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VOLCANIC ASH CONTINGENCY PLAN OF THE AIR NAVIGATION SERVICES OF ECUADOR

1. INTRODUCTION

Pollution caused by volcanic ash poses a hazard to the safety of air operations. The mitigation of the hazards caused by volcanic ash in the atmosphere and/or at the aerodrome cannot be done in isolation, but through collaborative decision-making of all the technical areas involved, such as the Aeronautical Information Services (AIS) and Aeronautical Meteorology (MET). During an eruption, volcanic pollution can reach and exceed the cruising levels of turbine-powered aircraft in a matter of minutes and cover large geographical areas within a few days.

The presence of volcanic ash can cause a number of hazards, including one or more of those listed below:

a) Malfunction or failure of one or more of the engines, resulting not only in the reduction or total loss of thrust, but also in the failure of electrical, pneumatic and hydraulic systems;

b) Blockage of pitot or static sensors, causing unreliable indications of aerodynamic speed and erroneous warnings;

c) Partial or total opacity of the windscreens;

d) Contamination of cabin air with smoke, dust and/or toxic chemicals that force crew to wear oxygen masks, affecting oral communications;

e) Erosion of the external and internal components of the aircraft;

f) Less efficient electronic cooling, resulting in a series of aircraft system failures;

g) The aircraft may need to be maneuvered in a manner that conflicts with other aircraft; and

h) Falling volcanic ash on a runway can degrade the braking performance of aircraft, especially if the volcanic ash is wet; and, in extreme cases, it can result in the closure of the tracks.

Volcanic ash can also affect the operation of aircraft at aerodromes, the fall of volcanic ash at an aerodrome, even in small quantities, can cause the closure of the airfield until all deposited ash has been removed.

In extreme cases, aerodromes could become completely inoperative causing repercussions on Air Traffic Management (ATM) that would have to direct aircraft traffic to alternative aerodromes.

2. OBJECTIVE

Establish the actions and procedures to be followed in case of contingencies related to volcanic activity that cause ash emission that affect the operation of aircraft, causing temporary closures of airspace and restrictions on certain routes and / or affected areas, with the consequent reduction of the operational capacity of air traffic services.

3. SCOPE

Applicable to all operational positions of the Guayaquil Area Control Center, Approach Control Offices and affected Control Towers, Meteorological Surveillance Office and International NOTAM Office, as well as to operational personnel who are working in said dependencies.

4. REFERENCE DOCUMENTATION

Annex 3	-	Meteorological Service for International Air Navigation
Annex 6	-	Aircraft operation;
Annex 19	-	Safety management;
Doc. 4444	-	Procedures for Air Navigation Services (PANS) – Air Traffic Management;
Doc. 9691	-	Manual on Volcanic Ash Clouds, Radioactive Materials and Toxic Chemicals;
Doc. 9766	-	Handbook on Monitoring Volcanoes in International Airways – Operational Procedures and Checklist;
Doc. 9974	-	Flight Safety and Volcanic Ash – Risk Management of Flight Operations Known or Predicted to Be Contaminated by Volcanic Ash;
LAR 153	-	Aerodrome Operations;
Regulation 203	-	Air Navigation Meteorological Service;
Regulation 211	-	Air Traffic Services;
Regulation 215	-	Aeronautical Information Service;

Volcanic Ash Contingency Plan for the ICAO South American Region (VACP/SAM); and
Template of the Contingency Plan on Volcanic Ash of Air Traffic Management (ATM) prepared by the IVATF.

5. GLOSSARY OF TERMS

5.1 DEFINITIONS

Aerodrome meteorological office. An office designated to provide meteorological service for aerodromes to the service of air navigation

Aeronautical weather station. A station designated for meteorological observations and reports for use in international air navigation

Affected area. Volume of airspace, airfield or other area on the ground, identified by VAA (Volcanic Ash Warning) / (Volcanic Ash Warning Graphic Format) and/or SIGMET as a place where volcanic ash cloud contamination is known or forecast.

AIRMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of low-level aircraft operations and which was not already included in the forecast issued for low-level flights in the flight information region concerned or sub-area thereof.

Air-report. A report from an aircraft in flight prepared in conformity with requirements for position, and operational and/or meteorological reporting.

Air traffic flow management. A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.

Air traffic management. 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.

Air traffic management system. A system that provides ATM through the collaborative integration of humans, information, technology, facilities and services, supported by air and ground- and/or space-based communications, navigation and surveillance.

Air traffic services. A generic expression that applies, as the case may be, to flight information, alert, air traffic advice, air traffic control services (area control, approach control or aerodrome control services).

Air traffic services Unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Area control center. A unit established to provide air traffic control service to controlled flights in the control areas under its jurisdiction.

Cloud of volcanic ash. The totality of the material ejected from a volcano into the atmosphere and transported by winds at height. It consists of volcanic ash, gases and chemicals.

Danger area. An airspace of defined dimensions in which hazardous activities for the flight of aircraft may be deployed at certain times.

> ***NOTE. –*** *In the context of volcanic ash cloud pollution, Danger area is the volume of airspace identified by NOTAM as affected by known or predicted levels of volcanic ash cloud pollution that States consider should be reported to operators.*

Flexible use of airspace. Airspace management concept based on the principle that airspace should not be designated as exclusively military or civilian, but as a continuous space in which the requirements of all users are met to the fullest extent possible.

Flight information region. An airspace of defined dimensions within which flight information and alerting services are provided.

Meteorological office. An office designated to provide meteorological service for international air navigation.

NOTAM international office. An office responsible for collecting and disseminating information NOTAM and ASHTAM for the entire territory and airspace covered by the FIR/UIR.

Pollution area. Information on areas of volcanic ash observed and/or forecast in the atmosphere is provided through appropriate MET messages, in accordance with Regulation 203 – Air Navigation Meteorological Service.

Prohibited area. An airspace of defined dimensions over the territory or waters under the jurisdiction of a State, within which the flight of aircraft is prohibited.

Restricted area. An airspace of defined dimensions over the territory or waters under the jurisdiction of a State, within which the flight of aircraft is restricted, in accordance with certain specified conditions.

SIGMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather and other phenomena in the atmosphere that may affect the safety of aircraft operations.

Volcanic ash. Composed of minerals characteristic of volcanic eruptions. The characteristic minerals of most volcanic ash are silica and minor amounts of aluminum oxides, iron, calcium and sodium. The vitreous material of silicate is very hard and extremely abrasive. Its melting point is below the temperature of the jet motor burner, which implies additional risks.

Weather information. Weather report, analysis, forecast, and any other statements regarding existing or anticipated weather conditions.

Weather report. Declaration of observed meteorological conditions in relation to a given time and place.

