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## AFI Workshop on the Volcanic Ash Exercise- VOLCEX21

### Overview on AFI VACP and general considerations in line with ATM Contingency Plan for Volcanic Ash

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## Presentation Outline

- Volcanic Ash Hazards/effect in aviation
- Background to AFI ATM VACP
- Major Volcanoes in AFI Region
- State Responsibilities
- Agencies, Coordination, Procedures, Delineation of Responsibilities
- Eruption Phases and ACCs Actions
- Delineation of Responsibility: ATS Unit and Pilot in Command
- Training and Awareness of ATS Personnel
- responsibility for collection, exchange and dissemination of VA Info
- Summary





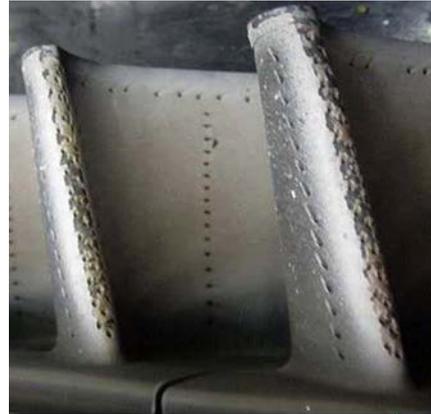
## Volcanic Ash Hazards/effect in aviation

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



## Background to ATM VACP

- 24 June 1982, B747 from Kuala Lumpur to Perth lost power on all four engines, diverted safely.
- Three weeks later, another B747 en route to Melbourne reported a similar incident.
- Suspicion: Galunggung Volcano.
- Serious threat, potential to cause a major aircraft accident.



Examples





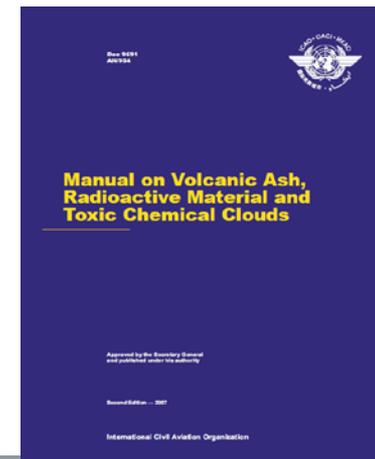
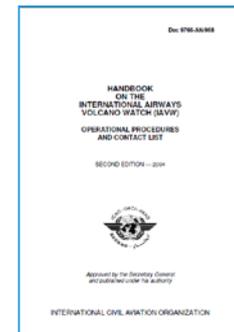
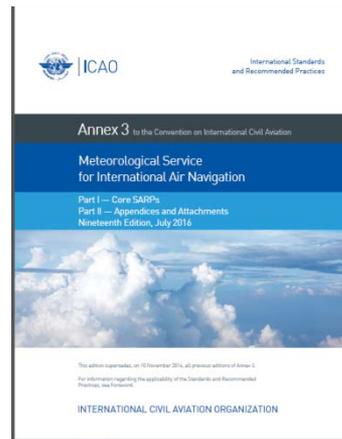
## Background to VACP

- **ICAO Air Navigation Commission**
  - **Interim guidelines developed**
- **Formal amendments of Annexes and procedures in 1987 (assistance of VAWSG, States and International Organizations)**
- **How?**
  - **AIREP (Pilots)**
  - **SIGMETs (Meteorological Watch Offices - MWOs)**
  - **NOTAMs (Air traffic Control – ACCs/NOTAM Office)**
  - **Management of air routes (ANSPs/Regulators)**



## International provisions and guidance

- Establishment of the International Airways Volcano Watch (IAVW) in Annex 3 (Nov 1998):
  - Standards and Recommended Practices for monitoring and providing warnings to aircraft of volcanic ash in the atmosphere.
- Additional provisions in Annexes 11 and 15
- Guidance and operational procedures in ICAO Doc 4444, Doc 9766, Doc 9691, and others
- IAVW Operations Group (IAVWOPSG)
  - since 2002
  - States, International Organizations and users

