

## Position Paper

# *AEA proposal for Operations in airspace at risk of volcanic ash contamination*

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Version 2 - June 2010

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## Preface

Volcanic activity in Iceland resulted in the unprecedented closure of European airspace in April and May 2010. Whilst volcanic eruptions are common across the globe, their impact on European airspace is less so. The event has highlighted a number of airline operator concerns with respect to ensuring that maximum use is made of available airspace in a safe manner that takes into account the dense and complex nature of the European airspace.

The risks to aviation from airborne volcanic ash are well known and documented. They range from a basic increase in operating costs to the critical failure of essential power plant and flight systems. It should be noted that there have only been about one hundred encounters with volcanic ash over the past 50 years that have impacted on safety and despite some very serious events, no accident has resulted and no loss of life has occurred. Although a significant safety hazard, the risk to safety of volcanic ash must be considered when considering implementation of avoidance strategies

The aim of any air transport operation is to eliminate encounters with ash that could degrade the in-flight safety of aircrews and passengers and cause damage to the aircraft.

This document is an initial proposal for a new European Approach and process to permit operations in areas presenting a risk from volcanic ash and that transfer ownership of responsibility for safe flight and ash avoidance onto the operator. Therefore this document does not form part of any commitment to undertake all suggestions or processes proposed within it. In light of the various combinations of legislation that could apply and changing environment we are currently in with respect to knowledge and experience, it is likely that most of the policies put forward in this document would be reviewed and adjusted to match the conditions and legislative environment we ultimately operate in.

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## Purpose

The purpose of this document is to outline AEA proposals for commercial operations in European and Transatlantic Airspace, taking account of the significant developments made to date in the enhancement of the reliability of London Volcanic Ash Advisory Center (VAAC) information through the provision of particulate density acceptable for engine ingestion by OEM's and the move to measurement at  $10^{-17}$  units  $m^3$  to  $10^{-16}$  units  $m^3$ .

The responsibility for avoidance of hazardous ash to sit with the airlines themselves and the operating flight crew, using all available data sources at their disposal to determine the safety of the flight. In order to achieve an optimum solution that enhances flight safety whilst avoiding unnecessary disruption to operations, AEA sees several elements as being relevant to enabling operators to plan and execute flights in a safe manner:

1. Observation and forecasting capability in order to assist airline operators in planning operations to avoid an encounter with ash clouds that present a hazard to safe flight. This must contain a level of granularity so as to support individual operator risk assessments.
2. In-flight monitoring by ground based flight planning departments of evolving ash clouds, their propagation and dispersion, with the ability to provide real time information to flight crews in the vicinity of such areas such that timely coordination can be made with Air Navigation Service Providers (ANSPs) to adjust tracks or altitude to avoid hazardous ash clouds in a way that minimizes disruption to the airspace network.
3. Minimise the complication of the air traffic network due to unnecessary air traffic delays, diversions, or evasive actions when hazardous clouds are encountered inadvertently.
4. Building on experience learnt and continuously evolving the policy to optimize safe and commercial flight operations

In addition to the above, ideally a worldwide standard would be developed for the procedures involved in operating in areas at risk of ash contamination and for the exchange of information. Further to this more work could be done by the OEMs in conjunction with airline operators to define an exact ash density that represents a hazard to air safety (hazardous ash) but not necessarily to commercial operations, However, the timeframe to achieve both of these aspirations is unrealistic given the present threat that exists to European Airspace.

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### **Proposed Policy**

AEA recognises the expertise and worldwide coordination of the VAACs and their critical role in notification of eruptions and the resultant ash clouds they cause, including the forecasting of their movement/dispersal and relevant threat to aviation safety. AEA would see a complete move away from the VAAC processes for the provision of ash information as a retrograde step.

Over reliance on any one source of information is, however, not appropriate and contradictory to most if not all elements of aviation practice. Furthermore, the core expertise in aviation operations in conditions in the proximity of volcanic ash lies with the airline operators and not the state meteorological provider, ANSP, or state regulatory bodies. Therefore AEA believes that experience of worldwide operators should be utilised to determine the optimum method of utilising airspace, building upon and enhancing the tools currently in place.