5.2 ABBREVIATIONS AND ACRONYMS

AAC	Civil Aviation Authority
ACC	Area Control Center
AD	Aerodrome
AIP	Publication of aeronautical information
AIREP	Air-report
AIS	Aeronautical Information Service
ANSP	Air Navigation Service Provider
ASHTAM	Special NOTAM series reporting a change in volcano activity, volcanic eruption and/or volcanic ash cloud that is of importance to aircraft operations.
ATC	Air traffic control
ATCO	Air traffic controller
ATFM	Air traffic flow management
ATM	Air traffic management
ATS	Air traffic services
CDM	Collaborative Decision Making
FMU	Air Traffic Flow Management Unit
FIR	Flight information region
IAVW	International airways volcano watch
IVATF	ICAO International Task Force on Volcanic Ash
LOA	Letter of agreement
MET	Meteorology
NOF	NOTAM International Office
NOTAM	Notice to airmen
OVM	Meteorological Watch Office
PANS ATM	Procedures for Air Navigation Services
SAM	ICAO South American Region
SARPS	Standards and Recommended Practices
SIGMET	Information relating to en-route weather events that may affect the safety of aircraft operations

SMS	Security Management System
SRA	Safety Risk Assessment
VAA	Volcanic ash advisory
VAAC	Volcanic ash advisory centre
VACP/ANS-EC	Volcanic ash contingency plan of the Air Navigation Services of Ecuador
VACP/SAM	South American Region Volcanic Ash Contingency Plan
VAG	Volcanic ash advisory information in graphical format
VAR	Notification of volcanic activity from an aircraft (the real-time part of the VAR is issued in the same way as a special AIREP)
VOLCEX	ICAO regular volcanic ash exercises to validate and improve regional volcanic ash contingency plans and procedures
VONA	Notification from the Volcanoes Observatory for Aviation
WAFC	World Area Forecast Center

6. DECLARATION OF A DANGER AREA DUE TO VOLCANIC ACTIVITY

If it is considered that the volcanic event could be a hazard to aviation, a danger area can be declared by NOTAM. The considerations for determining the danger area are described in 8.1.1, 8.2.1 and 8.3.1.

Normally, permits will not be granted to cross the danger area unless explicitly requested by the flight crew. Therefore, within this context, the final decision as to the route, whether to avoid or traverse an area of volcanic activity and therefore the responsibility for the safety of the aircraft lies with the flight crew.

7. PHASES OF A VOLCANIC EVENT

The response to a volcanic event affecting air traffic has been divided into four well-defined phases:

Pre-Eruption Phase
Eruption Onset Phase
Eruption Phase in Progress
Recovery Phase

7.1 **PRE-ERUPTION PHASE** (where applicable)

The initial response, "sounding the alert," begins when a volcanic eruption is predicted to occur. SIGMET, ASHTAM and NOTAM messages will be issued and immediately relayed to the affected aircraft in flight.

It is worth mentioning that, sometimes, volcanoes erupt unexpectedly, without any warning having been issued, so the pre-eruption phase can be omitted.

7.2 **ONSET OF ERUPTION PHASE** (where applicable)

The eruption phase begins at the time the volcanic eruption begins and volcanic ash enters the atmosphere, and involves mostly aircraft in flight. SIGMET and ASHTAM messages will be issued, and a danger area will be declared by NOTAM. Normally, authorizations will not be issued to cross the danger area unless explicitly requested by the flight crew.

7.3 ERUPTION PHASE IN PROGRESS

The ongoing eruption phase begins at the time of the first volcanic ash warning (VAA) with information on the extent and movement of the volcanic ash cloud, after completing the previous reactive responses. SIGMET, ASHTAM and NOTAM messages will be issued.

7.4 RECOVERY PHASE

The recovery phase begins with the issuance of the first VAA containing a statement of "NO VA EXP" (i.e., "no volcanic ash is expected"), which normally occurs when it is determined that volcanic ash is not expected to occur in the atmosphere and volcanic activity has returned to its pre-eruption state.

While the four phases describe the actions to be taken during a real volcanic event, these are based on a theoretical scenario. The actual eruptions may not always be so clearly differentiated with respect to the ATM actions to be adopted. Likewise, a rash may occur without any activity prior to the eruption, or it may stop and restart more than once.

Therefore, the first observation may be the presence of an ash cloud that is already at some distance from the volcano.

Flight crews must report their observations of volcanic activity by means of a special air-report (special AIREP). Arrangements should be made to ensure the prompt transfer of such information to the appropriate aeronautical institutions responsible for subsequent actions.

8. DESCRIPTION OF THE PHASES AND ACTIVITIES TO BE CARRIED OUT

8.1 PRE-ERUPTION PHASE

When planning flight operations in areas susceptible to volcanic eruptions, ATS units can expect to receive the Volcanic Activity Report (VAR) form from flight crews.

In general, aircraft pilots are a source of information of an eruption, except in those cases where there is an established system of volcanological monitoring, for this reason, pilots operating in areas with unmonitored volcanoes should always remain alert to those signs that could indicate an eruption and also understand the importance of their role as information providers.

The initial “alert" response begins when there is a presumption of a volcanic eruption or when it occurs unexpectedly, the source of such information may come from pilots (AIREP/VAR) and/or meteorological or volcanological agencies (VONA).

Air Traffic Management, Aeronautical Meteorology Management and Aeronautical Information Management should ensure the immediate dissemination of alert information to affected aircraft in flight or through SIGMET, NOTAM, ASHTAM or AIREP retransmission, as appropriate, by the most expeditious means possible.

This phase focuses on alerting aircraft to a potential hazard and protecting them from the hazards inherent in the eruption itself, aircraft are expected to release or avoid the affected area according to standardized operating procedures, this alert will be the initiator of actions, such as collecting additional data and preparing specific safety risk assessments.

8.1.1 Actions of the ACC

In the event of significant pre-eruptive volcanic activity, an ongoing eruption or a reported volcanic ash cloud that could pose a hazard to aviation, the area control center (ACC) receiving the information should take the following actions:

a) Inform the partner MET provider, in accordance with national/regional arrangements (unless such provider was the originator of the initial notification), and the NOF;

b) It will be ensured that the generation of MET (SIGMET) and AIS (NOTAM/ASHTAM) messages are appropriate, these must provide accurate information about the activity of the volcano, as soon as it is available, it is imperative that this information is issued by the Meteorological office watch and the International NOTAM Office, and disseminated as soon as possible;

c) Define a danger area, the size of this danger area shall comprise a reasonable volume of airspace in accordance with available information, seeking to avoid unnecessary disruption of flight operations, as follows:

i. If the eruption has not started or if no information is available on the wind at height, the danger area shall be defined as a circle of radius of 222 km (120 NM) centered on the place of origin of the volcanic activity, the purpose being to ensure the operational safety of flights in the absence of a prediction by a competent authority as to the extent of contamination. (See Figure 1).