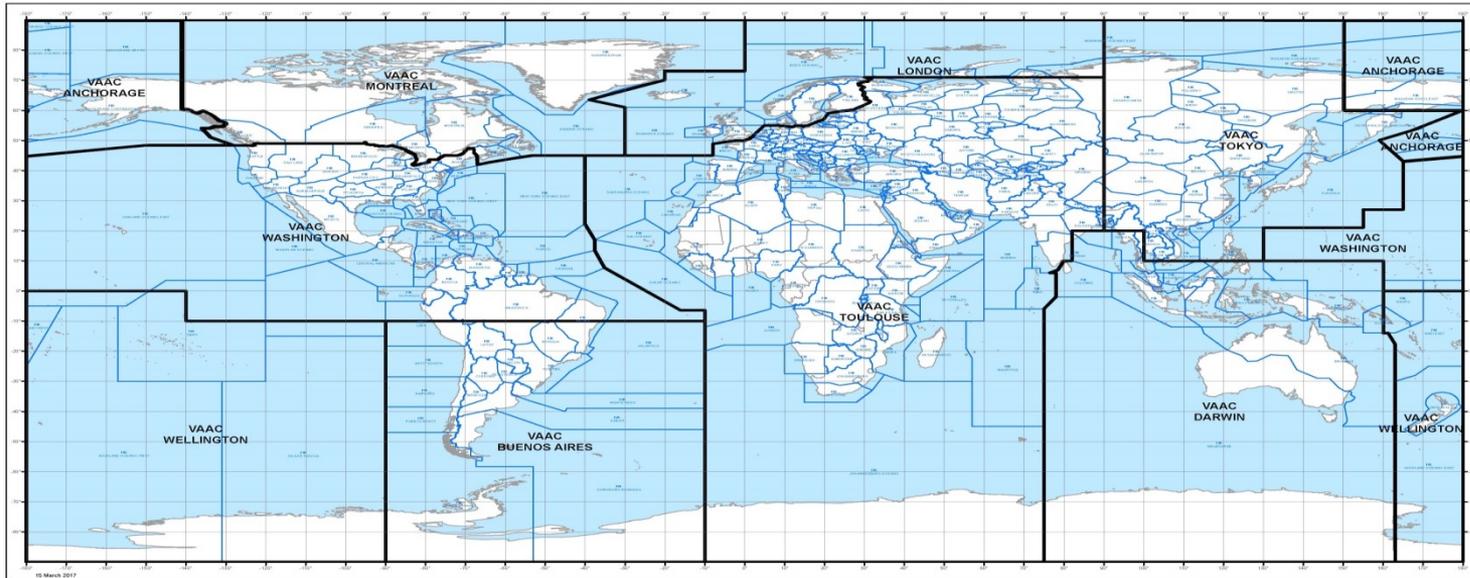


# The worlds volcanoes and the VAACs



# The worlds volcanoes and the VAACs

CURRENT STATUS OF ICAO VOLCANIC ASH ADVISORY CENTRES (VAAC) - AREAS OF RESPONSIBILITY  
SITUATION ACTUELLE DES CENTRES D'AVIS DE CENDRES VOLCANIQUES (VAAC) - ZONES DE RESPONSABILITE  
ESTADO ACTUAL DE LOS CENTROS DE AVISOS DE CENIZAS VOLCANICAS (VAAC) DE LA OACI - AREAS DE RESPONSABILIDAD  
СУЩЕСТВУЮЩЕЕ РАСПРЕДЕЛЕНИЕ КОНСУЛЬТАТИВНЫХ ЦЕНТРОВ ИКАО ПО ВУЛКАНИЧЕСКОМУ ПЛЕТИ (VAAC) - РАЙОНЫ ОТВЕТСТВЕННОСТИ



# Eyjafjallajökull eruption April 2010

- Airlines cost impact of €1.7 billion
- Much bigger global economic effect
- Largest closure of airspace since WWII
- Extreme disruption to air traffic in Europe (western and northern parts ) and eastern North Atlantic





# Responding to Eyjafjallajökull

- International Volcanic Ash Task Force (IVATF) established by ICAO on 18 May 2010
- Prompted by the urgency to address the crisis
- Tasked to:
  - assess global aviation needs in anticipation of additional volcanic activity
  - determine actions needed to address aviation risk
  - review, and learn from, the European response
  - actively involve all the stakeholders/disciplines
- **Four IVATF Sub-Groups:**
  - ATM, Airworthiness, Science and IAVW Coordination





## AFI Region: *How did we get here?*

APIRG/17: Core Team of experts established under APIRG Decision 17/84 on Volcanic Ash Contingency

APIRG DECISION 18/13: The Core Team of experts established under APIRG Decision 17/84 is dissolved, and the AFI ATM/MET Task Force be established;



## Establishment of AFI ATM VACP

CONCLUSION 18/14: That,

- a) the ATM/AIM/SAR and the MET Sub-Groups finalize development of the AFI Volcanic Ash Contingency Plan;
- b) the Plan be provided to States for implementation, without awaiting the next meeting of APIRG.



