Organización de Aviación Civil Internacional
Quinta Reunión del Grupo de Tarea ATFM (ATFM/TF/5)

(Armenia, Colombia, 8 al 12 de junio de 2009)

Cuestión 2
del Orden del día : Revisión de la estrategia y planificación ATFM en las Regiones CAR/SAM
2.3 Los planes de contingencia ATFM y ATS

PROCEDIMIENTOS DE CONTINGENCIA CONTRA HURACANES Y CENIZAS VOLCÁNICAS EN LAS REGIONES CAR/NAM

(Presentada por la Secretaría)

Resumen

Esta Nota de Estudio presenta procedimientos de coordinación para mejorar los Planes de contingencia ATS a través de medidas preventivas contra erupciones volcánicas y nubes de cenizas volcánicas, así como huracanes.

Referencias

- Anexo 11
- Informe Reunión GREPECAS/13 (Santiago, Chile 14 al 18 de noviembre del 2005)
- Informe Reunión NACC/DCA/3 (Punta Cana, República Dominicana, 8 al 12 de septiembre de 2008)

Objetivo Estratégico: D

1. Introducción

1.1 Las erupciones volcánicas producen normalmente plumas de cenizas volcánicas que ascienden hasta FL400 con la consiguiente nube de cenizas volcánicas a niveles donde operan aviones de turbina. Esta situación ha levantado una serie de cuestiones relacionadas a una respuesta por parte de la gestión del tránsito aéreo a sucesos de cenizas volcánicas.

1.2 La Región CAR se ve afectada con regularidad por la actividad de huracanes. Como resultado, se deberían elaborar procedimientos de contingencia que traten sobre actividad de huracanes en las Regiones de Información de Vuelo (FIRS). En vista de que las consideraciones de seguridad operacional establecen evitar áreas de fuerza de los huracanes, las notificaciones y respuestas a las notificaciones oportunas de áreas con evento de huracán son esenciales como parte de un plan de contingencia ATS.

1.3 GREPECAS/13 aprobó un Modelo para Planes de contingencia ATS en las Regiones CAR y SAM. Sin embargo, los procedimientos señalados en estos planes necesitaban incluir medidas preventivas contra sucesos de cenizas volcánicas y huracanes.

2. Discusión

2.1 Los planes de contingencia ATS es una herramienta muy importante no solo para los Estados que sufren fenómenos naturales en su territorio, sino para todos los Estados cuyo espacio aéreo pueda verse afectado por ellos. Los Estados de Regiones adyacentes deberían elaborar su plan nacional de contingencia dentro del mismo marco de referencia. Debido al impacto en el tránsito aéreo, los procedimientos de contingencia deberían validarse y practicarse con regularidad para mejorar la coordinación y mantener el sistema listo para actuar.

2.2 Es importante garantizar la coordinación operacional para reducir el daño de desastre natural durante huracanes o cenizas volcánicas. Por lo tanto, todos los participantes deben ser informados con bastante anticipación y todos los mensajes emitidos deben estar claramente elaborados de manera que no se pierda información real sobre sucesos de cenizas volcánicas y/ huracanes.

2.3 Durante estos sucesos, se coordina información detallada sobre el escenario, el formato de los mensajes operacionales a promulgar, medios de comunicación y puntos de contacto. Los **Apéndices A** y **B** a esta nota contienen una propuesta de procedimientos de coordinación de Huracanes y Cenizas Volcánicas aprobados por la NACC/DCA/3.

1.4 2.5 Reconociendo el impacto en la seguridad operacional, eficiencia y continuidad del tránsito aéreo, la Reunión debería continuar otorgando una alta prioridad a la mejora de los planes de contingencia ATS en las Regiones NAM y CAR.

2.6 Una tarea importante es identificar las entidades de los Estados que deberían tratar con los sucesos de cenizas volcánicas y huracanes y mejorar la red de información, entre ellos, en particular, la coordinación entre los actores ATM (incluyendo FMUS), las dependencias MET (VAACS y MWOS), y aerolíneas.

2.7 Se debería considerar un análisis más profundo para evaluar el impacto en el tránsito aéreo bajo diferentes escenarios de desastres naturales. Deberían utilizarse los resultados de estas evaluaciones para aumentar la conciencia por parte de los involucrados y para mejorar los planes de contingencia ATS.

3 Acción sugerida

3.1 Se invita a la Reunión a:

a) tomar nota de la información presentada;

b) proporcionar comentarios para mejorar los procedimientos de contingencia ATS; y

c) aprobar los documentos incluidos en los Apéndices, según sea apropiado, para que sean utilizados como material guía en el desarrollo y/o actualización de los planes de contingencia ATS.