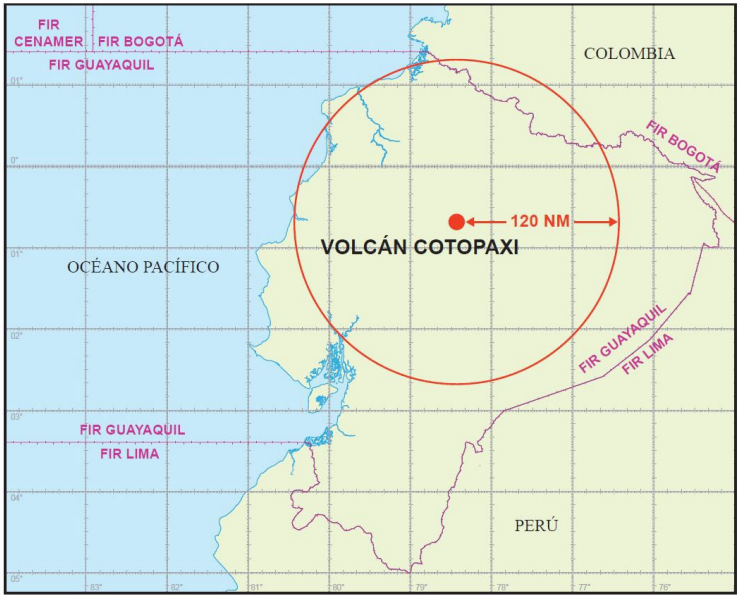

Figure 1. Danger area: 120 NM circle

ii. If more information is available (wind forecast, pilot report, etc.), the danger area should be defined by a circle of radius 111 km (60 NM), centered on the place of origin of the volcanic activity. (See Figure 2).

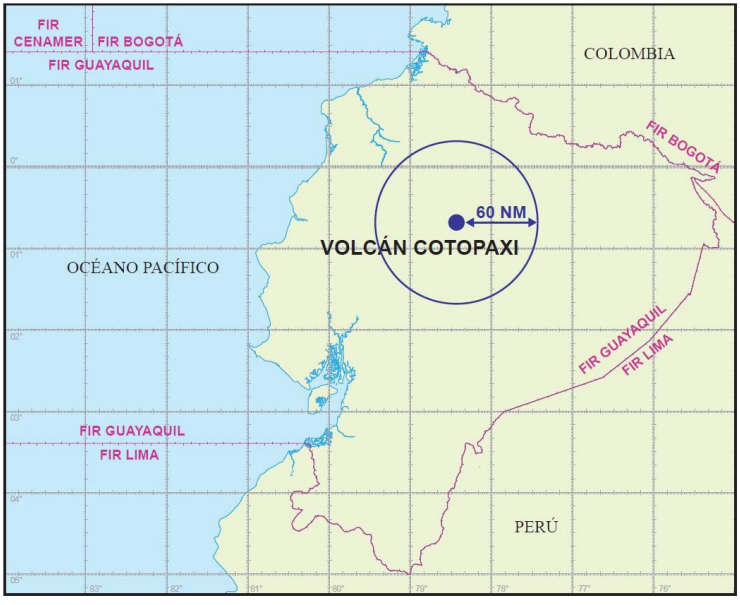

Figure 2. Danger area: 60 NM circle

d) To immediately relay to the pilots of those aircraft that could be affected, by means of a general call, all available information so that they are situationally aware of the horizontal and vertical extent of ash-contaminated airspace;

e) If required, suggest appropriate route changes to assist flights in avoiding areas of known or predicted contamination;

f) Request a special aero-notification when the flight path leads the aircraft to or near the predicted ash cloud and send such special air-report to the appropriate agencies;

g) The ATC must not issue authorizations for the entry or operation of aircraft in a danger area, aircraft must be provided with the necessary assistance to leave a danger area as expeditiously as possible, it is the responsibility of the pilot-in-command to determine the safest course of action;

h) If an aircraft has notified an ATS unit that it has entered an area contaminated with volcanic ash, the ATS unit shall:

i. Consider that the aircraft is in an emergency situation;

ii. Not initiate modifications to the assigned route or level, unless requested by the flight crew or necessary due to airspace requirements or traffic conditions;

iii. Do not initiate vector guidance without the consent of the pilot; and

iv. Experience has shown that the escape maneuver recommended for an aircraft that has had an encounter with a volcanic ash cloud is to reverse course and begin the descent (terrain permitting), however, the ultimate responsibility for that decision lies with the pilot.

i) Immediately notify the other Control Centers (adjacent ACCs, APP offices and control towers) about the phenomenon, informing the location and dimensions of the danger area, and must also carry out new coordination and reroute, if necessary, those flights previously coordinated but still in the adjacent flight information regions. It will inform adjacent ACCs about the phenomenon and will also require the re-routing of flights that have not yet been coordinated to keep them out of the danger area. It should be noted that flight crews may decide not to avoid the area in its entirety, based, for example, on visual observations; and

j) If necessary, take flow management measures to maintain the required level of security.

8.1.2 Actions of the Flow Management Unit - ATFM

The ATFM unit will determine how its initial communications will take place based on pre-existing bilateral agreements. From the moment of receipt of information on volcanic activity from the different ATS Units, the ATFM unit must initiate actions according to its procedures to ensure the exchange of information in support of air navigation service providers, OVM, VAACs and aircraft operators involved.

8.1.3 Actions of the Meteorological Watch Office - OVM

a) Upon receipt of information on volcanic activity and/or the existence of volcanic ash, the OVM shall:

i. Issue a SIGMET volcanic ash alert message with a validity period of 6 (six) hours, include SADIS, international OPMET databases, and the Brasilia regional OPMET database in the SIGMET address;

ii. Maintain continuous coordination with the ACC to ensure consistency in the issuance and content of SIGMET;

iii. Coordinate with the volcanological agency the issuance of the VONA, if you have not yet received it;

iv. Notify designated VAAC members of relevant details about the eruption;

v. Notify the ACC, as soon as possible, if the volcanic ash cloud can be identified through meteorological satellite images/data and, if so, provide regular information on the horizontal and vertical extent of the cloud and its trajectory.

b) In the event that an OVM becomes aware of the occurrence of pre-eruptive activity, a volcanic eruption or the presence of an ash cloud through any other source, such information shall be immediately transmitted to the ACC.

c) In the event that any other meteorological office becomes aware of the occurrence of pre-eruptive activity, a volcanic eruption or the presence of an ash cloud through any other source, such information shall be immediately transmitted to the OVM for retransmission to the ACC and the appropriate VAAC.

8.1.4 Actions of the International NOTAM Office - NOF

a) In the case of volcanic activity prior to an eruption, a developing volcanic eruption, or a volcanic ash cloud in the Guayaquil FIR, the NOF shall issue an ASHTAM and/or NOTAM for the volcanic activity, based on the information provided by the ACC Guayaquil and/or the OVM.

b) Must be included in the ASHTAM and/or NOTAM address list for volcanic activity, associated OVM and the VAAC responsible for the FIR Guayaquil: KWBCYMYX and EGZZVANW.

8.2 START OF THE ERUPTION PHASE

This phase begins when a **volcanic** eruption begins, with the ejection of volcanic ash into the atmosphere. The focus of these processes is to protect aircraft in flight and airfields from the hazards of eruption, collect relevant information and transform available information about the volcanic ash cloud (horizontal and vertical extent, etc.) into reliable and accurate information.

The information for the start of this phase can come from pilots (AIREP/VAR), the MET provider or volcanologies (VONA/SIGMET).

In addition to the relevant actions described under the pre-eruption phase, the main actions of the eruption initiation phase are:

a) Issuance of an eruption-onset SIGMET;

b) Issuance of a NOTAM and/or ASHTAM to start the eruption; and

c) The provision of information and assistance to in-flight traffic.

As appropriate, danger areas will be notified through a NOTAM and/or ASHTAM, this phase will continue until the eruption phase in progress is activated.

