

GUIDANCE REGARDING FLIGHT OPERATIONS IN THE VICINITY OF VOLCANIC ASH

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REVISION HISTORY**Version 1****10 February 2011**

Original issue in the form of a single document, bringing together guidance previously issued as AIRCOMs, ATSINs, FODCOMs and NOTALs.

The opportunity has been taken to make some minor updates to the text.

GLOSSARY

Abbreviation	Meaning
ANO	Air Navigation Order
ANSP	Air Navigation Service Provider
AOC	Air Operator's Certificate
ASR	Air Safety Report
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATS	Air Traffic Service(s) (Note: ATS encompass the provision of ATC and FIS.)
CAT	Commercial Air Transport
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
FIR	Flight Information Region
FIS	Flight Information Service
FISO	Flight Information Service Officer
FL	Flight Level
HEMS	Helicopter Emergency Medical Services
ICAO	International Civil Aviation Organization
IMC	Instrument Meteorological Conditions
MOR	Mandatory Occurrence Report
MSA	Minimum Safe Altitude
NOTAM	Notice to Airmen
OEM	Original Equipment Manufacturer
PT	Public Transport
RFFS	Rescue and Fire-Fighting Services
SAR	Search And Rescue
SVFR	Special Visual Flight Rules
TDA	Temporary Danger Area
TRA	Temporary Reserved Area
TRUCE	Training in Unusual Circumstances and Emergencies
USGS	United States Geological Survey
VAA	Volcanic Ash Advisory
VMC	Visual Meteorological Conditions

1 INTRODUCTION

1.1 Purpose

1.1.1 This guidance brings together guidance previously issued as AIRCOMs, ATSINs, FODCOMs and NOTALs. It aims to provide the essential guidance regarding flight in or near volcanic ash for pilots, aircraft owners, Air Traffic Service (ATS) staff, aerodrome operators and maintenance engineers.

1.2 Amendments

1.2.1 Marginal lines are used to indicate changes from the previous version, and the changes at each version are listed in the Revision History.

1.3 General Points Regarding Volcanic Ash

1.3.1 It is emphasised that the responsibility for the risk assessment and management, and for the safe operation of the aircraft, rests firmly with the operator of the aircraft. Operation through or within any area where volcanic ash is forecast is at the discretion of the operator and subject to the regulation of the operator by the State of Registry and the State of the Operator.

1.3.2 The information provided here, whilst not exclusive, is intended to facilitate as much flight as is safely possible in airspace in which an encounter with an ash cloud is a hazard, especially where those flights (and machines typically used for those flights) are used to provide essential services to communities.

1.3.3 Volcanic ash may extend for several hundred miles and may not be visible.

1.3.4 It should be recognised that the ash cloud can be the cause of a common failure mode (e.g. it would affect all engines on one aircraft) - that is why, for example, a twin-engine helicopter should be operated as if any engine failure would be a double-engine failure.

1.3.5 This guidance does not supersede any guidance or recommendations issued by the Original Equipment Manufacturers (OEMs), a phrase which refers mainly to aircraft and engine manufacturers. All aircraft operators should consult their OEMs when preparing safety cases to operate in airspace forecast to be contaminated with volcanic ash. Air Operator's Certificate (AOC) holders conducting Commercial Air Transport (CAT) or Public Transport (PT) must have appropriate measures in place before considering penetrating published Temporary Danger Areas (TDAs) (see paragraph 2.2.4).

1.3.6 Flights for the purposes of safety, security and the saving of life (e.g. Search And Rescue (SAR), Helicopter Emergency Medical Services (HEMS) and Police) may be permitted in the TDA. This applies to all classes of aircraft and airspace. Commanders should exercise extreme caution. Appropriate measures should be taken after any such flight to ensure the continued airworthiness of the aircraft concerned.

2 FLIGHT PREPARATION

2.1 Applicability

2.1.1 This paragraph is of particular relevance to:

- Aircraft operators and owners planning their flights.
- Aerodrome operators managing their aerodromes.

- ATS providers briefing their staff.

2.2 Areas of Contamination

2.2.1 In the International Civil Aviation Organization (ICAO) Volcanic Ash Contingency Plan EUR and NAT Regions (EUR Doc 019) [[Appendix 2](#), reference 7], three ash contamination levels have been defined as described below. All modelled ash concentrations are subject to a level of uncertainty. 'Defined dimensions' refers to horizontal and vertical limits.