### ***Ash density representing a hazard to flight safety***

Recent developments have led to OEMs committing to a particulate density that represents a hazard to flight safety. The current figure provided by power plant suppliers is  $2 \times 10^{-3} \text{ g m}^3$

Prior to this standard operator practice was to avoid visual ash encounters. Decades of experience of airline operations has confirmed that visual ash presents a hazard to flight safety. This practice is in use in other areas of the globe, in particular the USA and has served the airline community very well thus far.

There is a relationship that already exists between current modelling techniques and particulate density. The HYSPLIT model as used by many of the VAACs utilizes spherical particles of density where distribution levels were derived from aircraft sampling of Mount St. Helens and Redoubt Volcano ash clouds. Calculated concentrations relative to the unit emission have been correlated with satellite imagery for defining the visual ash cloud. The model's computation of the visual ash cloud includes the magnitude of the volcanic eruption as determined by an algorithm based on the ash column top height and column depth. There is therefore a correlation that already exists and is in use between ash cloud modeled densities and visual ash.

In light of this and the decades of operator experience that can confirm it, the use of visual techniques (either from PIREP reports or Visual Satellite or H24 infra-red Satellite) to identify the existence of ash are also a key part of determining those areas that present a risk. (Note when conditions do not permit observation then current methodology is used to update areas confirmed by previous observation).

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**Responsibility for avoidance of hazardous ash**

The unique nature and experiences of different operators invalidates the ability to apply a one size fits all avoidance policy without it becoming overly restrictive to flight operations. Each operator needs the flexibility to determine what constitutes safe operations in light of their fleet types, experience, flight planning and in flight support capabilities, OEM data and the information available to them on the location, propagation and dispersal of hazardous ash clouds. The regulatory bodies have expertise in a number of fields but this experience does not match that of many operators with respect to the threat to flight safety, or the ability to risk assess it.

Whilst all parties concerned have a responsibility for safety, it is the specific role that is important. AEA believes that the Regulator is responsible for oversight, the VAAC for notifying the relevant ANSPs of eruptions and for providing advisory information as to areas likely to be at risk, and the ANSPs for providing SIGMET/NOTAM information to bring to the attention of crews those areas most likely to be at risk of ash contamination. The airline operator is then responsible for assessing the risk and conducting safe flight in the light of all the information available to it.

**Observation and forecasting capability**

The VAAC provide valuable information to ANSPs to facilitate safe flight. However, they are a single source of information and as has already been demonstrated, no single model would appear to provide the optimum or necessarily most relevant output for the purposes of determining flight safety. Indeed different VAACs utilize different modeling techniques for ash dispersal with differing results. A prime example of this has been the recent opening of French airspace on the 09<sup>th</sup> May 2010 based on information provided by a combination of the Toulouse VAAC and Meteo France, whilst the same area was indicated as a no-fly zone on the basis of information provided by the London VAAC. Furthermore single sources of data in the aviation industry are not common where they have a safety critical function.

AEA believes it is necessary to utilize multiple sources of information in order to safely assess the relevant risk and flight plan accordingly. Worldwide VAACs are already one recognized source of information. The United States Federal Aviation Authority (FAA) has an alternative process for the provision of significant meteorology information to airline operators. They authorize providers under a scheme titled “Enhanced Weather Information System (EWINS)”, a description of which is provided in the appendix to this document. There are therefore established providers of Meteorological services that provide guidance as to areas at risk of volcanic ash contamination under a structured and regulated scheme that operates in an environment of more frequent volcanic activity than that experienced in aviation history in Europe. Since the Iceland event AEA airlines have utilized a combination of VAAC information and an EWINS approved supplier to determine areas of safe flight operations.

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EWINS approved organizations have the ability to provide real time information and most importantly very up to date assessments of the locations of ash that potentially represent a threat to flight safety. This capability exceeds that of the VAAC which is only required to provide 6 hourly updates of its modeling. Furthermore the London VAAC only provides vertical data in a fixed height of Surface to FL200, FL 200 to FL 350 and FL 350 and above, and is unable to provide information in 1000 ft increments at this time. EWINS approved suppliers are capable of supplying this level of granularity and that is essential in maximising the use of available airspace.