8.2.1 Actions of the ACC

The ACC shall inform flights of the existence of the volcanic ash cloud, its extent, the forecast of displacement and provide useful information for the safe conduct of flights.

Air traffic rerouting should begin immediately or could be in progress if the volcanic alert phase allows sufficient time.

The ACC shall assist in rerouting aircraft around danger areas as quickly as possible.

Adjacent CCAs should also take into account the danger area and provide similar assistance to aircraft, as early as possible.

While ATC will not normally initiate an authorization to pass through a danger area, it will inform aircraft of the hazard and continue to provide services as normal. Aircraft are expected to attempt to stay away from the danger area, however it is the responsibility of the pilots in command to determine the safest course of action.

The Area Control Center (ACC) should perform the following actions:

a) Maintain close liaison with the Meteorological Unit, which shall issue a SIGMET message of the onset of a volcanic eruption by the fastest possible means. It can simply report that an ash cloud has been reported, the date/time and its location. The SIGMET of volcanic eruption onset can also be promulgated by a VAA. During this phase, information about the extent and severity of the volcanic event may be limited; however, where possible, the message should contain information on the extent and predicted displacement of ash according to appropriate sources of information;

b) ATFM measures should be reviewed and updated where necessary, in the light of forecasts and cooperation with Aircraft operators (CDMs) and adjacent ACCs, for the safe conduct of air operations;

c) It shall be ensured that a NOTAM has been originated to define a danger area such that it comprises a volume of airspace in accordance with the available information. Information on winds at altitude should be taken into account in determining the area (See 8.1.1, c), ii).

d) Based on the delimitation of the safety zone, it will provide for the restriction of airways that are compromised or contaminated by ash, determining exactly the sections of closed or restricted airways and the flight levels affected. This information will be forwarded to the office NOTAM international (NOF) within 15 minutes after receipt of the SIGMET, for the immediate issuance of the corresponding ASHTAM and / or NOTAM.

   The airway restriction will be determined in the first instance, based on the ash reports and the pilots outside wind report (AIRMET), as well as wind reports/forecasts provided by the OVM. Identifying the sections of airways that are in an area of 45° on each side of the axis of the reported or forecasted wind direction and defined by a circle of radius 111 km (60 NM), centered on the place of origin of volcanic activity. (See Figure 3).

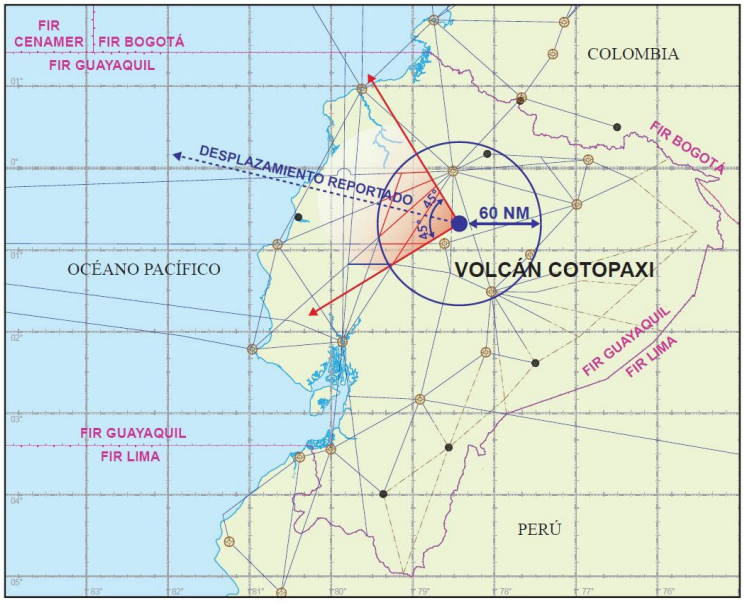

Figure 3. Determination of contaminated airways

e) Ensure that differences found between published information and observations (pilot reports, atmospheric measurements, etc.) are forwarded as soon as possible to the appropriate authorities to ensure their dissemination to all involved.

f) Planning of the CDM for the ongoing eruption phase shall be initiated in conjunction with the aircraft operators, the appropriate ATFM unit and the ATS Units involved.

8.2.2 Actions of the ATFM Unit

During the beginning of the eruption phase, depending on the impact and/or extent of the volcanic ash, the appropriate ATFM unit shall organize with the VAAC, the Air Navigation Service Providers, the OVMs and the Operators involved, the exchange of the latest available information on the evolution of the same to support the CDM and communicate to the Regional or Interregional ATFM units that correspond the updated information available.

8.2.3 Actions of the Meteorological Watch Office - OVM

a) Upon receipt of information on a volcanic eruption, the OVM shall:

i. Issue a SIGMET volcanic eruption message with a validity period of 6 (six) hours;

ii. Maintain continuous coordination with the ACC to ensure consistency in the issuance and content of SIGMET;

iii. Coordinate with the Geophysical Institute the VONA emission;;

iv. Notify Washington VAACs of relevant details about the eruption;

v. Notify the ACC, as soon as possible, if the volcanic ash cloud can be identified through meteorological satellite images/data and, if so, provide regular information on the horizontal and vertical extent of the cloud and its trajectory.

b) In the event that an OVM becomes aware of the occurrence of a volcanic eruption or the presence of an ash cloud through any other source, such information shall be immediately transmitted to the ACC.

8.2.4 Actions of the NOTAM International Office - NOF

a) In the event of a developing volcanic eruption, the NOF shall issue an ASHTAM and/or NOTAM for volcanic activity, based on information provided by the ACC Guayaquil and/or OVM; and

b) It must be included in the list of addresses of ASHTAM or NOTAM related to volcanic activity, associated OVM and the VAAC responsible for the FIR Guayaquil: KWBCYMYX and EGZZVANW.

8.3 ERUPTION PHASE IN PROGRESS

The ongoing eruption phase begins with the issuance of the first VAA/(Volcanic Ash Warning/Volcanic Ash Advisory Information in graphical format) by the Washington VAAC.

The VAA/will contain the current position of the volcanic ash and the forecasts of the vertical and horizontal extent of the volcanic ash cloud and its expected displacement at intervals of 6 (six) hours, from T+0 to T+18 hours. When the volcanic ash cloud is expected to move considerably during the 6-hour period, SIGMET messages should be emitted at shorter intervals than established.

Volcanic ash cloud forecasts at T+6, T+12 and T+18 hours and the greater the forecast extension (if available) are used for the elaboration of the NOTAM/ASHTAM.

Volcanic ash cloud forecasts and/or VAA/may include (if available) quality indicators (e.g., certainty, variability, etc.).