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APÉNDICE A

REGIONAL CARIBBEAN CONTINGENCY PROCEDURES FOR HURRICANES

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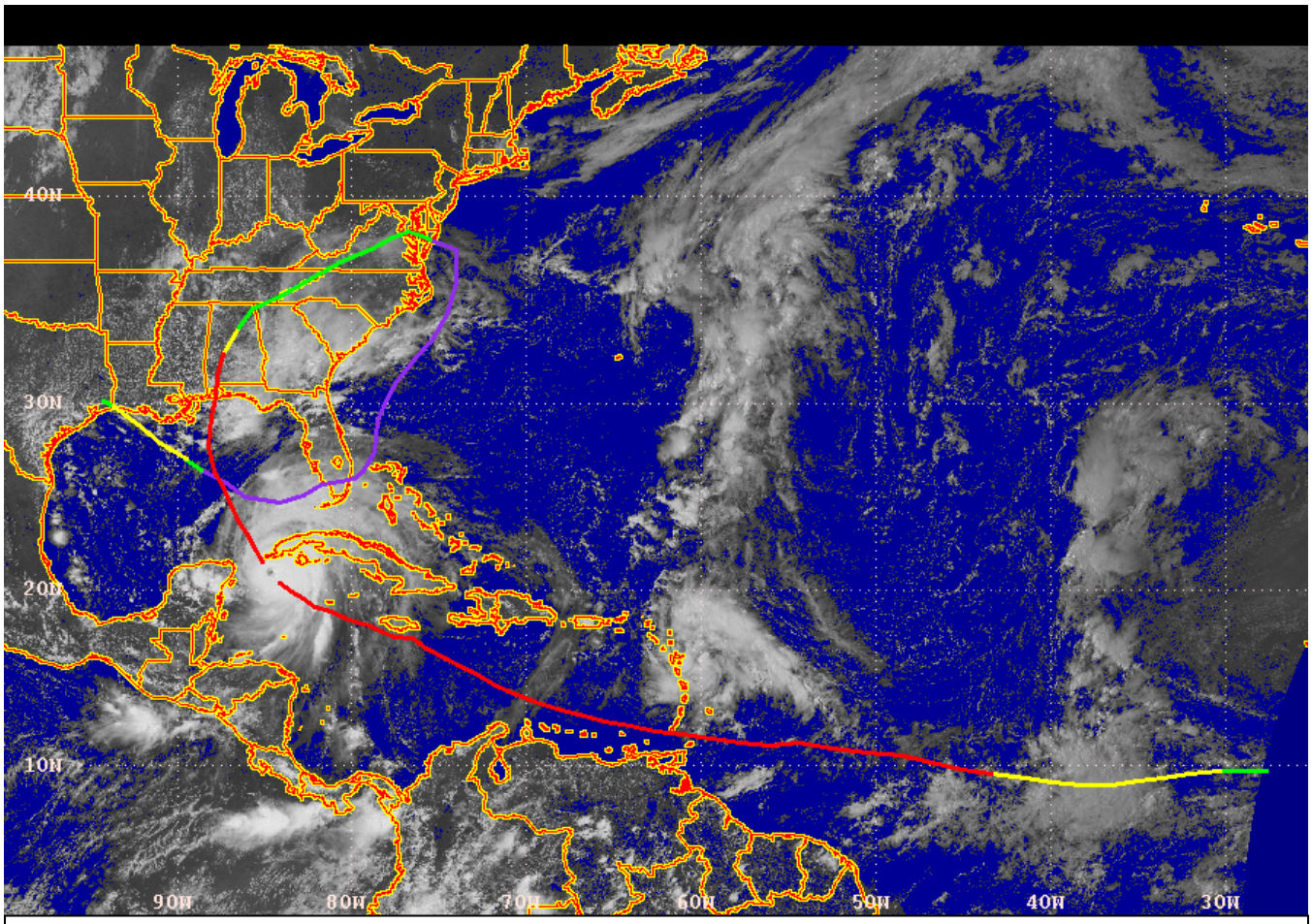

CAR Region
Contingency Procedures for Hurricanes

BACKGROUND

The CAR region is regularly impacted by hurricane activity. As a result, contingency procedures addressing hurricane activity in the flight information regions (FIRs) were developed. These procedures establish a standardized guideline for the alerting of aircraft when hurricanes and hurricane forces are possible and identify procedures to be followed by the area control centres (ACCs) when planning routings around these event areas.

Considering that safety considerations dictate avoidance of hurricane force areas, timely reports and responses to reports of hurricane event areas are essential.

Hurricane direction, speed and intensity are constantly changing. Therefore, all parties concerned are committed to ensure the safety of aircraft in flight by promulgating information as a matter of urgency including prompt reporting and dissemination of available information on the extent and severity of the hurricane area.

For every hurricane event being reported in areas which could affect ATS routes used by civil aviation, all ATS units receiving information of a hurricane event should carry out alerting actions, as appropriate.

It should be noted that this document should be part of an air traffic services (ATS) contingency plan. This document does not prescribe actions by any entity other than the ATS units concerned. Where actions by the Meteorological Weather Offices (MWOs) are described, those are for clarification only.