***In flight monitoring of flights in the vicinity of volcanic ash***

An element of management of in-flight safety in this environment is the ability to monitor the threat in a live environment. This can range from a basic level of monitoring of one information source, to the extensive monitoring of multiple information sources and interpretation of that information. In the latter case, this takes the function of the assessment (based on all available sources of information) by the ground based flight planning department of evolving ash clouds, their propagation and dispersion, with the ability to provide real time information to flight crews in the vicinity of such areas such that timely coordination can be made with Air Navigation Service Providers (ANSPs) to adjust tracks or altitude to avoid hazardous ash clouds in a way that minimizes disruption to the airspace network.

Such monitoring would be based upon the updated model outputs from the EWINS approved supplier and the VAAC charts when they are made available. This could be further supplemented by the provision of PIREPs and updated NOTAM/SIGMET information direct to the operating crews of flights already airborne.

This represents the ultimate end position of a mature and developed European approved process and not the starting point. Under this process individual operators would be responsible for determining their own risk assessed policies that take account of the changing nature of the threat and their information source/monitoring capabilities and use that to determine the appropriate no fly zones for their operation , which may vary based on the information available to them and their ability to monitor the evolution of the threat. A simple example of this would be an operator choosing to apply a buffer zone to a forecast based on their ability to monitor the updated picture and communicate critical changes to operating crews.

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***Minimise the complication of the air traffic network***

European airspace is complex and limited in its capacity given current traffic demand. Therefore, the concept of errors of judgment by specific operators in their assessment of the ash cloud position and safety threat is important in the context of the potential for diversions, or evasive actions when hazardous clouds are encountered inadvertently. Therefore any operator owned risk policy requires taking account of this risk.

AEA believes that in order to provide the ANSP with assurance as to minimizing the above risks, the National Aviation Administration (NAA) requires, in its position as the regulator, to ensure that the sources of meteorological information made available to operators is as accurate and reliable as is possible. They should also provide guidance to operators as to the considerations when building a safety case, such as their ability to provide in flight monitoring.

***Building experience***

To date, we are not aware of any European operator having discovered ash damage to their aircraft from operations in the Enhanced Procedures Zones (EPZ). Based on this, AEA believes that the current requirements in place for operations in the EPZ should be removed and the decision for inspections return to the operators.

AEA would propose a new policy that any flight conducted within the current black area of the London VAAC ash concentration graphs, as a result of the airline determining it to be safe based on other supplier information and its own risk assessments, would be subjected to enhanced inspection procedures and findings provided to the NAA.

The NAA would then be in a position to determine the strengths and weaknesses of the processes in place and based on an appropriate data set be in a position to determine what if any changes were required to policy. This would ensure that an appropriate oversight of safety was maintained. This data could then further inform the VAAC NAME model to ensure it is continually enhanced.

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## Steps towards an New European Approach to hazardous volcanic ash

The steps forward need to be made in a manner that supports a scientific approach to determining the threat. They also need to be made in a way that most supports safe flight in a commercially sustainable manner where responsibility for safe operation lies with the airline.

### Step 1

Transfer the responsibility for safe operations and avoidance of hazardous ash to the airline operators.

Withdrawal of the Enhanced Procedures Zones (EPZ) in both Europe and the Atlantic. Scientifically this is based on the fact that tens of thousands of flight hours have now been flown in the EPZ where concentrations are forecast to be between  $2 \times 10^{-4}$  and  $2 \times 10^{-3}$  gm<sup>3</sup> and no flights to date in the EPZ have been found to be subject to ash damage or serious equipment failure.

Withdrawal of the Buffer Zone in line with current work being undertaken by the DAP. This step can be supported by BA, KLM, and Air France flights within French airspace (totaling well over 100 flights), all of which flew through the buffer zone and upon inspection none of which have found any damage from volcanic ash. Note that in this particular event Air France operated to our knowledge repeatedly through the black areas of the charts without any damage or issues identified either in flight or upon engineering inspection.

Flight Operations management to play a key role in the daily interpretation of areas safe/unsafe for flight

### Step 2

Withdrawal of all current no fly zones including the North Atlantic and the use of SIGMET/NOTAM to establish areas identified to be at risk of encountering ash concentrations hazardous to aviation.