Volcanic ash can affect any combination of airspace; For this reason, it is impossible to establish measures for each particular situation. Nor is it possible to detail the actions to be taken by each ATS Unit. The following guidance may be useful during the ongoing eruption phase but should not be considered mandatory:

a) Depending on the impact and/or extent of the volcanic ash, the relevant ATFM unit may take the initiative of organizing teleconferences with the VAAC, Air Navigation Services, Meteorological Offices, volcanological agencies and Operators involved to exchange the latest information on the development of the event, in contribution to the CDM;

b) During this phase, VAAC should try to calculate the vertical extension of the ash area and provide the appropriate VAA/to enable the contaminated airspace to be defined as precisely as possible. For flight planning purposes, Operators should ensure that their aircraft fly over the horizontal and vertical boundaries of the danger area as if operating over mountainous terrain. Operators shall be warned of the risk of cabin depressurization or engine failure resulting in the inability to continue to maintain the level of flight, especially in the case of long-range operations with twin-engine aircraft; and

c) Any differences between published information and observations (pilot reports, atmospheric observations, etc.) should be forwarded as soon as possible to the appropriate authorities.

8.3.1 Actions of the ACC

ATS dependencies affected by ash displacement should ensure that NOTAM/ASHTAM continues to originate at appropriate intervals. The ATS Units involved and the ATFM Units should continue to publish details concerning the measures taken to ensure their distribution to all involved.

The area control center (ACC) should additionally redefine the danger area based on the VAAC report, this danger area could be defined by a polygon containing the area covered by the ash displacement; The size of this danger area should comprise a reasonable volume of airspace, trying to avoid unnecessary restrictions and disruption of air operations in uncontaminated areas. (See Figure 4).

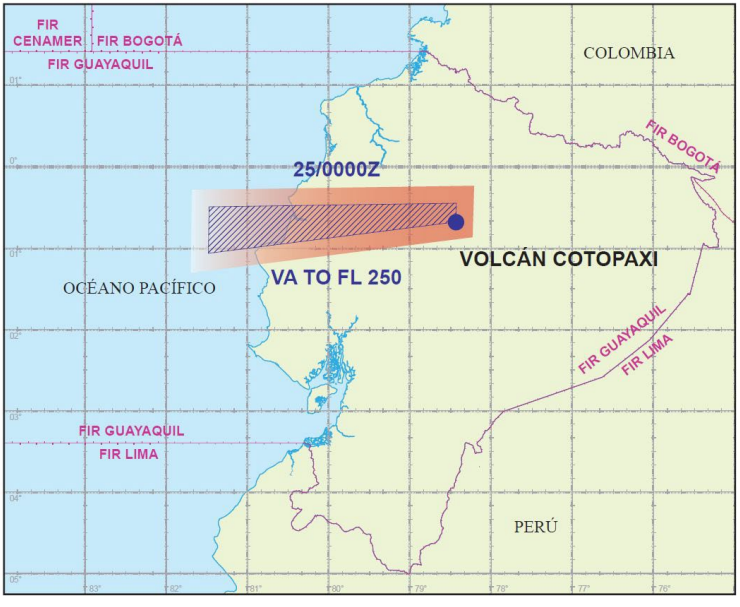

Figure 4. Danger area: Polygon

8.3.2 Actions of the ATFM Unit

Depending on the impact and/or extent of the volcanic ash, and for the purposes of supporting the CDM, the relevant ATFM unit should organize with the VAAC, ANSP, OVM and Operators involved, exchanging the latest available information on the volcanic event.

The ATFM unit will apply measures corresponding to the requirement of the ANSP involved, these measures must be reviewed and updated according to the most recent information.

The ATFM unit should also take into consideration civil-military coordination to implement the concept of Flexible Airspace (FUA) that allows the temporary use of alternative routes that normally cross restricted airspaces, thus preventing aircraft from undertaking long distances to avoid them.

8.3.3 Actions of the Meteorological Watch Office - OVM

a) Continue to issue SIGMET messages of volcanic eruption with a validity period of 6 (six) hours;

b) Maintain continuous coordination with the ACC to ensure consistency in the issuance and content of SIGMET;

c) Regularly provide the ACC with information on the horizontal and vertical extension of the cloud and its trajectory; and

d) In the event that an OVM becomes aware of information relevant to the volcanic eruption or the presence of an ash cloud through any other source, such information shall be immediately transmitted to the ACC.

8.3.4 Actions of the International NOTAM Office - NOF

a) The NOF shall continue to issue ASHTAM and/or NOTAM for volcanic activity, based on information provided by the ACC Guayaquil and/or OVM; and

b) Must be included in the ASHTAM or NOTAM address list for volcanic activity, associated OVM and the VAAC responsible for the FIR Guayaquil: KWBCYMYX and EGZZVANW.

8.4 RECOVERY PHASE

The recovery phase begins with the issuance of the VAA/VAG indicating that the airspace is no longer contaminated by volcanic ash or the first VAA/VAG containing the statement "NO FURTHER ADVISORY" which normally occurs when it is determined that volcanic activity has returned to its pre-eruption state and the airspace is no longer contaminated with volcanic ash.

Consequently, the corresponding SIGMET/NOTAM messages should be issued.

Control Units and ATFM units should return to normal operations as soon as possible.

8.4.1 Actions of the Meteorological Watch Office – OVM

a) Issue the cancellation SIGMET based on Washington VACC information.

8.4.2 Actions of the International NOTAM Office - NOF

a) ASHTAM or NOTAM should be cancelled, in consultation with the ACC, as soon as the airspace is deemed not to be contaminated by volcanic ash; and

b) Must be included in the ASHTAM or NOTAM address list for volcanic activity, associated OVM and the VAAC responsible for the FIR Guayaquil: KWBCYMYX and EGZZVANW.

9. RESPONSE TO VOLCANIC ASH EMERGENCIES AT AIRFIELDS

In LAR 153 – paragraph 153.550 – Control of volcanic ash emissions of said regulation it is established that:

a) The Aerodrome Operator must prepare a contingency plan for the control of volcanic emissions which must be developed as established in Appendix 2 - Emergency Response, Part III – Volcanic Ash Emergencies of this Regulation and that is acceptable to the AAC in order to guarantee operational safety at the aerodrome;

b) The contingency plan for the control of volcanic emissions should include procedures before, during and after the natural event to protect:

1) Aircraft in flight;
2) Aircraft on the ground;
3) Fuel tanks;
4) Land vehicles;
5) Aeronautical infrastructure including:
   i. Radio aids;
   ii. Communications;
   iii. Runways, taxiways, platforms, terminals;
   iv. Ramp equipment; and
   v. Electric power service, power plants, drinking water.

c) In case of a need to issue a NOTAM and/or ASHTAM regarding the fall of volcanic ash on an aerodrome, the following guidelines are suggested:

1) In cases where a forecast of imminent ash fall is available, a NOTAM and/or ASHTAM should be issued indicating the estimated period of time for the ashes to reach the aerodrome;

2) A NOTAM and/or ASHTAM must be issued when ash reaches an airfield or begins to accumulate on the ground at an airfield. NOTAM and/or ASHTAM must report whether the aerodrome is still open for air operations;

3) A new NOTAM and/or ASHTAM must be emitted every 4 hours, while ash fall is occurring or is present in the air at the aerodrome. If a friction test of the track surfaces has been carried out, the value and time in which the test was carried out must be informed; and

4) A final NOTAM and/or ASHTAM must be issued when clean-up activities have been completed and operations have resumed.

Since volcanic ash falls on an aerodrome, close coordination between the NOF and the aerodrome meteorological office (OMA) in its area of responsibility is recommended in relation to the issuance of such warnings.