1. STRATEGIC PHASE

This phase is characterized by initial information on the extent and severity of the hurricane event. With all information available, the actions of this alerting phase should be carried out within 36 hours from the receipt of information of the event. The alerting phase actions should be carried out for every event. The purpose of this phase is to ensure the safety of aircraft in flight and to promulgate information as a matter of urgency.

During the Strategic Phase aircraft operations may be tactically rerouted to avoid areas with hurricane force events. Adjacent ACCs should, upon reception of information from the MWO, issue an advisory through the air traffic flow management unit. The ATFM units will determine how the initial communications will take place on the basis of bilateral agreements.

ORIGINATING ACC ACTIONS (in Flight Information Region (FIRs) concerned)

With the occurrence of a significant hurricane event reported in areas which could affect ATS routes used by civil aviation, an ACC, on receiving information of an event, should carry out the following:

1. Identify an initial impact area with the size and location of the area designed so as to allow the assessment of impacts to routes that will be impaired by the effects of this event The purpose of this initial impact zone is to identify navigational routes and assets that will be render unusable to better mitigate the impacts of the event on air traffic.

2. Advise the appropriate Air Traffic Flow Management Unit (ATFMU). That ATFMU will then issue an air traffic flow management (ATFM) advisory and, as necessary, will also notify other ACCs or Air Traffic Flow Management units.

3. Tactically re-clear flights which would penetrate the area onto available routes requested by the pilot. It should also negotiate any re-routings necessary for flights already coordinated but still within adjacent flight information regions (FIRs). It is also expected that adjacent ACCs will be asked to reroute flights not yet coordinated to keep them clear of the impact area.

4. Issue a NOTAM. This must provide as precise information as is available regarding the activity of the hurricane. The name (where applicable), reference number and position of the hurricane should be included along with routes or portions of routes which could be affected and, as necessary, routes temporarily closed to air traffic. It is imperative that this information is disseminated as soon as possible. Some of the required information may not be available and alternative routes may yet have to be established.

In order to assist the staff in expediting the process of composing the NOTAM, a series of templates should be available for the activity. Should the eruption occur elsewhere, one of the templates can be used after being suitably modified.

An example NOTAM is shown below:

(A0001/02 NOTAMNQ) BIRD/QWWXX/IV/NBO/W/000/999/6359N01942W120
A) BIRD
B) 0705281230
C) 0705291230 EST
E) Due to weather impacts associated with Hurricane RITA the following routes are closed xxx xxx xxx xxx xxx
F) GND G) FL999)

In addition to sending the NOTAM (and any subsequent NOTAM) to the normal distribution list, it will be sent to the relevant meteorological agencies after adding the WMO header "NWIL31 BIRK ddhhmm" (where ddhhmm represents a date/time group).

ADJACENT ACC / ATFM UNITS ACTIONS

Aircraft will be tactically rerouted to avoid the impacted area and associated closed routes and disruptions to traffic should not be excessive. Adjacent ACCs should take the following action to assist:

1. When advised, re-clear flights which will be affected by the impact area but are still under your control.

2. Unless otherwise instructed, continue normal operations except:

a) if one or more routes are closed by the impact are, stop clearing aircraft on these routes and take steps to reroute onto open routes.

b) initiate a running plot of the impacted area.

Upon reception of information on hurricane activity from the WMO, air traffic flow management units will issue an advisory or a NOTAM as appropriate. The adjacent ACCs, ATFM units will determine how the initial communications will take place on the basis of bilateral agreements.

ATFM UNIT ACTIONS

Depending on the impact of the event, during any Phase, the appropriate ATFM unit may take initiative to organize teleconferences to exchange latest information on the developments with the VAACs, Air Navigation Service Providers (ANSPs) concerned and aircraft operators.

2. PRE-TACTICAL PHASE

This phase will last until such time as proactive standing procedures can be adopted. The actions detailed in this phase are designed to allow early intervention in the flight path of aircraft already airborne and the promulgation of a routing scheme taking account of the situation.

It is impossible to be prescriptive for every eventuality, thus the actions consider the 'worst case' scenario of a busy traffic flow affected by the hurricane.

ORIGINATING ACC ACTIONS (within its own FIR)

This phase begins once aircraft under the control of the ACC have been tactically rerouted around the impact area. Aircraft for which the ACC have received an estimate from adjacent ACCs at the start of the Alerting Phase will be rerouted by those agencies and an initial NOTAM will have been issued. During this phase the ACC should:

1. Maintain close liaison with its associated MWO. The MWO should issue a SIGMET message on the forecast movement of the hurricane at least every 3 hours, valid for 6 hours, with an outlook appended providing information on the trajectory for up to 12 hours beyond the validity period. In the interest of expediency this outlook may be omitted from the initial SIGMET.

2. Based on these forecasts and in cooperation with the appropriate ATFM unit and adjacent ACCs, air traffic flow management measures should be devised and updated to ensure that routings are proactively managed to remain available as long as practical to assist normal air traffic requests and eventually and as needed facilitate in evacuation, disaster relief efforts and search and rescue operations.

