

26 February 2016  
Reference: F0002689

Dear XXXX

I am writing in respect of your recent request of 23 February 2016, for the release of information held by the Civil Aviation Authority (CAA).

Your request:

*'I would like to read the report 'In focus - Volcanic Ash : A briefing from the Civil Aviation Authority' for an essay I am writing in Risk Communication, MSc Risk Analysis.'*

Our response:

Your request has been considered in line with the provisions of the Freedom of Information Act 2000 (FOIA).

Please refer to attachment 1, where you will find a copy of the briefing, *'In focus - Volcanic Ash: A briefing from the Civil Aviation Authority'*.

If you are not satisfied with how we have dealt with your request in the first instance you should approach the CAA in writing at:-

Caroline Chalk  
Head of External Information Services  
Civil Aviation Authority  
Aviation House  
Gatwick Airport South  
Gatwick  
RH6 0YR

[caroline.chalk@caa.co.uk](mailto:caroline.chalk@caa.co.uk)

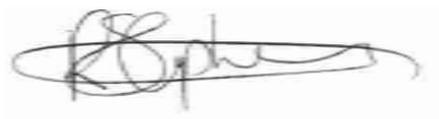
The CAA has a formal internal review process for dealing with appeals or complaints in connection with Freedom of Information requests. The key steps in this process are set in the attachment.

Should you remain dissatisfied with the outcome you have a right under Section 50 of the FOIA to appeal against the decision by contacting the Information Commissioner at:-

Information Commissioner's Office  
FOI/EIR Complaints Resolution  
Wycliffe House  
Water Lane  
Wilmslow  
SK9 5AF  
<https://ico.org.uk/concerns/>

If you wish to request further information from the CAA, please use the form on the CAA website at <http://publicapps.caa.co.uk/modalapplication.aspx?appid=24>.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Rihanne Stephen', enclosed within a light grey rectangular border.

Rihanne Stephen  
Information Rights Officer

**CAA INTERNAL REVIEW & COMPLAINTS PROCEDURE**

- The original case to which the appeal or complaint relates is identified and the case file is made available;
- The appeal or complaint is allocated to an Appeal Manager, the appeal is acknowledged and the details of the Appeal Manager are provided to the applicant;
- The Appeal Manager reviews the case to understand the nature of the appeal or complaint, reviews the actions and decisions taken in connection with the original case and takes account of any new information that may have been received. This will typically require contact with those persons involved in the original case and consultation with the CAA Legal Department;
- The Appeal Manager concludes the review and, after consultation with those involved with the case, and with the CAA Legal Department, agrees on the course of action to be taken;
- The Appeal Manager prepares the necessary response and collates any information to be provided to the applicant;
- The response and any necessary information is sent to the applicant, together with information about further rights of appeal to the Information Commissioners Office, including full contact details.

## Volcanic Ash

On 20th March 2010 the Icelandic volcano Eyjafjallajökul began erupting for the first time in 190 years, sending a cloud of ash over Northern Europe. Volcanic ash is a known hazard to aircraft, and the unequivocal guidance from the International Civil Aviation Organisation (ICAO) - based on such events as the multiple engine failure that affected a British Airways flight over Indonesia in 1982 - is that aircraft encountering volcanic ash must avoid it completely. The ICAO guidance, which is based on the evidence from a number of previous volcanic events, states simply that operators should **AVOID, AVOID, AVOID**.

Volcanoes erupt frequently, but normally only affect areas where air traffic is light and airspace is uncongested. Their ash clouds are tracked by nine global Volcanic Ash Advisory Centres, which provide information to allow flights to reroute their flight paths around any area of contamination.



Satellite Image of the ash plume on 19 April 2010. Source Met Office

The disruption to UK flights on 15 April and the five days that followed was caused by unprecedented conditions - frequent eruptions from Eyjafjallajökul combining with a weather pattern that sent volcanic ash into airspace where there was simply not the room to avoid it. As the severity of the situation increased UK air traffic control service provider NATS announced it would not provide IFR clearances into the contaminated airspace in accordance with International Civil Aviation Organisation (ICAO). As such, no flights could take place in the UK's Controlled Airspace. At this stage given the ICAO guidance documentation, there was no alternative strategy that would have allowed NATS or the CAA to provide the necessary assurance of safety.

The UK was not alone in restricting flight operations, with many other European countries following suit as the ash cloud drifted into their airspace.

### Safety first

Safety always comes first in aviation. The UK has one of the world's best safety records, secured by strict guidelines. When the scale of the problem and extent of airspace closures became evident on 15 April, and looked set to continue for some time, the challenge facing the CAA was evident. It had to establish whether the guidelines from ICAO could safely be revised to allow aircraft to fly through a low density of ash (instead of the zero tolerance specified which was not based on hard scientific evidence) and to better understand and predict the height and density of ash contamination in UK airspace.

