templates to be provided
    - Info Requirements for airspace users (supplementary information) and instructions for personnel: What? When? How?
    - VAA/VAG/C-Charts
    -
- ATCFM requirements
- Crisis Mangement
    - Aviation
    - Other modes of transport
    - General Crisis Management
        - Share information
        - Where GCM exists: integrate and cooperate
- Regulations and Arrangements
    - Flight Ops (Doc 9974)

        - approval/acceptance of SRAs (national and foreign operators)
        - operations with and without SRA
            - no SRA: avoid VAA/VAG/SIGMET/C-Chart/Danger Areas/contaminated areas
        - Operational control + coop with ATS
        - Instructions for pilots
    - ATM (VA ATM CP)
    - Others ?
- Competent Authority for Danger/Restricted Areas
    - Arrangements and conditions for declaration by interim authority (e.g. ACC) if competent authority is not 24/7
    - Criteria for DA / RA (different users / acft types / …)
    -
- Training of personnel, Exercises
- National publication

Example UK

A-04 VAAC Checklist (ref Doc 9766)

VAACs and Volcano Observatories are elements of ANP vol I

- communication lines established?
- regional cooperation details
- VAAC coordination and handover procedures
- are Special Air Reports necessary? Under which circumstances?
- VAA verification arrangements
    - feedback from States, MWOs, ANSPs, ATS units, VARs, ...
    - revision of VAA
- message templates? and instructions for composition
-
- participation in exercises

A-05 ANSP Checklist

- local instructions
- personnel training
- communication links
- message templates
- ATCFM and Crisis Management
-
- participation in exercises

A-06 Airspace User (Operator) Checklist

- SRA (according to ICAO Doc 9974) within SMS (Annex 19; Doc 9859)
  - SOPs
  - required information for dispatchers and flight crews
  - operational control in case of volcanic contamination (different from normal operations?)
  - specific instructions for flight crews
  - …
- Information requirements for planning and execution of flights
  - sources of information
  - use of supplementary information
  -
  - avoiding information overload
  -
  - provide VAR forms for use by pilots
  -
- operational control considerations
-
- consideration of national/regional contingency arrangements and crisis plans
-
- participation in exercises

ATTACHMENTS

X1 Regional Monitoring Capabilities of volcanic activities and arrangements

- Volcano Observatories and Volcanoes monitored
    - areas/volcanoes NOT monitored
- Need for Special Air Reports on Volcanic Activity (VARs)
- Satellites
- LIDAR networks
- In-situ ground monitoring
- In-situ airborne monitoring
    - dedicated scientific research aircraft
    - general scientific research aircraft
    - aircraft with appropriate sensors (e.g. AVOID)
    -
-

X2 Regional Information Flow arrangements and model templates

- VAAC contact details
- EACCC
- EVITA (incl teleconference procedures)
-
- VONA
- VAA/VAG
- Concentration Charts and Contamination Charts
- SIGMETs
- NOTAMs (ASHTAMs)
-
- Message Templates
-

X3 Regional arrangements and agreements for information service provision and reduction of information overload

- Use of NOTAM/ASHTAM
- Use of SIGMET
    - no duplication of information in SIGMET and NOTAM
    - SIGMETs only for T+0 to T+6
- Use of Supplementary Information (VAA/VAG, C-Charts; …)
-

X4 Guidance on the establishment, amendment and withdrawal of Danger Areas. Appendix ???

- competent authority
-
- Size of precautionary danger area (incl wind expansion)
    - standard dimensions
    - promulgation requirements (shape by 7 waypoints)
    -
    -
- Size of danger area for existing eruption and/or airspace contamination
    - standard dimensions
    - promulgation requirements (shape by 7 waypoints)
    -
    -
    -
- guidance for flight operations in
    - precautionary danger areas
    - danger areas around erupting volcano
    - danger area for contaminated airspace
    - restricted airspace

X5 Air Traffic Capacity and Flow Management arrangements

- EU (exact area?) Network Manger
- NAT: OTS system and oceanic clearance arrangements
- EUR-East ???

X6 Crisis Management Arrangements

- EACCC
- NM
- EVITA

- Who needs to travel? How can this be achieved safely?
    - Need for evacuation of humans from hazardous areas?
    - Different Acceptable Level of Safety?
- What goods or infrastructure (e.g. for volcanic contamination monitoring) need to be transported?

X7 VOLCEX arrangements (GM in Doc9766)

- Steering/Planning Groups
- Schedule of Exercises
- Process to extract lessons from exercises and real events

X8 Regional Regulations, Means of Compliance and Guidance Material (References)

- EU Regulations, Directives
  - EU operators
  - Non-EU operators
  -
- EASA Safety Information Bulletin
- Russia/CIS
- other parts of EUR Region

--END --