10. COMMUNICATION AND DISSEMINATION OF PILOT REPORTS ON VOLCANIC ACTIVITY

10.1 PURPOSE OF REPORTING AND COLLECTING DATA ON VOLCANIC ASH

The main purpose of reporting and collecting data on volcanic ash is:

a) Define the location of volcanic hazards;

b) Immediately notify other aircraft (in flight) of the hazard;

c) Notify other interested parties (ANS (TC, MET, AIS, ATFM), VAAC, etc.), in order to ensure a consistent production of appropriate information and notices, in accordance with existing provisions;

d) Analyze reports collected in the post-flight phase in order to:

i. Identify areas of concern;
ii. Validate and improve volcanic ash dispersion forecasts;
iii. Improve existing procedures;
iv. Contribute to the definition of better airworthiness requirements; and
v. Share lessons learned, etc.

10.2 PHASE OF OPERATIONS

The roles and responsibilities of the participants in the collection, exchange and dissemination of volcanic information are clearly differentiated into two distinct phases:

a) In flight; and
b) Post-flight.

10.3 PARTICIPANTS IN THE NOTIFICATION PROCESS, THEIR ROLES AND RESPONSIBILITIES

The identification of participants, as well as their roles and responsibilities in general, but, specifically, during the two distinct phases of operations (in-flight, post-flight), is an important element in improving the collection, exchange and dissemination of volcanic information.

The number of participants and their roles and responsibilities depends on the operations phase, their position in the information chain within one of the two phases and national/regional arrangements.

One of the main issues with regard to the roles and responsibilities of the participants is that each of them, at one time or another, are both data/information providers and users of the information.

10.3.1 In-flight phase

	Participants	Roles and responsibilities
1	Pilots, civilian and/or military, observing and/or encountering volcanic activity	Provide information, as detailed as possible, about the type, position, color, odor, dimensions of volcanic contamination, level and time of observation, and immediately send the VAR Part I to the ATS unit with which the pilot is in radiotelephone (R/T) communication. Record the information required by the VAR Part II in the appropriate form as soon as possible after the observation or encounter, and submit the report via data link, if available, or by any available means authorized and disseminated by the civil aviation authority of the State.
2	ATS unit that receives the information of the pilot who has found the volcanic event	Ensure that pilot information received by an air traffic controller has been listened to, clarified (if necessary) and disseminated to other pilots as well as the ACC supervisor. Air traffic controllers may also ask other pilots who are flying within the same area if they have observed any volcanic activity.
3	The supervisor of the ATS/ACC unit (as applicable) or other responsible person within the air navigation service provider	Use all available means of communication and forms to ensure that the information received from the air traffic controller has been: - Transmitted to partner meteorological organizations and VAAC in accordance with national/regional arrangements; - Disseminated completely and immediately to the entire organization, especially to the adjacent sectors and to the associated NOTAM office (NOF). - Transmitted to neighboring sectors and ACCs (if necessary); - Transmitted to the ATFM regional center, if any. - Transmitted to the national/regional authority responsible for handling contingency situations. ***Note:*** *Order is subject to what the State deems appropriate.*

4	Neighboring ANSP (ACC, etc.)	Ensure that the information is provided to flight crews flying to the area affected by volcanic contamination and disseminated through the organization; that the system is prepared to deal with possible changes in traffic flows; and that the information be provided to the national authority responsible for handling contingency situations and then transferred to the NOF and OVM, as required.
5	MET Surveillance Office	Use the information originated by the flight crews and re-sent by the ATS unit that received the information, in accordance with Annex 3.
6	VAAC	Use information originating from flight crews, OVMs and other competent sources, in accordance with Annex 3.
7	AIS/NOF	Publish the appropriate AIS messages, in accordance with Annex 15.
8	ATFM unit or center (if any)	Ensure that the information received is stored and available to all partners in their area of responsibility (ANSP, airlines, VAAC, MET, etc.). As part of the daily activity, coordinate ATFM measures with the ACCs involved.

10.3.2 Post-Flight Phase

	Participants	Roles and responsibilities
1	Pilots, civilian and/or military, observing and/or encountering volcanic activity	Present the volcanic ash report with as much detailed information as possible about volcanic activity and/or encounter (position, color, smell, dimensions, flight level, time of observation, impact on flight, etc.). Ensure that the VAR is presented and transmitted to the relevant recipients as soon as possible after landing (in case it has not been presented via data link during the flight). Make an entry in the Aircraft Maintenance Record (AML) in case of an actual encounter or suspected encounter with volcanic contamination.
2	ANSP	Provide a summary report of the effects of volcanic activity on its operations at least once a day to the national authority, with as much detailed information as possible about the number of encounters, their impact on air traffic management, etc.).
3	AOC Maintenance - Post-Flight Inspection	Report on the observation of the surfaces, engine, etc. of the aircraft and provide the information to the central data repository at national (or regional or global, as the case may be) level.
4	Investigating Authority	All aeronautical service providers (including operators, ANSPs, airports, etc.) should investigate the effects of volcanic activity, analyze information and draw conclusions; and report the results of the investigation and relevant information to the national supervisory authority and any central data repository.
5	National authority	Manage the central data repository at the national level and notify the central data repository at regional/global level, if any. Analyze the notifications of your aeronautical service providers and adopt the necessary actions.

6	Central data repository at regional level	Collect national data and make them available to interested stakeholders, under agreed conditions.
7	OVM	Use national and regional information from central data repositories at national and regional levels.
8	VAAC	Use information originating from flight crews and other competent sources to: a) Validate their products; and b) Improve prognosis.
9	Global data repository (and research institutes – as appropriate)	Analyze the information stored in the central data repository at the regional level, and provide the results of the research to feed the process of lessons learned
10	Knowledge management (e.g., SKYbrary)	Use lessons learned in the post-flight phase and disseminate them to stakeholders
11	OACI	Review/modify ATM contingency plans for volcanic ash

10.4 Tools for presenting and sharing information on volcanic ash

Different types of tools can be used to notify, transmit and disseminate information about volcanic ash encounters.

The following list aims to give an idea of the tools that can be used, these could be divided into regulatory and general information tools.

In any case, it is not an exhaustive list, and can be updated with new elements, depending on regional experiences:

a) Radiotelephony and data link communications;
b) VAR;
c) NOTAM/ASHTAM;
d) SIGMET;
e) VAA/VAG;
f) Central data repository; for example, the Network Operations Portal CFMU *(Network Operations Portal - NOP);*
g) Centralized portals with regularly updated information and maps, such as: EVITA - http://www.eurocontrol.int/services/evita-european-crisis-visualisationinteractive-tool-atfcm;

h) Teleconferencing;
i) Periodic newsletters with information defined by data providers and users; for example, the Smithsonian Institution's Weekly Newsletter Smithsoniano *(Smithsonian Institution Weekly Bulletin);*
j) Up-to-date reports of volcanic activity issued by weather stations;
k) Centralized internet portals to share lessons learned (Knowledge management for example SKYbrary http://www.skybrary.aero/index.php/Main_Page).