3. Issue a NOTAM. By this stage it will be possible to define the affected area based on a prediction from the MWO. It is important that the content of the NOTAM is coordinated and agreed with adjacent ACCs.

Consideration should be given to including the following text in item E of the NOTAM:

"ATFM MEASURES LIABLE TO CHANGE SUBJECT TO THE TRACK AND IMPACT OF HURRICANE XXXXXX. MAINTAIN WATCH FOR NOTAM/SIGMET FOR THE AREA"

4. Should the track of the hurricane significantly change during this phase and the airspace no longer impacted, a NOTAM cancelling the last active NOTAM shall be issued stating the cause for cancellation. Otherwise, begin planning for the Proactive Phase in conjunction with ATFM Units and the affected ACCs.

ADJACENT ACC ACTIONS

During the Phase 2 the adjacent ACCs should take the following action:

1. Maintain close liaison with the appropriate ATFM unit and the originating ACC to design, implement and keep up to date ATFM measures which will ensure routes are managed allowing options and support to all users

2. In the event that tactical measures additional to those issued by the appropriate ATFM unit are required, the air traffic control (ATC) watch supervisors should, in cooperation with the originating ACC, impose such measures. Details are included in the ATFM measures section of this document.

3. Maintain a running plot of the affected area.

4. Begin planning for the Proactive Phase in conjunction with the appropriate ATFM unit and ACCs concerned.

3 TACTICAL PHASE

Standing procedures should be in place to route traffic around the impacted area. During this phase, numerous combinations of airspace may be impacted with routes and options limited. It may be impossible to prescribe all measures to be taken for any particular situation, nor is it possible to detail the actions to be taken by any particular ACC.

The following guidance actions may be used during this phase:

1. ACCs affected by the movement of the hurricane should continue to issue NOTAMs at appropriate intervals. ACCs concerned and the appropriate ATFM unit should continue to publish details on measures taken.

2. Should the impacted area move wholly outside the originating ACC’s airspace to affect adjacent or other FIRs only, the ACCs in charge of that airspace should take over responsibility for the promulgation of NOTAMs.

3. Depending on the impact of the event, the appropriate ATFM unit may take initiative to organise teleconferences to exchange the latest information on the developments with the ANSPs concerned and aircraft operators.

4. During this phase discussions on contingency planning and responsibilities may deal with possible catastrophic loss of ATC services, facilitating evacuation flights, coordinating disaster relief traffic and search and rescue operations. The need to involve users is acknowledged by the impact that TFM initiatives will have on the user’s abilities to provide services to impacted areas and protect aircraft fleets.

5. When the impact has passed, a NOTAM cancelling the active NOTAM shall be promulgated.

4. ATFM PROCEDURES

Upon reception of information on Hurricane activity from the WMO, the ATFM unit will coordinate issue advice or NOTAM as appropriate.

In close coordination with ACCs concerned, the appropriate ATFM unit may apply ATFM initiatives to prioritize services and mitigate impacts by relieving congestion on overloaded routes ensuring the orderly flow of traffic with an equitable distribution of delays. The measures should be reviewed and updated in agreement with respective ACCs on receipt of any forecast from the WMO or VAAC.

When ATFM initiatives are applied, the appropriate ATFM unit should coordinate issue of AIM or NOTAM as appropriate, explaining in plain language why the measures have been implemented. Operators should also be advised to maintain watch for NOTAMs and SIGMETs for the area.

Depending on the impact of the hurricane, the appropriate ATFM unit may take initiative to organize routine teleconferences to exchange the latest information on the developments with the ANSPs concerned and aircraft operators.

5. AIR TRAFFIC CONTROL PROCEDURES FOR ACCS

If hurricane impacts are reported or forecast in the FIR for which the ACC is responsible, the following procedures are followed:

1. Relay all available information immediately to pilots whose aircraft could be affected to ensure that they are aware of the impact area ;

2. Suggest appropriate reroutings and advise users of airspace closures ;

The final responsibility for inflight decisions rests with the pilot in command.

6. GENERAL GUIDANCE FOR THE DEVELOPMENT OF ATS HURRICANE CONTINGENCY PLANS

In an emergency plan 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 for the manager in charge, supervisors and air traffic controllers. The plan should also identify the officials who need to be contacted, the type of messages that are to be created, and how to conduct business.

Controllers need to be trained and be made aware that aircraft which encounter violent weather conditions can suffer a complete loss of power along with loss of structural integrity in the airframe.

Particular issues are as follows:

1) Impacted areas may extend for hundreds of miles horizontally and reach several miles vertically, therefore pilots may not be able to fly around or climb above the area.

2) Conditions at airports will deteriorate as hurricane forces build. Pilots and controllers should be aware of the escalating impacts to basic services and navigational systems as forces approach. The loss of support services may render ATC systems unusable long before and long after weather impacts reach these areas.