## Awareness Seminars On The AFI ATM VACP

- APIRG CONCLUSION 18/53: That ICAO Dakar and Nairobi Regional Offices through the ATM/MET Task Force, conduct regional awareness seminars on the AFI ATM Volcanic Ash Contingency Plan in view of:
  - a) Making all aviation stockholders in the AFI region aware of ATM VACP;
  - b) Supporting its implementation; and
  - c) Proposing further improvements to the plan.



## **CONCLUSION 19/19: INTEGRATION OF THE VOLCANIC ASH CONTINGENCY PLAN TO THE AIR TRAFFIC MANAGEMENT CONTINGENCY PLAN**

- **That, the AFI Volcanic Ash Contingency Plan at Appendix 3.2J to this report be integrated as an Appendix to the AFI ATM Contingency Plan.**

*Note: States are thus required to integrate Volcanic Ash Contingency Plan in their ATM Contingency Plans*



## VA Contingency Plans and VA Exercise

### APIRG CONCLUSION 21/05: IMPLEMENTATION OF CONTINGENCY PLANS

That,

- a) States develop or update Contingency Plans (CPs) that include Public Health Emergencies (PHE) and Volcanic Ash (VA) provisions and publish them as soon as practical; and
- b) ICAO provide assistance to States in the development and coordination of the CPs to enable their publication and completion of the Regional CP.

***Note: APIRG/22 Conclusion 22/14: Adopted the AFI ATM Contingency Plan which contains Volcanic Ash provisions.***



## VA Contingency Plans and VA Exercise

- **APIRG/23 Conclusion 23/28 (b, c):**

That, in view of the need for the provision of information to airlines and en-route aircraft before and during a volcanic eruption:

- b) States that have not developed volcanic ash contingency plans and conducted Volcanic Ash exercises should do so, using the guidance in the AFI Volcanic Ash Contingency Plan as contained in Appendix H of the AFI Regional ATM Contingency Plan by 30 June 2021; and
- c) ICAO assist in planning and conducting a coordinated regional Volcanic Ash exercise by 31 December 2021.



## Major Volcanoes in AFI Region

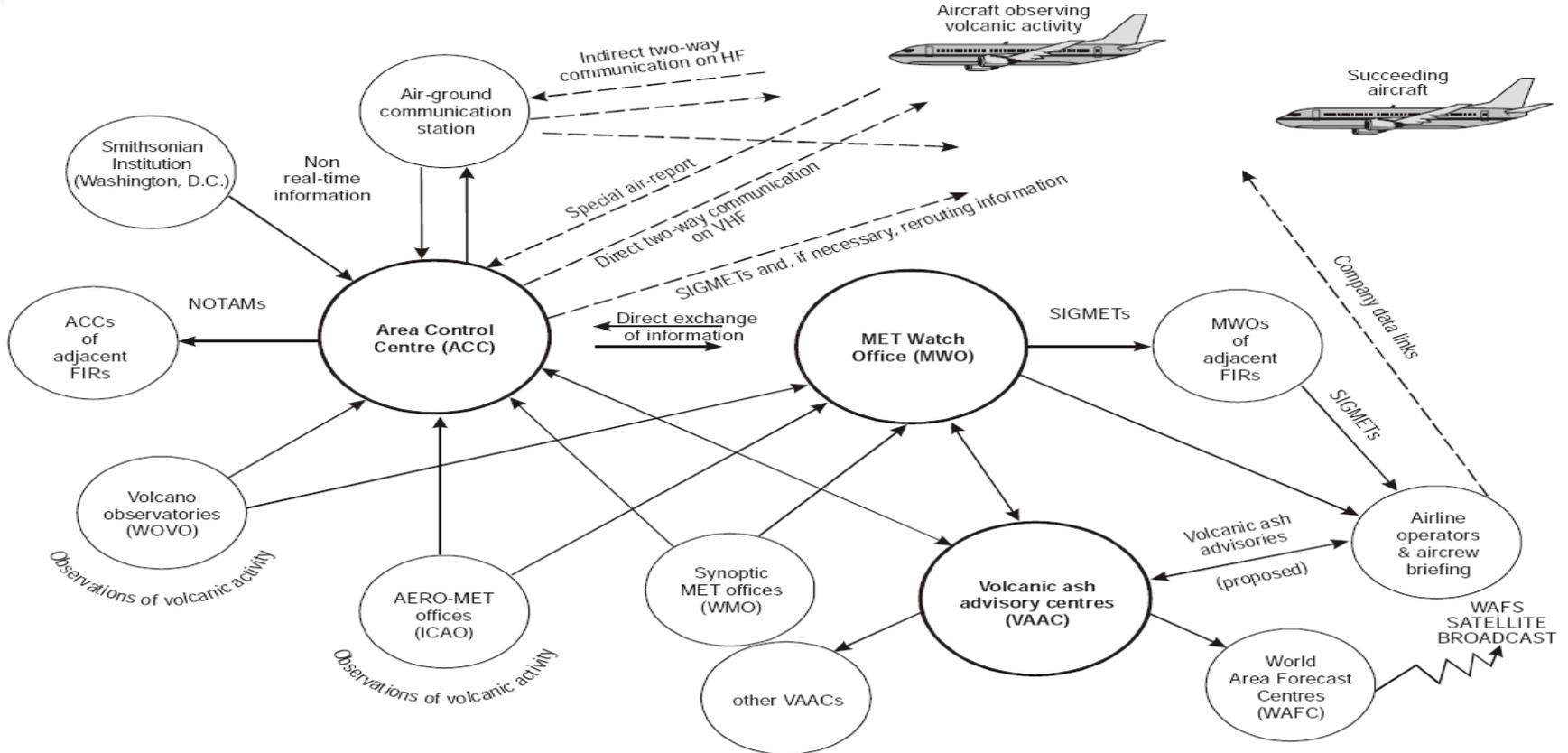
The major volcanoes in the region are located in the following States: Algeria, Cameroon, Cape Verde Islands, Chad, Comoros Island, Democratic Republic of Congo, Djibouti, Eritrea, Ethiopia, France (Reunion Island), Kenya, Madagascar, Mali, Niger, Nigeria, Rwanda, Sao Tome and Principe, Spain (Canary Islands, Madeira), Sudan, Tanzania and Uganda.