Aircraft with special instruments to measure the ash cloud's density were used, complementing the data provided by six ground-based lasers located across the UK. Over the course of the first weekend further evidence was gathered from commercial jets, without passengers, flying a flight path behind the instrument-bearing aircraft. Before and after any flights, engines were intensively examined to check for any correlation between ash density and engine damage. Meanwhile, work was underway with manufacturers to frame new guidance for allowing aircraft to safely fly through Europe's skies.

## How was the new level set?

The scale of the challenge was enormous. International and European regulators, manufacturers and aviation experts had to co-ordinate their expertise and agree a new zoning system for the airspace affected by volcanic ash and to establish new airworthiness guidance. The CAA, with NATS, took the lead in getting both of these workstreams underway, and after five days of intensive conference calls with hundreds of experts the necessary data was amassed for the basis of the agreed new guidelines. Politicians, airlines and tour operators were kept abreast of developments.

On Monday 19 April, Europe agreed a proposed new zoning system for allowing flights to operate in low levels of ash. This established a no-fly zone where the predicted ash density exceeded the proposed ash tolerance figure. This however proceeded any final approval from manufacturers to allow flights in any amount of ash. This allowed identification of a secondary zone where flying could be resumed, albeit subject to some additional inspections of the aircraft if evidence of ash contamination was found and a tertiary, ash-free zone where normal operations could be conducted.

By the afternoon of Tuesday 20 April, key manufacturers had provided the CAA with agreed revised guidelines which would not compromise safety. This resulted in the manufacturers setting an agreed limit of low levels of ash that were deemed to be safe. Forty-five minutes after securing that agreement, the CAA board met in emergency session and agreed the new guidelines. Two hours after the meeting, the skies reopened and the first flights landed at Heathrow – three of them reporting smells of sulphur – an indication that they had flown through, or near to areas of ash contamination. The new limit of tolerable ash density is set at  $2 \times 10^{-3}$  grammes of ash per cubic metre of air.

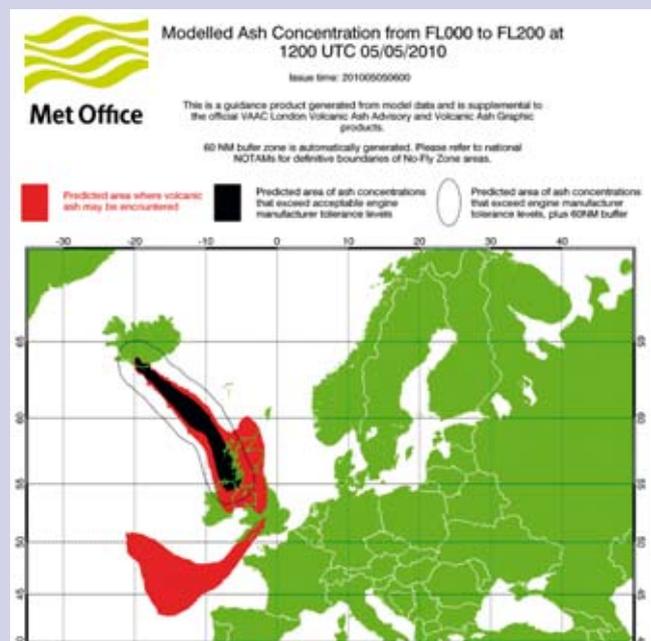
This meant that no fly zones were established where the ash had a higher concentration than that agreed as being safe by the manufacturers, the secondary zone was where ash was present but at lower concentrations (down to an ash density of  $2 \times 10^{-4}$  grammes of ash per cubic metre of air) so aircraft were allowed to fly with additional safety measures and a strict inspection regime in place, and a tertiary ash free zone (below  $2 \times 10^{-4}$  grammes of ash per cubic metre of air) where aircraft could continue operations as normal. Eurocontrol, the air traffic provider for much of

European controlled airspace, imposed a further 60 nautical mile buffer around the no-fly zone as a contingency measure, in place until there was evidence in place to show the buffer was unnecessary.

Since then airline operations have resumed without major incident, or any reports of airframe or engine damage. There have been cases of aircraft encountering some suspected ash and ash deposits have been discovered on aircraft after a flight. This is to be expected as the ash cloud has not gone away and therefore aircraft will be encountering ash as they fly through it.

The no fly zone has since affected parts of the UK a number of times, but relatively small areas and for much shorter periods of time. Transatlantic flights have been disrupted, most significantly over the weekend of 8/9 May when a large no fly zone was put in place to the west of Ireland. Spanish airspace has also been affected, causing a lot of disruption to flights in and out of Spain.