The ACC in conjunction with the appropriate ATFM unit serves as the critical communication link between the pilot, dispatcher and meteorologist. During contingency episodes within the FIR, the ACC has two major communication roles. First and of greatest importance is its ability to communicate directly with aircraft en route which will encounter hurricane forces. Based on the information provided in the SIGMET and advisory message, and working with MWO meteorologists, the air traffic controllers should be able to provide the pilot with current information and the projected trajectory of the area. Through the use of radio communication, ACCs have the capability to coordinate with the pilot alternative routes.

Similarly, through the issuance of a NOTAM, the ACC can disseminate information on the status and activity of hurricane activity. NOTAM and SIGMETs, together with special air reports (AIREPs) are critical to dispatchers for flight planning purposes.

Airlines need as much advance notification as possible for strategic planning of flights and the safety of the flying public. Dispatchers need to be in communication with pilots en route so that a coordinated decision can be made between the pilot, the dispatcher and air traffic control regarding alternative routes that are available. It cannot be presumed, however, that an aircraft will be provided with the most desirable route. 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.

The NOTAM for hurricane activity provides information on its activity along with other information of operational significance. They are issued by the ACC 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 strength of a hurricane, the NOTAM also provides information on the location, extent and movement of it along with the air routes and flight levels affected. The NOTAM can also be used to close the airspace affected by the hurricane forces. Complete guidance on the issuance of the NOTAM is provided in Annex 15 — *Aeronautical Information Services.*

It is essential that the procedures which the ACC personnel should follow during this hurricane event described in the foregoing paragraphs are translated into the local staff instructions (adjusted as necessary to take account of local circumstances). It is also essential that these procedures/instructions form part of the basic training for all air traffic services personnel whose jobs would require them to take action in accordance with the procedures.

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APÉNDICE B

REGIONAL CARIBBEAN CONTINGENCY PROCEDURES FOR VOLCANIC ASH

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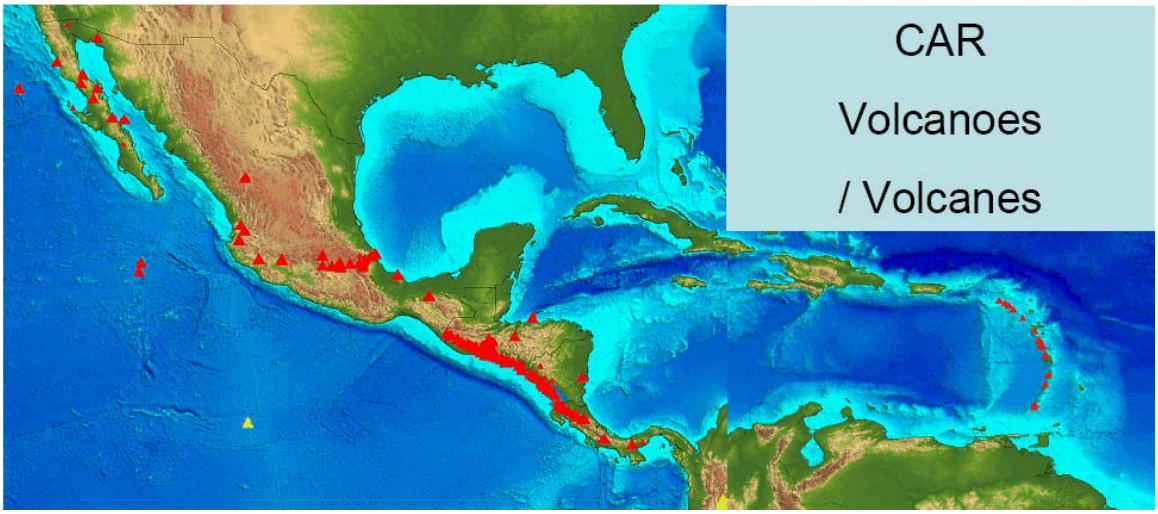

These procedures are based in the Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds - Doc 9691.

BACKGROUND

The CAR region encompasses several areas with a potential for volcanic activity. As a result, contingency procedures addressing volcanic eruptions in the NAM and CAR flight information regions (FIRs) were developed. These procedures/ methodology establish a regional guidelines for the alerting of aircraft when volcanic eruptions are possible or have occurred, and identifies procedures to be followed by the area control centres (ACCs) when planning routings around the ash cloud.

Considering that a commercial aircraft can travel 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 reports of volcanic ash is essential.

It can take as long as one hour to define a flight operations danger area around volcanic activity. Therefore, all parties concerned are committed to ensure the safety of aircraft in flight by promulgating information as a matter of urgency including prompt reporting and dissemination of available information on the extent and severity of the volcanic event.

For every volcanic event of significant pre-eruption volcanic activity, a volcanic eruption occurs, or a volcanic ash cloud being reported in areas which could affect ATS routes used by civil aviation all ATS units receiving information of an occurrence should carry out alerting actions as appropriate.