## ATM Contingency Plan interfaces with supporting services

- Aeronautical Information Service (AIS)
- Meteorological (MET)
- Volcanic Ash Advisory Centres (Toulouse, France)
- Aerodromes
- Airspace Users (Operators)
- Emergency Services
- Others (Military, etc.)
- *Note: to assist staff in expediting the process of originating and issuing relevant AIS and MET messages (VA SIGMET, NOTAM, and ASHTAM), TEMPLATES should be available for different stages of the volcanic activity.*







## States Responsibilities, Coordination & Delineation of Responsibilities

States ensure:

- Establishment of an effective VA preparation and response
- Steps for coordination and control of response are established
- Responsibilities are clearly defined (ATS, AIS, MET, Ops, etc.)
- VA CP should identify officials who need to be contacted
- Indicate types of messages that are to be created
- Proper distribution of the messages
- How to manage and conduct business???



## Emphasis on Volcanic Ash Contingency Plan

### Emphasis:

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



## SOME TERMINOLOGIES

- **Areas of Contamination:** areas of observed and/or forecast volcanic ash in the atmosphere is provided by means of appropriate MET messages in accordance with the Meteorological Service for International Air Navigation (Annex 3)
- **Danger Areas:** a danger area may be declared by NOTAM; however, this option should only be applied over and in the proximity of the volcanic source.
- Although it is the prerogative of the provider State to promulgate a danger area, **in airspace over the high seas**, it should be recognized that restrictions to the **freedom of flight over the high seas cannot be imposed** in accordance with the United Nations Convention on the Law of the Sea (Montego Bay 1982).



## SOME TERMINOLOGIES

- NOTAM/ASHTAM for volcanic activity provides information on the status of activity of a volcano when a change in its activity is, or is expected to be, of operational significance;
- the NOTAM/ASHTAM provides information on the location, extent and movement of the ash contamination and the air routes and flight levels affected
- NOTAM can also be used to limit access to the airspace affected by the volcanic ash.
- NOTAM/ASHTAM should be originated by ACC and issued through the respective international NOTAM office, based on the information received from any one of the observing sources and/or advisory information provided by Toulouse VAAC.