Area of Low Contamination: An airspace of defined dimensions where volcanic ash may be encountered at concentrations equal to or less than $2 \times 10^{-3} \text{ g/m}^3$, but greater than $2 \times 10^{-4} \text{ g/m}^3$.

Area of Medium Contamination: An airspace of defined dimensions where volcanic ash may be encountered at concentrations greater than $2 \times 10^{-3} \text{ g/m}^3$, but less than $4 \times 10^{-3} \text{ g/m}^3$.

Area of High Contamination: An airspace of defined dimensions where volcanic ash may be encountered at concentrations equal to or greater than $4 \times 10^{-3} \text{ g/m}^3$, or areas of contaminated airspace where no ash concentration guidance is available.

- Notes:**
- 1) Other names have previously been used to describe areas containing various concentrations of volcanic ash, including Enhanced Procedure Zone (EPZ), Time Limited Zone (TLZ) and No-Fly Zone (NFZ). However, these are now withdrawn.
 - 2) Some Volcanic Ash Advisories (VAAs) in other parts of the world may not differentiate between different levels of contamination.

2.2.2 Note that paragraphs 2.2.3 to 2.2.6 apply to airspace for which the UK is responsible for the provision of air navigation services. In other areas of the world there are variations. In particular, in some areas of the world only a SIGMET or Notice to Airmen (NOTAM) may be published defining the airspace contaminated by volcanic ash.

2.2.3 In the UK, areas of ash contamination will be displayed on the [Volcanic Ash Concentration Chart](#) available from the UK Met Office.

2.2.4 The CAA will issue [NOTAMs](#) specifying UK airspace predicted to contain medium and high contaminations of volcanic ash. Areas of high contamination will be promulgated as Volcanic Ash TDAs. The term Volcanic Ash TDA should not be confused with the Initial Danger Zone, which is established with a 120 NM radius in the vicinity of the volcanic eruption.

2.2.5 The boundaries of the Volcanic Ash TDAs in UK airspace will be promulgated via [NOTAMs](#) (requires prior registration).

2.2.6 Only NOTAMs issued by the CAA should be used to determine areas of medium and high ash contamination (and any associated Volcanic Ash TDAs). It is possible that a NOTAM may not be consistent, on occasions, with the high or medium ash contamination areas that are provided on the UK Met Office Volcanic Ash Concentration Charts. The most likely causes for inconsistencies are:

- a) Smoothing of the contamination area for ease of interpretation in the NOTAM.

- b) Observational evidence received since the forecast has been issued and prior to any revised or updated forecast being issued. This may include:
- old ash that has dispersed more quickly than expected by the model;
 - small areas of high contamination, which may be considered unrealistic; and
 - areas of ash detached from a main plume that are incorrectly modelled.

It should also be noted that on occasions it may be necessary to amend the NOTAM that is in force when updated observations are received.

2.3 Clearing Volcanic Ash from Aerodrome Surfaces

2.3.1 The following guidance is available regarding clearing ash from aerodrome surfaces:

- a) Flight Safety Foundation article [[Appendix 2](#), reference 3]. The chapter 'Aircraft Also Face On-ground Ash Hazards', starting on page 5, is particularly useful to aerodrome operators.
- b) ICAO Document 9691 [[Appendix 2](#), reference 4].
- c) United States Geological Survey (USGS) article [[Appendix 2](#), reference 12]. Guidance on surfaces starts on page 13 of the report.
- d) Guidance from the United States Geological Survey [[Appendix 2](#), reference 11].
- e) A paper [[Appendix 2](#), reference 8] and presentation [[Appendix 2](#), reference 9] made to the ICAO International Volcanic Ash Taskforce in July 2010 by the operators of Kagoshima airport, arising from the eruption of Mount Sakurajima in Japan.

2.3.2 The approaches to ash removal discussed in these documents have been endorsed by the Federal Aviation Administration (FAA), which has experience of volcanoes in Alaska.