The ATS and/or ATFM units will initiate communication process with the Meteorological Watch Offices (MWOs) posted in each FIR and/or Volcanic Ash Advisory Center (VAAC) posted in Washington D. C. on the basis of bilateral agreements.

This document should be part of an air traffic services (ATS) contingency plan, therefore does not prescribe actions by any entity other than the ATS units concerned. Where actions by the MWOs and VAACs are described these are for clarification only.

1. STRATEGIC PHASE

This phase is characterized by the limited availability of information on the extent and severity of the volcanic event. Regardless of the extent of information available, the actions of this alerting phase should be carried out within 30 minutes but no more than one hour from the onset of every event. The purpose of this phase is to ensure the safety of aircraft in flight and to promulgate information as a matter of urgency.

During the Strategic Phase aircraft operations will be tactically rerouted to avoid danger zone. As this phase will only last for a short period, any ash cloud would be contained within a limited area and disruption to traffic should not be excessive. Adjacent ACCs should, upon reception of information on volcanic activity from the VAAC, issue an appropriate advisory through the air traffic flow management unit. The ATFM units and the WMOs/VAAC will determine how the initial communications will take place on the basis of bilateral agreements.

ORIGINATING ACC ACTIONS (within Flight Information Region concerned)

Upon receiving information of: a significant pre-eruption volcanic activity, a volcanic eruption occurring or a volcanic ash cloud being reported in areas which could affect ATS routes used by civil aviation, the ACC concerned should carry out the following:

1. Define an initial danger area of a circle with a radius of 222 km (120 NM). If the eruption has not commenced or if no information on upper winds is available, the circle should be centered on the estimated location of the volcanic activity. If an eruption has started and predicted upper wind information is available, the circle should be centered 111 km (60 NM) downwind from the volcano . The purpose of this initial danger zone is to ensure safety to air operations in the absence of any prediction from a competent authority of the extent of contaminated area.

2. Advise the MWO and/or the appropriate Air Traffic Flow Management Unit (ATFMU). Thae ATFMU will then issue an air traffic flow management advisory and, as necessary, will also notify other ACCs or Air Traffic Flow Management units which will issue appropriate NOTAMs.

3. Alert flights already operating within the danger zone and, per request, provide them vectors to expedite evacuation out of the area. Aircraft that are close to the danger zone should be vectored clear of the area. Tactically re-clear flights which would penetrate the zone to routes that will keep them clear. The ACC should immediately notify other affected centres of the event and the dimensions of the danger zone. It should also negotiate any re-routings necessary for flights already coordinated but still within adjacent flight information regions (FIRs). It is also expected that adjacent ACCs will be asked to reroute other air operations to keep them clear of the danger zone.

4. Issue a NOTAM. This must provide precise information as much as is available regarding the activity of the volcano. The name (where applicable), reference number and position of the volcano should be included along with the date and time of the start of the eruption (if appropriate), levels and routes or portions of routes which could be affected and, as necessary, routes temporarily closed to air traffic. It is imperative that this information is disseminated as soon as possible. Some of the required information may not be available and alternative routes may yet have to be established.

In order to assist the staff in expediting the process of composing the NOTAM, a series of templates should be available for the activity. Should the eruption occur elsewhere, one of the templates can be used after being suitably modified.

An example NOTAM announcing pre-eruption activity of Soufriere Hills volcano in Montserrat is shown below:

(A0001/02 NOTAMN
Q) TTPZ/QWWXX/IV/NBO/W/000/999/1645N6110W120
A) TTPZ
B) 0705281230
C) 0705291230 EST
E) INCREASED VOLCANIC ACTIVITY, POSSIBLY IMMINENT ERUPTION, REPORTED FOR VOLCANO SOUFRIERE HILLS AT 1702-07 AT 1645N6110W AIRCRAFT ARE ADVISED TO REMAIN AT LEAST 120NM CLEAR OF VOLCANO AND MAINTAIN WATCH FOR NOTAM/SIGMET FOR AREA.
F) GND
G) FL999)

In addition to sending the NOTAM (and any subsequent NOTAM) to the normal distribution list, it will be sent to the relevant meteorological agencies after adding the WMO header “NWTD31 TTPP ddhhmm” (where ddhhmm represents a date/time group).

ADJACENT ACC / ATFM UNITS ACTIONS

Aircraft will be tactically rerouted to avoid the danger area contained and disruptions to traffic should not be excessive. Adjacent ACCs should take the following action to assist:

1. When advised, re-clear flights which will be affected by the danger zone but are still under your control.

2. Unless otherwise instructed, continue normal operations except:

a) if one or more routes are affected by the danger zone, stop clearing aircraft on these routes and take steps to reroute onto routes clear of the area; and

b) initiate a running plot of the affected area.