## Responsibility of Area Control Centres (ACCs)

- Serves as the **critical communication link** between affected aircraft in flight and the information providers during a volcanic eruption
- Within the flight information region (FIR), the ACC has two major communication roles:
  - First and most important is its ability to communicate directly with aircraft en-route which may encounter the ash.
  - Second, based on SIGMET information for volcanic ash and volcanic ash advisories (VAAs) and working with meteorological watch offices (MWOs), ATS personnel should be able to advise the flight crew of which flight levels are affected by the ash and the forecast movement of the contamination.
  - coordinate with the flight crew alternative routes which would keep the aircraft away from the volcanic ash cloud



## Responsibility of Area Control Centres (ACCs)

Can originate issuance of a NOTAM/ASHTAM, SIGMET, together with AIREPs on volcanic activities in order to:

- disseminate information on the volcanic status and activities
- inform flight dispatchers for flight planning purposes
- inform Operators for strategic planning of flights and the safety of the flying public
- facilitate decision making among the flight crew, flight dispatch and ATS regarding alternative routes that are available
- advise the ATFM unit concerning the availability of alternative routes

*Note: ACC to take into account **information on traffic levels on other routes, fuel reserve available for flights which may have to be diverted to other routes, to allow for the affected aircraft to divert.***



## PROCEDURES FOR ATS WHEN VOLCANIC ASH CLOUD IS REPORTED/FORECAST

ATS unit is responsible for the following actions:

- a) relay pertinent information immediately to flight crews whose aircraft could be affected to ensure that they are aware of the ash cloud's current and forecast position and the flight levels affected;
- b) accommodate requests for re-routing or level changes to the extent practicable;
- c) suggest re-routing to avoid or exit areas of reported or forecast ash clouds when requested by the pilot or deemed
- d) necessary by the controller; and
- e) when practicable, request a special air-report when the route of flight takes the aircraft into or near the forecast ash cloud and provide such special air-reports to the appropriate agencies.



## Phases of an Event

- Response to a volcanic event that affects air traffic has been divided into **four distinct phases** (Pre-Eruption Phase, a Start of Eruption Phase, an On-going Eruption Phase, and a Recovery Phase).
- **PRE-ERUPTION PHASE:** The initial response, “raising the alert”, commences when a **volcanic eruption is expected** - AIS (NOTAM) and MET (VA SIGMET) messages may be issued.
- **START OF ERUPTION PHASE:** The start of eruption phase commences at the outbreak of the volcanic eruption and entrance of the volcanic ash into the atmosphere - AIS (NOTAM:ASHTAM) and MET (VA SIGMET) messages may be issued



## Phases of an Volcanic Event

- **ONGOING ERUPTION PHASE:** commences with issuance of the first volcanic ash advisory (VAA) containing information on the extent and movement of the volcanic ash cloud following completion of the previous reactive responses - AIS (NOTAM:ASHTAM) and MET (VA SIGMET)
- **RECOVERY PHASE:** commences with the issuance of the first VAA containing a statement that "NO VA EXP" (i.e. "No Volcanic Ash Expected") which normally occurs when it is determined that no volcanic activity has reverted to its pre-eruption state.
- eruption may occur without any pre-eruptive activity, or may cease and restart more than once,
- Flight crews are required to report observations of significant volcanic activity by means of a Special **Air Report (AIREP)**



## Start of Eruption Phase

- commences at the outbreak of volcanic eruption with volcanic ash being ejected into the atmosphere;
- Focus is on processes to protect aircraft in flight and at aerodromes from the hazards of the eruption through the collection and use of relevant information;
- Issuance of VA SIGMET; eruption NOTAM/ASHTAM;
- provision of information and assistance to airborne traffic;
- As appropriate, danger areas will be declared via NOTAM,
- Start of Eruption Phase lasts until the on-going eruption phase can be activated



## Start of Eruption Phase: Originating ACC Actions (eruption in its FIR)

- inform flights about the existence, extent and forecast movement of volcanic ash and provide information useful for the safe and efficient conduct of flights.
- rerouting of traffic should commence immediately or may be in progress if the alerting time has been sufficient to facilitate activation of the pre-eruption phase
- assist in rerouting aircraft around the danger area as expeditiously as possible
- Coordinate with adjacent ACCs to also take the danger area into account and give similar assistance to aircraft as early as possible



## START OF ERUPTION PHASE: Originating ACC Actions

**ACC** should carry out the following:

- a) ensure a NOTAM is originated to define a Danger Area (DA) delineated cautiously so as to encompass a volume of airspace in accordance with the limited information available, taking information on upper winds into account, in the absence of any prediction from a competent authority of the extent of contamination)
- b) maintain close liaison with MET facilities (its associated MWO and the AFI VAAC, Toulouse) who should issue appropriate MET messages ("start of eruption" SIGMET message by the most expeditious means) in accordance with Annex 3