Application of a No fly zone to the emitting source and a defined area around this, coupled with the application of a no fly zone up to a similar size downwind of this where necessary.

Establish procedures for Air Traffic Controllers whereby they provide information and guidance to flight crews in flight and offer suggestions for routings rather than direct instructions.

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Establish procedures for ATM where in the first instance, where operators are flying within the area indicated by the VAAC, a measured level of ATM is established to regulate airspace so as to minimize the risk of excessive workload compromising safety in the event of multiple aircraft turn backs or emergency traffic. This ATM should not be excessive and whilst taking account of the volume of traffic in sectors adjacent to any black zone, should be predominately based upon the volume of traffic within the black zone itself. Furthermore it must take account of the fact that other information will be in use by operators to support a decision for safe flight operations

Review the FAA EWINS approval process and as a temporary measure adopt this standard in the first instance with an equivalent NAA/European standard to follow in the mid term.

Establish guidance material for airline operators and the requirement to utilize an EWINS approved supplier in conjunction with own risk assessments and resource capabilities to determine areas believed to be safe/unsafe for flight operations.

**Step 3**

Build upon the experience of the operators and ANSP and progressively reduce the applied levels of ATM and operational restrictions.

Determine through the data collected by airlines of aircraft inspections of those aircraft flying within the black zone, the accuracy of the London VAAC model and use this data to further refine it and provide greater accuracy of information to airlines via this source.

Progress the initiative to take the best practice of worldwide procedures for the avoidance of volcanic ash posing a threat to flight safety and move this towards a unified solution that would provide consistency and clarity for airlines across the globe.

Transfer the ownership of daily interpretation of areas safe for flight to normal line management functions.

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## Summary

This policy identifies a three step process to move towards a New Europea Approach to facilitating safe flight in areas of volcanic ash. The key requirements to making this a realistic outcome are:

- Transfer the responsibility for safe operations and avoidance of hazardous ash to the airline operators.
- Flight Operations management to play a key role in the daily interpretation of areas safe/unsafe for flight
- Review the FAA EWINS approval process and as a temporary measure adopt this or similar standard
- Establish guidance material for airline operators and the requirement to utilize an EWINS approved supplier in conjunction with own risk assessments and resource capabilities.
- Adopt of a different but appropriate interpretation of the ICAO guidance relevant to this threat.
- Aim to establish a worldwide standard
- Withdrawal of all current no fly zones including the North Atlantic and the use of SIGMET/NOTAM to establish areas identified to be at risk of encountering ash concentrations hazardous to aviation (smaller no fly zone to be applied in the vicinity of the eruption itself).
- Procedures for Air Traffic Controllers to provide information and guidance to flight crews in flight and offer suggestions for routings rather than direct instructions.
- Establish ATM principles to minimize the risk of excessive workload compromising safety where flights are being permitted into the current black zones on VAAC ash concentration charts
- Change the EU law requiring the compensation of passengers for delay or cancellation in the event of this threat being the causal factor. This would enhance customer care and safety.
- Build upon the experience of the operators and ANSP and progressively reduce the applied levels of ATM and operational restrictions.
- Further refine the London VAAC model from data collected and experience gathered by operators.
- Transfer the ownership of daily interpretation of areas safe for flight to normal line management functions and move to a “business as usual” management of the threat.

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## Appendix 1 - Q & A on the AEA Proposal for Operations in Airspace at risk of volcanic ash

AEA had tabled in May 2010, its proposal for operations in airspace at risk of volcanic ash contamination. This proposal calls for a 'new European approach' to deal with this issue. It proposes to transfer the responsibility for safe operation and avoidance of hazardous ash to the airline operators. Better predictability of ash presence and better information sharing is the cornerstone of the AEA proposal for a new European approach.

The AEA and EASA have discussed the AEA proposal and share a mutual objective to move forward based on a fine-tuned AEA proposal. This paper, which complements the May 2010 AEA proposal, is providing further input based on those discussions between AEA and EASA and in response to the questions raised by EASA.