11. FORMATION OF THE VOLCANIC ASH CONTINGENCY COMMITTEE

The **"Volcanic Ash Contingency Committee"** is formed, for the **"activation"** of the contingency for volcanic activity and the corresponding application of the Contingency Plan in case of Volcanic Ash; This Committee shall be composed of the following officials:

- Coordinator of the Internal Management of Air Navigation Services;
- Zonal Manager of Air Traffic Management;
- Shift supervisor of the Guayaquil Area Control Center;
- Shift supervisor of the Meteorological Watch Office of Guayaquil; and
- Shift supervisor of the International NOTAM Office of Guayaquil.

The Coordinator of the Internal Management of Air Navigation Services, assumes functions as Director of the Contingency Committee and is responsible for the correct execution of this Contingency Plan, in order to guarantee the continuity, regularity and safety of air operations within the FIR/UTA Guayaquil.

The Contingency Committee's base of operations will be located in the SNA Air Navigation Services Building.
Avenida de las Américas S/N second floor
Guayaquil – Ecuador
Phones: 593 4 2925760 / 593 4 22925606
593 2 2947400 Ext. 2161 - 2132

The Guayaquil Area Control Center (ACC-Guayaquil) is located in the SNA Air Navigation Services Building.
Avenida de las Américas S/N.
Guayaquil - Ecuador
AFTN: SEFGZQZX
Phones: 593 4 2924219 / 593 4 2925495
593 2 2947400 Ext. 2130
REDDIG: 5060

The Office of Meteorological Surveillance of Guayaquil (OVM-Guayaquil) is located in the Building of Services for Air Navigation SNA.
Avenida de las Américas S/N.
Guayaquil - Ecuador
AFTN: SEGUMAMX
Phones: 593 4 2925782
593 2 2947400 Ext. 2116 - 2117

The International NOTAM Office of Guayaquil (NOF-Guayaquil) is located in the Building of Services for Air Navigation SNA.
Avenida de las Américas S/N.
Guayaquil - Ecuador
AFTN: SEGUYNYX
Phones: 593 4 2924940
593 2 2947400 Ext. 2135

ATTACHMENT A

ACTIVE VOLCANOES IN ECUADOR

There are volcanoes with active eruptive activity in Ecuador, the main ones are: Tungurahua Volcano, Cotopaxi Volcano, Reventador Volcano, Guagua Pichincha Volcano, Sangay Volcano and Sierra Negra Volcano.

At the beginning of an eruption phase, the airways affected according to the volcano that is in the eruptive process will be:

TUNGURAHUA VOLCANO

Coordinates	:	012805S 0782646W
Lower routes	:	W5, W23, W11, W13, W14, W29, W15, W16, W27, G675, W10, W24 and W30.
Higher routes	:	UW5 and UW23.
RNAV routes	:	UP533, UT5, UM674, UP408 and UM662

COTOPAXI VOLCANO

Coordinates	:	004059S 0782610W
Lower routes	:	G439, G426, G675, W9, W21, W25, W10, W23, W11., W13, W14, W29, W15, W16, W27, W11, W5, W6 and W1.
Higher routes	:	UW21, UW23, UW5, UW9, UW6 and UW1.
RNAV routes	:	UT21, UL318, UM328, UM674, UP533, UP778, UM795, UM662, UM776, UP408 and UT5

REVENTADOR VOLCANO

Coordinates	:	000448S 0773925W
Lower routes	:	G439, G426, G675, W9, W21, W22, W25, W11, W10, W23, W5, W6 and W1.
Higher routes	:	UW21, UW23, UW5, UW9, UW6 and UW1.
RNAV routes	:	UT21, UL318, UM328, UM674, UP533, UP778, UM795, UM662, UM776, UP408 and UT5

GUAGUA PICHINCHA VOLCANO

Coordinates	:	001016S 0783632W
Lower routes	:	G439, G426, G675, W9, W21, W25, W10, W23, W5, W29, W9, W6 and W1.
Higher routes	:	UW21, UW23, UW5, UW9, UW6 and UW1.
RNAV routes	:	UT21, UL318, UM328, UM674, UP533, UP778, UM795, UM662, UM776, UP408 and UT5

SANGAY VOLCANO

Coordinates	:	020007S 0782028W
Lower routes	:	W5, W29, W11, W23, W13, W14, W15, W16, W27, W30, A566, W24 and W12G.
Higher routes	:	UW23 and UW5.
RNAV routes	:	UM662, UT5, UM674, UP408, UM795 and UM665.

SIERRA NEGRA VOLCANO

Coordinates	:	004948S 0911012W
Lower routes	:	W21 y W26.
Higher routes	:	NIL
RNAV routes	:	NIL

ATTACHMENT B

SIGMET, NOTAM AND ASHTAM EXAMPLES

OMM Publication No. 386 Volume I (Global Telecommunication System Handbook) Part II (Operating Procedures for the Global Telecommunication System) you will find the guide on the World Meteorological Organization (OMM) headings referenced in the previous Eruption Phase.

NOTAM Offices are reminded that ASHTAM and/or NOTAM for volcanic ash shall be distributed via AFTN and/or AMHS to their associated OVMs, SADIS and all VAACs, in accordance with the regulations contained in ICAO Doc. 9766, Chapter 4 paragraph 4.3.

1. SIGMET.

FIRST SIGMET

SEFG SIGMET A1 VALID 131358/131958 SEGU-
SEFG GUAYAQUIL FIR VA ERUPTION MT REVENTADOR PSN S0004 W07739
VA CLD OBS AT 1240Z WI N0010 W07740 - S0004 W07739 - S0004 W07740 - N0009 W07747 - N0010 W07740 SFC/FL160 MOV N 10KT

SIGMET WITH PROJECTION

SEFG SIGMET A1 VALID 131358/131958 SEGU-
SEFG GUAYAQUIL FIR VA ERUPTION MT REVENTADOR PSN S0004 W07739
VA CLD OBS AT 1240Z WI N0010 W07740 - S0004 W07739 - S0004 W07740 - N0009 W07747 - N0010 W07740 SFC/FL160 MOV N 10KT
FCST AT 1830Z WI N0012 W07736 - S0005 W07739 - S0005 W07739 - N0012 W07743 - N0012 W07736=

2. NOTAM ALERTING ABOUT PRE-ERUPTIVE ACTIVITY

(A1234/23 NOTAMN
Q) SEFG/QWWXX/IV/NBO/W/000/999/0128S07827W020
A) SEFG B) 2302260830 C) 2302261100
E) INCREASE VOLCANIC ACTIVITY, POSSIBLY INDICATING IMMINENT ERUPTION, EPORTED FOR TUNGURAHUA VOLCANO 1502-08 S0128 W07827 ECUADOR. VOLCANIC ASHCLOUD IS EXPECTED TO REACH 50000 FEET FEW MINUTES FROM START OF ERUPTION. AIRCRAFT ARE REQUIRED TO FLIGHT PLAN TO REMAIN AT LEAST XXXNM CLEAR OF VOLCANO AND MAINTAIN WATCH FOR NOTAM/SIGMET FOR SEFG AREA.
F) GND G) UNL)