## START OF ERUPTION PHASE: Originating ACC Actions

**Originating ACC** should carry out the following:

- c) devise and update ATFM measures when necessary to ensure safety of flight operations, based on these forecasts and in cooperation with aircraft operators and the adjacent ACCs using the CDM process;
- d) ensure that reported differences between published information and observations (pilot reports, airborne measurements, etc.) are forwarded as soon as possible to the appropriate authorities to ensure its dissemination to all concerned
- e) begin planning for the on-going eruption phase in conjunction with the aircraft operators, the appropriate ATFM unit/ACCs concerned
- f) issue appropriate AIS messages in accordance with Annex 15. (Make Templates readily available for composition of AIS messages)



## START OF ERUPTION PHASE: Originating ACC Actions

**Originating ACC** should carry out the following :

g) inform aircraft about the potential hazard and continue to provide normal services. **It is the responsibility of the pilot-in-command to determine the safest course of action;**

h) alert flights already within the area concerned and offer assistance to enable aircraft to exit the area;

i) immediately notify other affected ACCs of the event and the location and dimensions of the area concerned. The ACC should also negotiate any re-routings necessary for flights already coordinated.



## START OF ERUPTION PHASE: Adjacent ACC Actions

### Adjacent ACCs should:

- a) maintain liaison with ATFM unit and originating ACC to design, implement and keep up to date ATFM/ACC measures for safety of flight OPS;
- b) in cooperation with the originating ACC and aircraft operators, should impose as required additional tactical measures to those issued by the appropriate ATFM unit;
- c) maintain awareness of the affected area;
- d) Begin planning for the on-going eruption phase in conjunction with the aircraft operators, the appropriate ATFM unit and the ACCs concerned.



## START OF ERUPTION PHASE: Adjacent ACC Actions

Adjacent ACCs should take the following action to assist:

- e) when advised, re-clear flights to which services are being provided and which will be affected by the danger area; and
- f) unless otherwise instructed, continue normal operations and:
  - i) if one or more routes are affected by the area, suggest re-routings to the affected aircraft onto routes clear of the danger area; and
  - ii) maintain awareness of the affected area.



## START OF ERUPTION PHASE: ATFM Actions

**ATFM** should:

depending on the impact and/or extent of the volcanic ash, organise the exchange of latest information on the developments with the associated VAACs, ANSPs, MWOs and operators concerned in order to support CDM.



## ONGOING ERUPTION PHASE

### On-going eruption phase:

- a) commences with the issuance of the first volcanic ash advisory (VAA) by the Toulouse VAAC
- b) VAA should contain information on the extent and movement of the volcanic ash cloud in accordance with Annex 3 provisions.
- c) Use VAA/VAG to prepare AIS and MET messages
- d) volcanic contamination may affect any combination of airspace; therefore, guidance not be considered mandatory or exhaustive



## ONGOING ERUPTION PHASE

**ACCs** should:

- a) ensure appropriate AIS messages are originated
- b) ACC/ATFM units organise teleconferences to exchange latest information on the developments, in order to support CDM, with the VAACs, ANSPs and MWOs and operators concerned;
- c) ACCs/ ATFM units should be aware operators could treat the horizontal and vertical extent of volcanic ash contaminated area to be over-flown as if it were mountainous terrain
- d) report differences between published information and observations (pilot reports, airborne measurements, etc.) should be forwarded as soon as possible to all concerned.



## RECOVERY PHASE

- a) commences with the issuance of the first VAA/VAG containing a statement that “NO VA EXP” (i.e. no volcanic ash expected”) - which normally occurs when it is determined that the volcanic activity has reverted to its pre-eruption state and the airspace is no longer affected by volcanic ash contamination.
- b) Consequently, appropriate AIS messages (i.e. NOTAMC cancelling the active NOTAM, and a new NOTAM/ASHTAM) should be issued in accordance with Annex 15.
- c) ACCs and ATFM units should revert to normal operations as soon as practical.



## Inadvertent entry into volcanic ash cloud

ATS unit should:

- a) take such action applicable to an aircraft in an emergency situation; and
- b) **DO NOT INITIATE** modifications of route or level assigned **UNLESS REQUESTED BY THE FLIGHT CREW** or necessitated by airspace requirements or traffic conditions.



## Delineation of Responsibility between ATS Unit and Pilot in Command

- Note 1.— 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. **The final responsibility for this decision, however, rests with the pilot-in-command** as specified in the Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds (Doc 9691), 5.2.4.1.
- Note 2.— The final authority as to the disposition of the aircraft, whether to avoid or proceed through a reported or forecast ash cloud, **rests with the pilot-in-command**, as prescribed in Annex 2, 2.4.