**Q *How were the assumptions behind the approach checked? FAA is often quoted to say 'avoid ash' but in this case we accept flight in airspace with low ash contamination.***

The intention in the proposal is for operators to continue to avoid visible ash. The acceptance in the current UK approach is for flight into areas of predicted low ash concentration. Where this exceeds the manufacturers recent definition of visual ash ( $2 \times 10^{-3} \text{ g/m}^3$ ) it refers to a predicted level that we believe to have been implemented due to an unreliable model. This is bourn out by the fact that the OEMs have been explicit (& therefore limited) in their approval being for the UK VAAC model.

**Q *How were the possible differences between Europe and US checked? E.G. traffic density?***

Statistics such as traffic density can be easily obtained for comparison purposes, it is envisaged that flight planning and current flow control processes will remain unchanged on a strategic basis and that there would be minimal impact of tactical route changes.

The AEA strongly believes that traffic density (e.g. presence of high concentration of ash around major traffic flows) should not be a blocking point for the proposal. Possible mitigation measures could include temporarily and local capacity reductions (as it is the case when ATC has to deal with adverse weather conditions - thunderstorms, snow etc.-). In this context, it is also important to have better predictability of presence of high ash concentration levels so that the zones affected by temporarily capacity reductions could be kept limited. This would still be a major improvement compared to today's situation of complete airspace closures over large areas.

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**Q Was FAA experience reviewed in-depth?**

The plan assumes that current regulatory oversight from existing national authorities/EASA would suffice. It does not envisage changing any oversight requirements to match FAA requirements. It relies on the airline’s well developed safety management systems and better information sharing regarding the presence of visual ash (i.e. pilot reports).

**Q To what extend the parallel with adverse weather conditions is valid?**

Aircraft are protected specifically against icing, lightning, etc but not specifically against volcanic ash.

Clear Air Turbulence is the closest comparison in terms of inability to forecast accurately. This is where a consistent PIREP system would be beneficial, both in terms of reporting criteria and ANSP reaction to PIREPS.

The parallel with CAT is drawn in order to highlight the fact that it is common practice for pilots to report meteorological problems that might effect following aircraft on the same route. This is an internationally recognised function. Recent experience over the North Atlantic during times of ash contamination has shown that pilots have been reporting any suspected sightings of ash contamination in the atmosphere. This has resulted in a small number of level/route change requests that have been managed under existing processes.

**Q AEA proposal is not specific regarding Risks assessment/ mitigation procedures**

The intention would be for individual operators to produce their own risk assessments/mitigation procedures, within a guidance framework.

The list below is modified from the list in CAA FODCOM 12/2010 and provides a potential guide to factors that could be considered in an operator’s risk assessment and safety case.

Considerations	Guidance
<b>Operator Procedures</b>	
Guidance for Company Personnel	Publish procedures for flight planning, operations and maintenance. Review of flight crew procedures for detection of volcanic ash and associated escape manoeuvres.
Flight Planning	These considerations will be applicable to all flights that operate in areas of potential contamination by volcanic ash.
Departure, Destination and any Alternates	Consideration in conjunction with flight planning of primary route.

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Routing Policy	Consideration of minimizing period in and over contaminated area.
Diversion Policy	Maximum allowed distance from a suitable alternate. Availability of alternates outside contaminated area. Diversion policy after an ash encounter.
NOTAMs	Process to ensure that the operator closely monitors NOTAMs to ensure that the latest information concerning volcanic ash is available to crews.
SIGMETs	Process to ensure that the operator closely monitors SIGMETs to ensure that the latest information concerning volcanic ash is available to crews.
Minimum Equipment List / Dispatch Deviation Guide	Consider additional restrictions for dispatching aircraft: <ul style="list-style-type: none"> <li>• air conditioning packs;</li> <li>• engine bleeds;</li> <li>• air data computers;</li> <li>• standby instruments;</li> <li>• navigation systems;</li> <li>• Auxiliary Power Unit (APU);</li> <li>• Airborne Collision Avoidance System (ACAS);</li> <li>• Terrain Awareness Warning System (TAWS);</li> <li>• provision of crew oxygen; and</li> <li>• supplemental oxygen for passengers.</li> </ul> (This list is not necessarily exhaustive.)