2.3.3 Aerodrome operators will have their own recovery plans, but may wish to consider in advance options for clearing aerodrome surfaces, should this become necessary. Following any ash clearance, aerodrome operators should conduct a thorough pre-start-up inspection to ensure that:

- ash has been cleared from paved surfaces used by aircraft;
- all visual aids including aeronautical ground lighting, markings and signage are fit for purpose; and
- the runway surface has adequate friction levels.

2.4 Aerodrome Contingency Arrangements

2.4.1 Should a volcanic event occur rapidly that results in a surge in the number of operations (e.g. due to aircraft requiring to be grounded at short notice due to airspace restrictions) the CAA will permit aerodromes to accept aircraft larger than their infrastructure code, or of one Rescue and Fire-Fighting Services (RFFS) category higher than they normally provide, which should be managed through the normal contingency arrangements.

2.4.2 Aerodrome operators should ensure that aircraft operators affected by these contingency arrangements are aware of the facilities and operations that will be made available at the aerodrome, and aerodrome licence holders should apprise their allocated aerodrome inspector of the arrangements in place.

2.5 Parked Aircraft

- 2.5.1 Aircraft parked in areas that may be contaminated by volcanic ash should be suitably protected in accordance with the aircraft OEM's advice and covered where possible.
- 2.5.2 Clouds, especially cumuliform clouds, may produce precipitation, which may be dirty if ash is present.
- 2.5.3 Any volcanic residues must be removed prior to operations by following the appropriate OEM's recommendations.

2.6 Operations to or from an Aerodrome Known to be Affected by Volcanic Ash

- 2.6.1 The aircraft OEM's advice should be sought prior to any operation to or from aerodromes contaminated with volcanic ash. Service Bulletins and Operations Manuals should be consulted. In addition to the hazards of contamination by volcanic ash, the runway braking action may be significantly affected, typically to the equivalent of:
- a wet runway for dry ash; and
 - a slush-covered runway for wet ash.

2.7 Deciding Whether and Where to Fly

- 2.7.1 The decision as to whether and where to fly rests with the operator and aircraft commander. In all cases, in accordance with the Air Navigation Order (ANO) 2009 article 87, commanders must satisfy themselves that it is safe to conduct the flight.
- 2.7.2 In accordance with OPS 1.180(a)(3)(v) and JAR-OPS 3.180(a)(3)(v), all aeroplane and helicopter operators conducting CAT or PT in airspace likely to be affected by volcanic ash, or to/from affected aerodromes, must carry out a safety risk assessment prior to planned operations. The operator must have its safety risk assessment accepted by its supervising NAA before initiating operations into airspace, or at aerodromes, which may be contaminated by volcanic ash.
- 2.7.3 A volcanic ash encounter is potentially extremely hazardous and areas of known contamination above $4 \times 10^{-3} \text{ g/m}^3$ should be avoided. The decision to operate should be taken carefully.
- 2.7.4 Guidance on carrying out a safety risk assessment or deciding whether and where to fly is at Appendices A and B of ICAO Guidance Material [[Appendix 2](#), reference 6] and [Appendix 1](#).

2.8 Overflight of Volcanic Ash Clouds

- 2.8.1 It is likely that only aeroplanes have the performance capabilities to overfly volcanic ash clouds.
- 2.8.2 Providing an operator can plan a flight such that in the event of any credible emergency the aeroplane can continue to remain clear of the air mass containing significant concentrations of volcanic particles, there is nothing in the available data that would indicate overflight of such airspace is unacceptable. It is recommended that airspace with significant ash contamination be treated as a 'solid object' for the purposes of flight planning. This is analogous to a mountainous area with a high Minimum Safe Altitude (MSA) and no alternate aerodromes within it. In general, the assumed MSA should be at least 2,000 ft above the top of the ash cloud.

2.8.3 The following should be considered in relation to emergency descents:

- a) Extensive damage may be caused if the level of airborne contamination is high, potentially leading to engine shutdown, loss of air data systems and significant airframe damage. Lower levels of contamination may have a long-term detrimental effect on engines and systems.
- b) A review by the CAA was conducted of emergency descents reported under the Mandatory Occurrence Reporting scheme in a three-year period from 2007 until 2010 in UK airspace. There were 51 in 4.5 million flight hours. However, operators should carry out their own risk assessment for their particular operation.