Upon reception of information on volcanic activity from the MWO or VAAC the air traffic flow management units will issue an advice or a NOTAM as appropriate. The adjacent ACCs, ATFM units, MWOs and the VAAC will determine how the following communication will take place on the basis of bilateral/multilateral agreements.

ATFM UNIT ACTIONS

Depending on the impact of the event, during the Strategic Phase and all subsequent phases, the appropriate ATFM unit may take initiative to organize teleconferences to exchange latest information on the developments with the VAACs Air Navigation Service Providers (ANSPs) concerned and aircraft operators.

2. PRE-TACTICAL PHASE

This phase will last until such time as proactive standing procedures can be adopted. The actions detailed in this phase are designed to allow early intervention in the flight path of aircraft already airborne and the promulgation of a routing scheme taking account of the situation.

During this phase it is possible that the ash cloud will have spread, affecting several FIRs.

It is impossible to be prescriptive for every eventuality, thus the actions consider the ‘worst case’ scenario of a busy traffic flow affected by the ash cloud.

ORIGINATING ACC ACTIONS (within its own FIR)

This phase begins once aircraft under control of the ACC have been tactically rerouted around the danger area. Aircraft for which the ACC have received an estimate from adjacent ACCs at the start of the Alerting Phase will be rerouted by those agencies and an initial NOTAM will have been issued. During this phase the ACC should:

1. Maintain close liaison with its associated MWO. The appropriated MWO should issue a SIGMET message on the forecast movement of the ash cloud at least every 3 hours, valid for 6 hours, with an outlook appended providing information on the trajectory of the cloud for up to 12 hours beyond the validity period. In the interest of expediency this outlook may be omitted from the initial SIGMET.

2. Based on these forecasts and in cooperation with the appropriate ATFM unit and adjacent ACCs, air traffic flow management measures should be devised and updated as necessary to ensure that aircraft are cleared from the perimeter of the forecast furthest extent of the ash cloud.

3. Issue a NOTAM. By this stage it will be possible to define the affected area based on a prediction from the MWO/VAAC. It is important that the content of the NOTAM is coordinated and agreed with adjacent ACCs.

Consideration should be given to including the following text in item E of the NOTAM:

"ATFM MEASURES LIABLE TO CHANGE SUBJECT TO THE PROGRESS OF THE ASH CLOUD. MAINTAIN WATCH FOR NOTAM/SIGMET ISSUED FOR THE AREA"

4. Should the volcano revert to its dormant state during this phase and the airspace no longer is contaminated by volcanic ash, a NOTAM cancelling the last active NOTAM shall be issued stating the cause for cancellation. Otherwise, begin planning for the **TACTICAL** Phase in conjunction with ATFMU and the affected ACCs.

ADJACENT ACC ACTIONS

During Phase 2 the adjacent ACCs should take the following action:

1. Maintain close liaison with the appropriate ATFM unit and the originating ACC to design, implement and keep up to date ATFM measures which will ensure aircraft are cleared from the perimeter of the forecast furthest extent danger area

2. In the event that tactical measures additional to those issued by the appropriate ATFM unit are required, the adjacent ACCs in cooperation with the originating ACC, should impose ATFM measures..

3. Maintain a running plot of the affected area.

4. Begin planning for the Proactive Phase in conjunction with the appropriate ATFM unit and ACCs concerned.

3 TACTICAL PHASE

In the Tactical Phase standing procedures should be adopted to reroute traffic clear of the danger area. NOTE: It is impossible to detail all measures that might be taken for any and every particular situation. ATCOs should exercise their best judgment if they encounter situations that are not covered by guidance in this phase. Through ATS contingency plan

The following guidance actions may be used during this phase:

1. ACCs affected by the movement of the ash cloud should continue to issue NOTAMs at appropriate intervals. ACCs concerned and the appropriate ATFM unit should continue to publish details on measures taken.

2. Should the ash cloud move wholly outside the originating ACC's airspace to affect adjacent FIRs, the ACCs in charge of that airspace should take over responsibility for the promulgation of NOTAMs.

3. Depending on the impact of the event, the appropriate ATFM unit may take initiative to organize teleconferences to exchange latest information on the developments with the ANSPs concerned and aircraft operators.

4. During this phase it may be possible to assess the vertical extent of the event. While operators cannot be prevented from flight planning routes predicted to be above the danger area, such routes should not be proposed by ATC. Operators should be aware of the risk of engine failure

resulting in the inability to maintain an altitude above a volcanic ash cloud, especially where ETOPS aircraft are involved.

5. When the airspace is no longer contaminated by volcanic ash, a NOTAM cancelling the active NOTAM shall be issued to cancel ATS contingency plan.

4. ATFM PROCEDURES

Upon reception of information on volcanic activity from the WMO or VAAC, the ACCs will coordinate and issue an advisory and/or NOTAM as appropriate.

ACCs concerned in close coordination with the appropriate ATFM unit may apply ATFM initiatives to ensure that aircraft are cleared from the perimeter of the forecast furthest extent of the ash cloud. The measures should be reviewed and updated according to the agreements with respective ACCs on receipt of any forecast from the WMO or VAAC.