Considerations Guidance Operator Procedures

Provision of Enhanced Flight Watch	Timely information to and from crew of latest information.
Fuel Policy	Consideration to the carriage of extra fuel if and when appropriate

Considerations	Guidance
Pilot Reports	Requirements for reporting in the event of an airborne encounter. Guidance on recognition of ash encounter. Post-flight reporting.
Mandatory Occurrence Reports	Reminder regarding the necessity for filing MORs following an encounter.

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- Air Malta
- Alitalia
- Austrian
- bmi
- British Airways
- brussels airlines
- Cargolux
- Croatia Airlines
- Cyprus Airways
- Czech Airlines
- DHL
- Finnair
- Iberia
- Icelandair
- Jat Airways
- KLM
- LOT
- Lufthansa
- Luxair
- Malev
- Montenegro Airlines
- Olympic Air
- SAS Scandinavian Airlines
- SWISS
- TAP Portugal
- TAROM
- TNT Airways
- Turkish Airlines
- Ukraine International Airlines
- Virgin Atlantic Airways

<p>Standard Operating Procedures</p>	<p>Review changes to normal and abnormal operating procedures:</p> <ul style="list-style-type: none"> <li>• pre-flight planning;</li> <li>• operations to/from aerodromes contaminated with volcanic ash;</li> <li>• supplemental oxygen;</li> <li>• engine-out procedures; and</li> <li>• escape routes.</li> </ul> <p>(This list is not necessarily exhaustive.)</p>
<p>Technical Log</p>	<p>Any actual or suspected volcanic ash encounter will require a tech log entry and appropriate maintenance action prior to subsequent flight.</p> <p>Penetration (detail and duration) of the <i>Enhanced Procedures Zone</i> and/or operations to/from aerodromes contaminated with volcanic ash will require a tech log entry.</p>

- Adria Airways
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- Aer Lingus
- AeroSvit
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## ANNEX I - The FAA Approach to operations in Volcanic Ash

In the words of Victoria Cox, Senior Vice-President for NextGen and Operations Planning, during her recent testimony before the U.S. House of Representatives Committee on Science and Technology, Subcommittee on Space and Aeronautics, the current model used by the FAA is to: “gather the information from the reporting agencies and disseminate that information to the operators of aircraft. In turn, the operator makes the decision to fly or not”.

In this way, individual operators are responsible for assessing the risk both preflight and en route. Operators have the most detailed and current information about the capability of their individual aircraft. The evaluation of whether to operate above an observed ash cloud or around an observed ash cloud is just one example of a decision that is best made by an operator rather than by an Air Navigation Service Provider (ANSP) or regulatory body. The only no fly zone is that determined by the core plume exiting the volcano and a buffer around this.

Such an approach it relies on the operator to have systems in place to collect pertinent information regarding atmospheric hazards in a timely manner and to then distribute it to the decision makers both on the ground (flight technical dispatch in the case of BA) & in the air (the flight crew). There is also obviously the requirement to have clear procedures for implementing action. If these systems and procedures are not in place or are not used, there is likely to be an increased risk of an encounter with hazardous ash.

The specific FAA policy can be found in FAA Orders 7900.5B and 7110.65T and JO 7930.2M Notice to Airmen (NOTAM), which provide operational information regarding volcanic ash. The FAA’s primary method of dealing with volcanic ash events is operator avoidance. Since the geographical location of areas that may be affected by volcanic ash is weather-dependent, the FAA model of managing air traffic when confronted with volcanic ash is to treat it much like a major weather event. That is, they gather the information from the reporting agencies and disseminate that information to the operators of aircraft. In turn, the operator makes the decision to fly or not.

The FAA DOT FAA Order JO 7110.65T Air Traffic Organisation Policy states in section 4.4.2 Operations and Procedures, that; “Controllers will: Provide to aircraft the most current information available (SIGMET, CWA, MIS, PIREP) concerning the ash cloud position, altitude and movement. **Suggest headings and re-routes around known ash or possible ash areas.** Assist Visual Flight Rules aircraft to the extent possible in avoiding ash cloud areas. Solicit PIREP and forward to Operations Supervisor.

In the case of Terminal Radar Approach Control/Tower, it states that; “TRACON/Tower controllers are to:

- Provide SIGMET, CWA, PIREP concerning the ash cloud position, altitude and movement to flight crews.