3. NOTAM ESTABLISHING A DANGER AREA AFTER THE INITIAL ERUPTION

(A1235/23 NOTAMR A1234/23
Q) SEFG/QWWXX/IV/NBO/W/000/500/0128S07827W030
A) SEFG B) 2302260900 C) 2302261200
E) VOLCANIC ERUPTION REPORTED IN TUNGURAHUA VOLCANO 1502-08 S0128 W07827 ECUADOR. VOLCANIC ASH CLOUD REPORTED REACHING FL500. AIRCRAFT ARE REQUIRED TO REMAIN AT LEAST XXXNM CLEAR OF VOLCANO AND MAINTAIN WATCH FOR NOTAM/SIGMET FOR SEFG AREA.
F) GND G) 500)

4. NOTAM ESTABLISHING A DANGER AREA THAT INCLUDES AN AREA OF HIGH OR HIGH / MEDIUM OR HIGH / MEDIUM / LOW POLLUTION

(A1236/23 NOTAMN
Q) SEFG/QWWXX/IV/NBO/W/000/350/0128S07827W030
A) SEFG B) 2302260900 C)2302261200
E) TEMPORARY DANGER AREA HAS BEEN ESTABLISHED FOR VOLCANIC ASH AREA OF HIGH CONTAMINATION IN AREA LIMITED BY THE FOLLOWING COORD XXXXS XXXXXW, XXXXS XXXXXW, XXXXS XXXXXW, XXXXS XXXXXW.
F) SFC G) FL350

5. NOTAM TO DEFINE AN AREA OF MEDIUM POLLUTION IN THE AREA THAT WAS NOT DEFINED AS DANGER

(A1237/23 NOTAMN
Q) SEFG/QWWXX/IV/NBO/W/000/200/0128S07827W030
A) SEFG B) 2302260900 C) 2302261200
E) VOLCANIC ASH AREA OF MEDIUM CONTAMINATION FORECAST IN AREA LIMITED BY THE FOLLOWING COORD XXXXS XXXXXW, XXXXS XXXXXW, XXXXS XXXXXW, XXXXS XXXXXW
F) SFC G) FL200)

6. ASHTAM ALERTING ABOUT PRE-ERUPTIVE ACTIVITY

VASE 0001/23 SEFG 2305051340
ASHTAM 0001
A) GUAYAQUIL FIR
B) 2305051215
C) TUNGURAHUA 1502-08
D) 0128S 07827W
E) YELLOW ALERT
F) 10000/15000FT
J) VOLCANIC ASH ADVISORY CENTRE - WASHIGNTON
K) POSSIBLE AFFECTED ZONE BY VOLCANIC ASH SOUTH PASTAZA, LAST ASH POSITION AT 1309 UTC LINE FROM 0150S 07810W UP TO 0155S 07840W POSSIBLE ALT FL 100/150

7. ASHTAM WARNING ABOUT ERUPTIVE ACTIVITY

VASE 0002/15 SEFG 2305051430
ASHTAM 0002
A) GUAYAQUIL FIR
B) 2305051215
C) TUNGURAHUA 1502-08
D) 0128S 07827W
E) RED ALERT
F) SFC/15000FT
J) VOLCANIC ASH ADVISORY CENTRE - WASHIGNTON
K) AFFECTED ZONE BY VOLCANIC ASH SOUTH PASTAZA, MACAS CENTER, NORTH GUAYAQUIL, LAST ASH POSITION AT 1420 UTC LINE FROM 0150S 07810W UP TO 0155S 07840W ALT FL 100/150

8. ASHTAM WARNING ABOUT REDUCED ERUPTIVE ACTIVITY

VASE 0003/23 SEFG 2305051940
ASHTAM 0003
A) GUAYAQUIL FIR
B) 2305051215
C) VOLCAN TUNGURAHUA 1502-08
D) 0128S 07827W
E) YELLOW ALERT
F) SFC/15000FT
J) VOLCANIC ASH ADVISORY CENTRE - WASHIGNTON
K) AFFECTED ZONE BY VOLCANIC ASH SOUTH PASTAZA, MACAS CENTER, NORTH GUAYAQUIL, LAST ASH POSITION AT 1920 UTC LINE FROM 0150S 07810W UP TO 0155S 07840W ALT FL 100/150

ATTACHMENT C

ATS CONTINGENCY PROCEDURES FOR VOLCANIC ASH IN EASTERN AIRSPACE

1. PURPOSE

Establish the procedures to be followed in case of contingencies related to volcanic activity that cause ash emission that affect the operation of aircraft, causing temporary closures of airspace and restrictions on certain routes and / or affected areas in the airspace of the Eastern Region of Ecuador, with the consequent reduction of the operational capacity of air traffic services.

2. SCOPE

This procedure will be executed by the ATC personnel of the ATS units of the airports of Quito, Coca, Shell, Nueva Loja and others that are necessary; in order to maintain the operational safety margins in the area of their responsibility.

This procedure will be applied only when the airspace of the eastern sector of the Cotopaxi volcano is contaminated by volcanic ash and the arrival procedures at the "Mariscal Sucre" Airport in Quito cannot be used for air operation.

This procedure should be applied at the request of the pilot and his departure airport is located in the Eastern Region.

3. PROVISIONS

3.1 All flights departing from airports in the Eastern Region may request the following alternatives from the ATS service:

3.1.1 Departures from "Francisco de Orellana" Aerodrome

All flight crews must plan their flight and submit the FPL according to the following options:

a) Use airway W11 via LAV to intercept airway UW21/UT21 to QIT;

b) Use airway W11 via LAV to intercept airway W9 to QIT; and

c) In case of requiring the W22 airway to NEVDO to intercept the airway W9 to QIT, this alternative must be coordinated in advance and **WILL BE SUBJECT TO THE CONDITION OF TRANSIT AND AUTHORIZATION OF ATC.**

3.2 However, air traffic services may suggest and occupy airspace to protect air operations.

ATTACHMENT D

CONTACT LIST OVM/NOF/AAC/ANSP/ VOLCANOLOGICAL INSTITUTE

OFFICE	ACRONYM OACI	EMAIL	AFTN	PHONE / FAX	REMARKS
Guayaquil Area Control Center	SEGU ACC	accgye@aviacioncivil.gob.ec	SEFGZQZX SEGUZRZS	593 4 2924219 593 4 2925495 PBX: 593 2 2947400 Ext. 2111 / 2130	acc.supervisor@aviacioncivil.gob.ec
Meteorological Watch Office	SEGU OVM	meteorologiagye@aviacioncivil.gob.ec meteorologiagye@gmail.com	SEGUMAMX SEGUYMYX	593 4 2925782 PBX: 593 2 2947400 Ext. 2116 eXT. 2117	http://www.ais.aviacioncivil.gob.ec/sigmet
International NOTAM Office	SEGU NOF	nof_ecuador@aviacioncivil.gob.ec	SEGUYNYX	593 4 2924940 PBX: 593 2 2947400 Ext. 2135	http://www.ais.aviacioncivil.gob.ec
Geophysical Institute	n / a	geofisico@igepn.edu.ec informe_turno@mail.igepn.edu.ec	n / a	593 2 2225655 593 2 2225627 593 2 2567847	http://www.igepn.edu.ec https://twitter.com/IGecuador https://www.facebook.com/instituto.geofisico