When ATFM initiatives are applied, the appropriate ATFM unit should issue an advisory or NOTAM as appropriate, explaining in plain language why the measures have been implemented. Operators should also be advised to maintain watch for NOTAMs and SIGMETs for the area.

Depending on the impact of the volcanic ash, the appropriate ATFM unit may take initiative to organize teleconferences to exchange the latest information on the developments with the ANSPs and aircraft operators concerned.

5. AIR TRAFFIC CONTROL (ATC) PROCEDURES FOR ACCS

If a volcanic ash cloud is reported or forecast in the FIR for which the ACC is responsible, the following procedures should be applied:

1. Relay all available information immediately to pilots whose aircraft could be affected to ensure that they are aware of the ash cloud’s position and the flight levels affected;

2. Suggest appropriate rerouting to avoid areas of known or forecasted ash clouds;

3. Remind pilots that volcanic ash clouds are not detected by airborne or ATS surveillance systems. The pilot should assume that radar will not give them advanced warning of the location of the ash cloud;

4. If the ACC has been advised by an aircraft that it has entered a volcanic ash cloud and indicates that a distress situation exists:

a) Consider the aircraft to be in an emergency situation;

b) Do not initiate any climb clearances to turbine-powered aircraft until the aircraft has exited the ash cloud; and

c) Do not attempt to provide escape vectors without pilot concurrence.

Experience has shown that 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). However, the final responsibility for this decision rests with the pilot.

6. GENERAL GUIDANCE FOR THE DEVELOPMENT OF ATS CONTINGENCY PLANS FOR VOLCANIC ASH CLOUDS

In an emergency plan relating to volcanic ash clouds, 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 for the manager in charge, supervisors and air traffic controllers. The plan should also identify the officials needed to be contacted, the type of messages that are to be created, and how to conduct business.

Controllers need to be trained and be made aware that aircraft which encounter a volcanic ash cloud can suffer a complete loss of power and that extreme caution needs to be taken to avoid entering an ash cloud. Since there is no means to detect the density of the ash cloud and size distribution of the particles and their subsequent impact on engine performance and the integrity of the aircraft, controllers need to be aware of the serious consequences for an aircraft that may encounter an ash cloud. Particular issues are as follows:

1) Volcanic ash clouds may extend for hundreds of miles horizontally and reach the stratosphere vertically, therefore pilots should not attempt to fly through or climb out of the cloud;

2) Volcanic ash may block the pitot-static system of an aircraft, resulting in unreliable airspeed indications; and

3) Braking conditions at airports 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. Pilots and controllers should be aware of the consequences of volcanic ash being ingested into the engines during landing and taxiing. For departure it is recommenced 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.

The ACC in conjunction with the appropriate ATFM unit serves as the critical communication link between the pilot, dispatcher and meteorologists during a volcanic eruption. During episodes of volcanic ash clouds within the FIR, the ACC has two major communication roles. First, and of greatest importance, is its ability to communicate directly with aircraft en route which may encounter the ash cloud. Based on the information provided in the volcanic ash SIGMET and volcanic ash advisory message and working with MWO meteorologists, the air traffic controllers should be able to provide the pilot with flight levels that are affected by the ash cloud and the projected trajectory and drift of the cloud. Through the use of radio communication, ACCs have the capability to coordinate with the pilot alternative routes which would keep the aircraft away from the volcanic ash cloud.

Similarly, through the issuance of a NOTAM for volcanic activity (or an ASHTAM) the ACC can disseminate information on the status and activity of a volcano even for pre-eruption increases in volcanic activity. NOTAM, (ASHTAM) and SIGMETs, together with special air reports (AIREPs), are critical to dispatchers for flight planning purposes.

Airlines 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 pilots en route so that a coordinated decision can be made between the pilot, the dispatcher and air traffic control regarding alternative routes that are available. It cannot be presumed, however, that an aircraft which is projected to encounter an ash cloud will be provided with the most desirable route to avoid the cloud. 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.

The NOTAM for volcanic activity (and the ASHTAM) 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 issued by the ACC 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 (or ASHTAM) also provides information on the location, extent and movement of the ash cloud and the air routes and flight levels affected. The NOTAM can also be used to close the airspace affected by the volcanic ash cloud. Complete guidance on the issuance of the 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 (and ASHTAM) be cancelled as soon as the volcano has reverted to its normal pre-eruption status, no further eruptions are expected by vulcanologists and no ash cloud is detectable or reported from the FIR concerned.

It is essential that the procedures which the ACC personnel should follow during a volcanic eruption/ash cloud event described in the foregoing paragraphs are translated into the local staff instructions (adjusted as necessary to take account of local circumstances). It is also essential that these procedures/instructions form part of the basic training for all air traffic services 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 U.S. Smithsonian Institution and sent free of charge to ACCs/FICs requesting it.

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