*AEA proposal for operations in airspace at risk of volcanic ash contamination*

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- **Suggest headings and re-routes around known ash or possible ash areas.**
- Assist VFR aircraft to the extent possible in avoiding ash cloud areas.
- Solicit PIREP and forward to Watch Supervisor.”

Thus the role of the ATC provider is to provide support and assist with the knowledge made available to them but the responsibility for the flight path and safety lies with the flight crew at this time, subject of course to other factors that might need to be taken into account.

In the 1990s, the International Civil Aviation Organization (ICAO) established Volcanic Ash Advisory Centers (VAAC) that disseminate information worldwide on atmospheric volcanic ash clouds that may endanger aviation. There are nine VAACs located around the world run by local weather forecasting organizations. In the United States, the National Oceanic and Atmospheric Administration (NOAA) runs VAACs in Anchorage, Alaska and Washington, D.C. In the past, the FAA has participated with other federal agencies on developing a national plan for dealing with volcanic ash with regard to aviation operations. Under the auspices of the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM), led by NOAA, the FAA helped develop the *National Volcanic Ash Operations Plan for Aviation*.

For these purposes the FAA work with the weather-reporting agencies to develop weather products specifically for aviation use. Their role in that partnership is to set the requirements of what the weather products must provide in order to be useful for aviation users, whether they are air traffic controllers or pilots. Accordingly, FAA participation in the OFCM project was primarily to set the requirements for the development of volcanic ash information products for the FAA and aviation operators to use.

Aviation operations in volcanic ash situations rely on information based on detection and monitoring, alerting, modeling, and post event assessments. The U.S. Geological Survey (USGS) provides seismic monitoring for early detection and passes the information directly to the FAA to provide early warnings when an eruption is imminent or has occurred, which is especially important for en route aircraft. NOAA uses satellite monitoring as a core element in detection, tracking, and monitoring eruptions, and the resultant ash plume. Pilots also make observations, and the FAA disseminates pilot reports or PIREPS along with NOTAMs and Significant Meteorological Information (SIGMETs).

SIGMETs originate from NOAA's National Weather Service. Much of the capability to predict dispersion of volcanic ash clouds is based on mathematical modeling. The HY-SPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) model is the current model in use by NOAA and Australia's Bureau of Meteorology and its Darwin VAAC. Other, similar, models are used by other VAACs.

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## ANNEX II - Enhanced Weather Information System (EWINS)

### Enhanced Weather Information System (EWINS)

An EWINS is an FAA-approved proprietary system for tracking, evaluating, reporting, and forecasting the presence or lack of adverse weather phenomena. An EWINS is authorized to produce flight movement forecasts, adverse weather phenomena forecasts, and other meteorological advisories. To receive FAA approval, an EWINS must have sufficient procedures, personnel, and communications and data processing equipment to effectively obtain, analyze, and disseminate aeronautical weather data. For a full explanation of the requirements for EWINS approval, see [Volume 3, Chapter 26, section 4](#). An EWINS may produce weather analyses and forecasts based on meteorological observations provided by the Federal Government. The weather analyses and forecasts produced by an EWINS are considered primary weather products as defined below in paragraph 3-2073, Classification of Aviation Weather Products.

### Commercial Weather Information Providers

In general, commercial providers produce proprietary weather products based on FAA/NWS products with formatting and layout modifications but no material changes to the weather information itself. This is also referred to as “repackaging.” In addition, commercial providers may produce forecasts, analyses, and other proprietary weather products that substantially alter the information contained in Government-produced products. However, those proprietary weather products that substantially alter Government-produced weather products or information, may only be approved for use by part [121](#) or part [135](#) operators or fractional ownership programs if the commercial provider is EWINS-qualified (see paragraph 3-2072C(2), above). Government products that are only repackaged and not altered, or products produced by a EWINS, are considered primary weather products as defined below in paragraph 3-2073, Classification of Aviation Weather Products.

NOTE: Commercial weather information providers contracted by the FAA to provide weather observations (e.g., contract towers) are included in the Federal Government category of approved sources by virtue of maintaining required technical and quality assurance standards under Federal Government oversight.