2.8.4 Issues that operators need to consider include descent due to engine failure and depressurisation:

a) Engine failure

The requirements are set out in OPS 1.495 and OPS 1.500. OPS 1.495 requires an aeroplane to be capable of avoiding all obstacles in the climb until it can comply with the en-route requirements of OPS 1.500. To comply with OPS 1.500, in general, the aeroplane must be capable of maintaining 2,000 ft above all terrain and obstacles after an engine failure, or a critical point must be calculated, with an associated minimum cruise altitude, which will allow the aeroplane to maintain the above clearance during drift down and diversion.

For en-route net flight paths, operators should refer to the Aircraft Flight Manual.

b) Depressurisation

The oxygen requirements are given in OPS 1.770 with the details in Appendix 1 to OPS 1.770. The limiting requirement is usually the one that calls for supplemental oxygen to allow continued flight above MSA where this is in excess of FL 100.

2.8.5 Volcanic ash is continually moving depending on weather patterns. Therefore the position and vertical extent of ash is not known to great accuracy. The density of ash will also vary. Operators should ensure that they use the most recent data from a recognised source for planning, with suitable safety margins. Recognised sources include charts and NOTAMs issued by the National Aviation Authorities or Meteorological Offices responsible for the airspace.

3 DURING FLIGHT

3.1 Applicability

3.1.1 This paragraph is of particular relevance to:

- Pilots during flight.
- ATS providers.

3.2 Encountering Volcanic Ash

3.2.1 Airborne weather radar systems are not designed to detect volcanic ash clouds and extra precautions should be taken during flight, particularly during hours of darkness and in Instrument Meteorological Conditions (IMC) when volcanic ash may be present in the atmosphere. The following are signs that volcanic ash may be present during flight:

- Smoke or dust in the cockpit.

- Reduced visibility.
- An acrid or sulphurous odour.
- St Elmo's Fire and static discharges around the windshield.
- A bright white or orange glow in the engine inlets.
- Sharp, distinct beams from the landing lights.

3.2.2 Any unexpected encounter with volcanic ash should be reported immediately to the Air Traffic Control Officer (ATCO) or Flight Information Service Officer (FISO) and the procedures provided in the Operations Manual should be followed. General advice is to execute a 180-degree turn to leave the ash cloud. If possible, the engine thrust should be reduced to flight idle to minimise the build-up of ash in the engines.

3.2.3 If any ash damage becomes apparent in flight (possibly by windscreen or leading edge impact), pilots should attempt to leave the area either horizontally or vertically or both. A precautionary landing should be made at the nearest suitable airport if it is suspected that the engines have been adversely affected or there is aircraft damage.

3.3 Advice for General Aviation Pilots

3.3.1 The guidance in this paragraph should be read in conjunction with paragraph 3.2.

3.3.2 Flights in or close to cloud should be avoided. Cloud, especially cumuliform cloud, forms around particles in the atmosphere and volcanic ash particles provide ideal cloud (and ice) nuclei.

3.3.3 Engine damage is particularly concerning for turbine-engined aircraft, but probably less so for other internal combustion engines, where the combustion air can be filtered. However, in some piston engine installations, fixed-wing or rotary-wing, the use of carburettor hot air will bypass the air intake filter and therefore pilots should be aware of the potential for airborne contamination to reach the engine. If possible, conditions of cloud, drizzle, mist and any other known or probable areas of high humidity requiring the extended use of carburettor hot air should be avoided.

3.3.4 Increased haze may indicate a high concentration of ash. Below the top of the haze layer, dust concentration levels are usually high and discrimination between normal dust and ash will be extremely difficult. Above any haze tops, variations in the normally good visibility may be apparent. However, in an anticyclonic situation air at medium to upper levels, which may be affected by volcanic eruptions, is slowly descending. Air from the surface rises with convection during the day and descends very slowly during the night, so the highest concentration of ash may well end up at the top of the anticyclonic haze layer. Climbs and descents through the levels around the haze tops should be flown at the maximum safe rate possible, as should those through likely high humidity areas if carburettor hot air may be needed.