## Delineation of Responsibility between ATS Unit and Pilot in Command

When the flight crew advises the ATS unit that the aircraft has inadvertently entered a volcanic ash cloud, the ATS unit should:

- a) take such action applicable to an aircraft in an emergency situation; and
- b) initiate modifications of route or level assigned only when requested by the pilot or necessitated by airspace requirements or traffic conditions.

**Note— The Pilot has final authority as to the disposition of the aircraft.**



## Training and Awareness of ATS Personnel

Aware of the potentially hazardous effects if an aircraft encounters a volcanic ash cloud:

- a) volcanic ash contamination may extend for hundreds, or even thousands of miles horizontally and reach the stratosphere vertically
- b) volcanic ash may block the pitot-static system of an aircraft, resulting in unreliable airspeed indications
- c) braking ability of the aircraft if ash deposits are on runway -more pronounced on runways contaminated with wet ash
- d) consequences of volcanic ash being ingested into the engines during landing and taxiing



## Training and Awareness of ATS Personnel

Aware of the potentially hazardous effects if an aircraft encounters a volcanic ash cloud and note:

- e) Pilots will allow sufficient time for the particles to settle before initiating a take-off roll
- f) the movement area be carefully swept before any engine is started
- g) volcanic ash may result in the failure or power loss of one or all engines of an aircraft
- h) aerodromes with volcanic ash deposition may be declared unsafe for flight operations. This might have consequences for the ATM system



# Communication and dissemination of Pilot Report of Volcanic Activity





## ANTICIPATED PILOT ISSUES WHEN ENCOUNTERING VOLCANIC ASH

ATS personnel should be aware flight crews will be dealing with:

- a) smoke or dust appearing in the cockpit which may prompt the flight crew to don oxygen masks (could interfere with the clarity of voice communications);
- b) acrid odour similar to electrical smoke;
- c) multiple engine malfunctions, such as stalls, increasing exhaust gas temperature (EGT), torching, flameout, and thrust loss causing an immediate departure from assigned altitude;
- d) on engine restart attempts, engines may accelerate to idle very slowly, especially at high altitudes (could result in inability to maintain altitude or Mach number);



## ANTICIPATED PILOT ISSUES WHEN ENCOUNTERING VOLCANIC ASH

ATS personnel should be aware flight crews will be dealing with:

- e) at night, St. Elmo's fire/static discharges may be observed around the windshield, accompanied by a bright orange glow in the engine inlet(s);
- f) possible loss of visibility due to cockpit windows becoming cracked or discoloured, due to the sandblast effect of the ash;
- g) because of the abrasive effects of volcanic ash on windshields and landing lights, visibility for approach and landing may be markedly reduced. Forward visibility may be limited to that which is available through the side windows; and/or
- h) sharp distinct shadows cast by landing lights as compared to the diffused shadows observed in clouds (this affects visual perception of objects outside the aircraft).



## ANTICIPATED PILOT ISSUES WHEN ENCOUNTERING VOLCANIC ASH

ATS to expect flight crews to execute contingency procedures:

- a) if possible, the flight crew may immediately reduce thrust to idle;
- b) exit volcanic ash cloud as quickly as possible. The shortest distance/time out of the ash may require an immediate, descending 180-degree turn (terrain permitting);
- c) don flight crew oxygen masks at 100 per cent (if required);
- d) monitor airspeed and pitch attitude. If unreliable airspeed is suspected, or a complete loss of airspeed indication occurs (volcanic ash may block the pitot system), the flight crew will establish the appropriate pitch attitude;
- e) land at the nearest suitable airport; and
- f) on landing, reverses may be used as lightly as feasible.