3.3.5 Airframe, propeller, rotor, intake and windscreen damage is caused by dust impacting surfaces. The extent of the damage depends on dust concentration, the composition of the dust and energy of impact (which is proportional to the square of impact speed). Operating airspeeds should therefore be chosen carefully, taking into account the rate at which any possible damage is likely to accumulate. However, aeroplanes should not be flown so slowly that they cannot be manoeuvred safely in an emergency.

3.3.6 It may be prudent to avoid flight over areas where the choice of landing areas in the event of engine failure is limited, even in twin-engined aircraft.

3.3.7 Ash may also find its way into pitot/static systems, or affect the lubrication of moving parts such as rotor heads, gearboxes and other bearings.

3.3.8 Glider pilots should avoid flight through cloud if the presence of ash has been notified, for the reasons given above. Balloon pilots are unlikely to be affected by volcanic ash, but should remain in Visual Meteorological Conditions (VMC) if flying where ash is present.

3.4 Provision of Air Traffic Services

Note: This paragraph applies to ATS provision in the UK Flight Information Regions (FIRs), excluding airspace delegated to other States. ATS procedures in other parts of the world may vary.

3.4.1 ATS providers should inform pilots of the presence of a Volcanic Ash TDA before the aircraft enters or operates in such an area and ask them for their intentions. The following phraseology should be used:

“You are about to enter a notified volcanic ash Temporary Danger Area in your (xx) o’clock up to FL (xxx). Report your intentions.”

3.4.2 ATCOs/FISOs are not required to question a pilot’s approval to fly through a volcanic ash TDA. There is no requirement to terminate or amend the ATS provided.

3.4.3 ATS providers should give a high priority to passing reports from pilots about unforecast but observed ash contamination to the UK Met Office (see paragraph 4.2). The Mandatory Occurrence Report (MOR) scheme should be used for volcanic ash events where considered appropriate.

3.4.4 Within the various contamination areas it is for the aircraft operator and aircraft commander to determine that it is safe to operate the aircraft in such airspace. ATS providers are not required to question a pilot’s approval to fly through a Volcanic Ash TDA.

3.4.5 ATS providers are to ensure that ATCOs and FISOs are aware that, should an aircraft unexpectedly encounter a significant concentration of volcanic ash, the pilot may (possibly without prior warning):

- execute a 180° turn;
- descend;
- reduce engine power; or
- disconnect auto-throttle.

3.4.6 Pilots operating within an area of contamination may decline a vector if that would take the aircraft into an area of higher contamination if that would be contrary to the aircraft type and engine pairing tolerance level. A pilot may also request to leave an area if the aircraft is unable to sustain flight within the area. ATCOs and FISOs should accommodate any such request as expeditiously as operational safety considerations allow.

3.4.7 ATS providers should ensure that:

- ATCOs and FISOs are appropriately briefed before they assume responsibility for a control position, on the actions to be taken in the event that a pilot intends

to operate an aircraft through a Volcanic Ash TDA, and potential pilot actions in the event of a significant volcanic ash encounter;

- ATCO and FISO workloads are managed such that sufficient capacity is maintained at all times to react appropriately to significant volcanic ash encounters. This may include the application of flow control or limitations on the number of aircraft in a defined airspace block or sector;
- adequate resources are available to accommodate planned aircraft movements, including an unexpected emergency/diversion incident; and
- service provision in areas of volcanic ash is considered to be an unusual circumstance and is therefore to be included in Training in Unusual Circumstances and Emergencies (TRUCE).

4 AFTER FLIGHT

4.1 Applicability

4.1.1 This paragraph is of particular relevance to:

- Aircraft operators and owners after flight.
- Engineering and maintenance staff.

4.2 Reporting

4.2.1 If any ash is encountered, whether or not damage occurs, the crew should report it to the operator by the most expeditious means and through the operator's Air Safety Report (ASR) system. It should be reported to the CAA through the Mandatory Occurrence Reporting Scheme on an occurrence report form [SRG 1601](#).

4.2.2 ATS providers are requested to report to the CAA any encounters with, or experience of, volcanic ash reported by pilots, as detailed in paragraph 4.2.1. Additionally, Special Air Reports provided by pilots should be forwarded to the UK Met Office via telephone on +44 (0) 1392 884918 and contain the following information:

- Volcanic Ash encounter;
- Aircraft identification;
- Position or Latitude and Longitude;
- Time;
- Flight Level or altitude; and
- Any further relevant information.

4.2.3 These reports should be made with maximum urgency. This information may assist the relevant bodies to predict more accurately the presence, movement and altitude of the volcanic ash, and any potential effect on flight.

4.2.4 If a volcanic ash encounter occurred or is suspected to have occurred during flight it must be reported to engineering staff and an entry made in the Aircraft Technical Log. Engineering action may be required prior to subsequent flight. The Aircraft Maintenance Manual should be consulted and advice sought from the aircraft OEM where necessary.

4.3 Maintenance Programmes

- 4.3.1 Where aircraft require routine schedule minor maintenance but are unable to fly to their normal maintenance facility, the possibility of issuing one-off maintenance authorisations to local maintenance staff in accordance with Part 145.A.30(j)(5) should be considered. Operators should also consider whether inspection for signs of volcanic dust contamination needs to be performed before returning an aircraft to service.
- 4.3.2 In all cases where it is not possible to have outstanding maintenance performed at the aircraft's current location, the aircraft operator should contact their **local CAA regional office** for further advice.
- 4.3.3 Even if no volcanic ash damage is apparent, it is advisable for all possibly affected areas to be checked (if necessary by a qualified engineer) more frequently than called for in most maintenance schedules. The latest information from the OEM, for both airframe and engine, should specify any particular areas of concern or any additional requirements that need to be observed.
- 4.3.4 Many aircraft and engine OEMs have updated their instructions for continuing airworthiness to include additional and revised information for aircraft operating in areas where volcanic ash could be present. It is recommended that operators immediately incorporate any new or revised information into their approved maintenance programmes. Insurance policies may also contain relevant clauses.
- 4.3.5 In the absence of specific information from an OEM, there is some generic guidance available via the European Aviation Safety Agency (EASA) **Safety Information Bulletins**.

5 SUMMARY

5.1 Disclaimer

- 5.1.1 This summary is designed to provide key information for the various groups of people who need to know how volcanic ash affects all aspects of flight. However, it is recommended that they read the document as a whole.

5.2 Aerodrome Licence Holders

- The responsibility for the safe operation of the aircraft rests firmly with the aircraft operator (see paragraph 1.3.1).
- Aerodrome operators should clear volcanic ash from aerodrome surfaces prior to operations taking place (see paragraph 2.3).
- Aerodrome operators should have in place contingency arrangements to manage events which occur at short-notice, e.g. airspace restrictions (see paragraph 2.4).

5.3 Aircraft Owners and Operators

- The responsibility for the safe operation of the aircraft rests firmly with the aircraft operator (see paragraph 1.3.1).
- Whether and where to fly should be considered carefully (see paragraph 2.7), with the decision based on the most recent and relevant volcanic ash information obtained through established procedures.

- General Aviation pilots should pay particular attention to the advice specific to them (see paragraph 3.3).
- Pilots should be aware of what information and service they can expect from ATS providers (see paragraph 3.4).
- Pilots should be aware of the symptoms of a volcanic ash encounter and the escape procedures. Pilots should report any volcanic ash encounters appropriately (see paragraph 4.2.1).

5.4 Air Traffic Service Providers

- The responsibility for the safe operation of the aircraft rests firmly with the aircraft operator (see paragraph 1.3.1).
- ATS providers are to ensure ATCOs and FISOs are aware of the procedures for the provision of ATS to aircraft intending to operate in a Volcanic Ash TDA and likely pilot actions on encountering volcanic ash (see paragraph 3.4).
- ATS providers should report any volcanic ash encounters appropriately (see paragraph 3.4.3).

5.5 Maintenance Personnel

- Maintenance personnel should report any volcanic ash encounters appropriately (see paragraph 4.2.4).
- Maintenance personnel should check airframes and engines more frequently if volcanic is likely to have been encountered (see paragraphs 4.3.3 and 4.3.4). They should carry out a thorough investigation of any signs of unusual or accelerated abrasions or corrosion or volcanic ash accumulation.