## PURPOSES OF VOLCANIC ASH REPORTING AND DATA COLLECTION

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

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



## PHASE OF OPERATIONS

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

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



## PHASE OF OPERATIONS: In-Flight Phase

	Participants	Roles & Responsibilities
1	Pilots, civil and/or military, observing and/or encountering volcanic activity	To provide as much detailed information as possible about the type, position, colour, smell, dimensions of the volcanic contamination, level and time of the observation and forward VAR Part I immediately to the ATS unit with which the pilot is in radiotelephony (R/T) communication. Record the information required for VAR Part II on the appropriate form as soon as possible after the observation or encounter, and file the report via data link, if available.
2	ATS unit receiving the information from the pilot encountering volcanic event	To ensure <b>that information received by an air traffic controller from the pilot has been copied, clarified (if necessary) and disseminated to other pilots as well as to the ACC Supervisor.</b> In addition, air traffic controllers could ask other pilots flying within the same area if they have observed any volcanic activity



## PHASE OF OPERATIONS: In-Flight Phase

	Participants	Roles & Responsibilities
3	<p>ATS unit/ACC Supervisor (if applicable) or other responsible person within the Air Navigation Service Provider</p>	<p><b>To use all means of communication and available forms to ensure that the information received from the air traffic controller has been:</b></p> <ul style="list-style-type: none"> <li>• <b>passed on to the associated Meteorological organizations in accordance with national/regional arrangements;</b></li> <li>• <b>fully and immediately disseminated across the organization, in particular to adjacent sectors and the associated NOTAM Office (NOF);</b></li> <li>• <b>passed on to the neighbouring sectors and ACCs (if necessary);</b></li> <li>• <b>passed on to the regional ATFM centre if existing (e.g. CFMU in AFI);</b></li> <li>• <b>passed on to the national/regional authority responsible for the handling of contingency situations</b></li> </ul>
4	<p>Neighbouring States and ANSPs (ACCs etc.)</p>	<p>To ensure that information is provided to flight crews flying towards the area affected by the volcanic contamination; disseminated across the organization and the system prepared to cope with the possible changes of the traffic flows; and that the information is provided to the national authority responsible for the handling of contingency situations and passed on to the NOF and MWO as required</p>



## PHASE OF OPERATIONS: In-Flight Phase

	Participants	Roles & Responsibilities
5	MET Watch Office	To use the information originated by flight crews and forwarded by the ATS unit which received the information in accordance with Annex 3
6	VAAC	To use the information originated by flight crews, MWOs and other competent sources in accordance with Annex 3
7	AIS / NOF	To publish appropriate AIS messages in accordance with Annex 15
8	ATFM unit or centre (if existing)	To ensure that information received is stored and made available for information to all partners in its area of responsibility (ANSPs, airlines, VAAC, MET etc.). As part of the daily activity, coordinate ATFM measures with ACCs concerned.



## Post-Flight Operations Roles & Responsibilities and reporting

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



## Post-Flight Operations Roles & Responsibilities and reporting

	Participants	Roles & Responsibilities
5	National Authority	To handle the national central data repository and report to the regional/global central data repository if any. To analyze reports from its aeronautical service providers and take action as appropriate
6	Regional Central Data Repository	To collect the national data and make them available to interested stakeholders under agreed conditions
7	MWO	To use the national and regional information coming from national and regional central data repositories
8	VAAC	To use the information originated by flight crews, and other competent sources to: a) validate its products accordingly and; b) improve the forecast
9	Global Data Repository (and research institutes - where appropriate)	To analyse the information stored in the regional central data repository and provide the research outcomes for lessons learnt process.
10	Knowledge management (e.g. SKYbrary)	To use the post-flight lessons learnt and disseminate them to interested stakeholders.
11	ICAO	To review/revise ATM volcanic ash contingency plans.



## SUMMARY

- Volcanic Ash is a hazard for safe flight operations
- Disruption of global air traffic/huge global economic effect
- Need for continuous awareness of all aviation stakeholders
- States to ensure an effective VA preparation and response
- ICAO, States, ANSPs update AFI VA Contingency Plan / integrate into ATM CP
- Ensure VA training for ATS, MET, AIS, Aerodrome Operators, Flight Crew, Regulators, etc. and **Conduct periodic VA Exercises**
- Establish framework for volcanic ash reporting, data collection, to validate and improve forecasts, improve existing procedures and share lessons learned
- Further Reading: Annexes 2, 3, 6, 11, 15; Doc 4444, 9766, 9691, 10066



# THANK YOU & QUESTIONS





ICAO

North American  
Central American  
and Caribbean  
(NACC) Office  
Mexico City

South American  
(SAM) Office  
Lima

ICAO  
Headquarters  
Montréal

Western and  
Central African  
(WACAF) Office  
Dakar

European and  
North Atlantic  
(EUR/NAT) Office  
Paris

Middle East  
(MID) Office  
Cairo

Eastern and  
Southern African  
(ESAF) Office  
Nairobi

Asia and Pacific  
(APAC) Sub-office  
Beijing

Asia and Pacific  
(APAC) Office  
Bangkok



THANK YOU