APPENDIX 1 GUIDANCE FOR COMBINATIONS OF AIRCRAFT TYPES AND AIRSPACE TYPES

	Class A & C	Class D	Class G
Turbine Aeroplanes	All flights must comply with published TDA procedures.	All flights must comply with published TDA procedures.	All flights must comply with published TDA procedures.
Piston Aeroplanes and Airships	All flights must comply with published TDA procedures.	CAA advises no flight in TDA. If flying, do so in VMC, by day only, and avoid visible ash. AOC holders conducting CAT or PT must submit a safety case.	CAA advises no flight in TDA. If flying, do so in VMC, by day only, and avoid visible ash. AOC holders conducting CAT or PT must submit a safety case.
Turbine Helicopters	CAA advises no flight in TDA. Otherwise Special Visual Flight Rules (SVFR), by day only, in VMC. Only one aircraft in any airspace 'block' as determined by Air Navigation Service Provider (ANSP). Special rules apply to operations in Heathrow area. SVFR, by day only. AOC holders conducting PT must submit a safety case. Multi-engine helicopters should be operated as if any engine failure would be a multiple-engine failure.	CAA advises no flight in TDA. If flying, do so in VMC, by day only, and avoid visible ash. Exercise extreme caution. AOC holders conducting PT must submit a safety case. Multi-engine helicopters should be operated as if any engine failure would be a multiple-engine failure.	CAA advises no flight in TDA. If flying, do so in VMC, by day only, and avoid visible ash. Exercise extreme caution. AOC holders conducting PT must submit a safety case. Multi-engine helicopters should be operated as if any engine failure would be a multiple-engine failure.

	Class A & C	Class D	Class G
Piston Helicopters	<p>CAA advises no flight in TDA.</p> <p>Otherwise SVFR, by day only, in VMC. Only one aircraft in any airspace 'block' as determined by ANSP.</p> <p>Special rules apply to operations in Heathrow area. SVFR, by day only.</p> <p>AOC holders conducting PT must submit a safety case.</p>	<p>CAA advises no flight in TDA. If flying, do so in VMC, by day only, and avoid visible ash. Exercise extreme caution.</p> <p>AOC holders conducting PT must submit a safety case.</p>	<p>CAA advises no flight in TDA. If flying, do so in VMC, by day only, and avoid visible ash. Exercise extreme caution.</p> <p>AOC holders conducting PT must submit a safety case.</p>
Balloons	<p>A - not permitted.</p> <p>C - only exists above FL195 (therefore not permitted except by special arrangement).</p>	<p>Normally permitted only by prior arrangement.</p> <p>CAA advises avoid visible ash.</p>	<p>CAA advises avoid visible ash. Otherwise, no restrictions.</p>
Gliders	<p>A - not permitted (except by specific Letter Of Agreement and associated procedures, or other specific arrangements).</p> <p>C – in VMC only within Temporary Reserved Area (TRA) (Gliding).</p>	<p>CAA advises avoid visible ash.</p> <p>In VMC only.</p>	<p>CAA advises avoid visible ash. Otherwise, no restrictions.</p>

APPENDIX 2 REFERENCES

No.	Organisation	Document
1	Airbus	Flight Operations Briefing Note – 'Volcanic Ash Awareness'
2	FAA	Aeronautical Information Manual Chapter 7
3	Flight Safety Foundation	'Volcanic Hazards and Aviation Safety: Lessons of the Past Decade' (May 1993)
4	ICAO	Document 9691 'Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds'
5	ICAO	Document 9766 'Handbook on the International Airways Volcano Watch (IAVW): Operational Procedures and Contact List'
6	ICAO	Document ????? 'Guidance Material: Management of Flight Operations with Known or Forecast Volcanic Ash Contamination' Note: This document has been made available as a draft until it is formally approved (see detailed explanation).
7	ICAO	ICAO Volcanic Ash Contingency Plan EUR and NAT Regions: <ul style="list-style-type: none"> • EUR Doc 019. • NAT Doc 006 Part II.
8	ICAO	Mt Sakurajima and Operation of Kagoshima Airport in Japan (Information Paper 14)
9	ICAO	Mt Sakurajima and Operation of Kagoshima Airport in Japan (Presentation Japan2)
10	UK Met Office	Volcano – Information for Customers
11	United States Geological Survey	USGS Volcano Hazards Program Site
12	United States Geological Survey	'Volcanic Ash and Airports – Discussion and Recommendations from the Workshop on Impacts of Volcanic Ash on Airport Facilities' (1993)