Maximising safe flying is the objective of all involved. As such the CAA is constantly reviewing the measures in place and, based on the evidence of the flights that have taken place so far around the ash, the CAA decided on 10 May to remove the requirement for a 60 nautical mile buffer around the area of higher ash concentration. This has been welcomed by industry and it is expected that the rest of Europe, once they have completed their own checks, will make the same judgement.



Illustrative Met Office modelled ash concentration chart from 05 May 2010

## What happens now?

Eyjafjallajökul is continuing to erupt. Airlines are examining aircraft engines and airframes before and after flights, including assessing the effects of cumulative exposure to ash. Scientists are constantly monitoring the ash cloud's movements.

As the UK has some of the most congested skies in the world, no fly zones will continue to disrupt UK flights until the volcano stops emitting large volumes of ash, the weather patterns change or the aviation industry comes up with technical solutions to allow aircraft engines to fly through denser levels of volcanic ash.

As the volcano and the weather are out of our control, the emphasis of the CAA's future is on working with industry and other partners on continuing to improve the airworthiness solution.

The CAA is also continuing to drive activities across Europe to develop more detailed scientific understanding of the problem. As the aviation sector's UK regulator, we are working hard to bring the industry together to address the issue. We are continuing to provide expert guidance, and are looking to engine and aircraft manufacturers, working in

conjunction with airlines, to build the evidence for new technical guidelines.

Manufacturers can perform testing based on ash intake into engines and certify its effect on airframes and instrumentation, and would be responsible for making any changes to technical guidelines.

Throughout this process, the CAA will ensure that the public is at the heart of all our work, and our goal will be to allow as much flying as safely possible, working with all stakeholders to be sure that safety is not compromised and disruption is minimised.



## Timeline of events

### Saturday 20 March

Icelandic volcano Eyjafjallajökull begins erupting for the first time in 190 years.

### Wednesday 14 April

More forceful eruption, emitting plumes of ash.

CAA is informed & advice is provided to airlines.

Late evening, as the extent of the ash cloud emitted become apparent, the National Airspace Crisis Management Executive (NACME) convenes, sponsored by CAA's DAP, including CAA's SRG, MoD, NATS, DfT and others. Thereafter NACME meets up to three times daily throughout the crisis.

### Thursday 15 April

Early morning, the ash cloud reaches Scottish airspace making it

unsafe for flights.

CAA starts internal briefings on ICAO guidelines.

NATS announces that from 1200 until at least 1800, it will not provide IFR clearances into the contaminated airspace in accordance with International Civil Aviation Organisation (ICAO) guidance that flying should not take place where there is ash in the atmosphere. CAA follows this with a NOTAM reinforcing the decision with advice to VFR pilots.

Six ground based LIDAR (Light Detection and Ranging) radars detect ash in the atmosphere. Dornier 228 aircraft launched for airborne evaluation.

### Friday 16 April

Evidence of ash presence detected at various locations throughout UK. Small window

allows Manchester to open briefly.

CAA, NATS, and Met Office in contact with Eurocontrol. CAA meets Transport Secretary and agrees further updates and briefings throughout the day, including afternoon meeting with airline & BAA representatives. Regular contact continues throughout the period.

CAA establishes international teleconference call, drawing together almost 100 organisations to assess whether slightly denser contamination than the current ICAO level would be an acceptable risk based position.

Dornier instrumented aircraft from NERC deployed to verify Met Office models.

Volcanic activity intensifies with ash up to 30,000ft.

Continued on back page

# CAA timeline of events

Continued

## Saturday 17 April

First International Teleconference chaired by CAA with International Airframe and Engine Manufacturers, Service Providers, Operators, Specialist Meteorological, Research and Geological Agencies and with European and International Aviation Safety Regulators.

There is no positive prognosis for allowing flights to recommence due to further eruptions, settled weather patterns and N/NW winds.

Operator in Penzance detects ash on airframe on landing. Similar reports from MoD in West Wales and North England.

Throughout weekend LIDAR data scrutinised – all showing continuing mild presence of contamination.

## Sunday 18 April

Second International Teleconference call. More data is requested by engine manufacturers on likely levels of contamination.

Instrumented Dornier flight ahead of BA flight, to measure contamination levels and practical impact.

Overflight policy circulated. Leads to proposals as announced at Eurocontrol conference 10.00am Monday morning.

## Monday 19 April

CAA work continues to seek agreement from aircraft engine manufacturers - overnight work in US suggests a solution may be possible.

European Transport Ministers meet and agree a three band model consisting of:

- a no fly zone within 60 nautical miles of the higher ash density area;
- a second zone where flying will not in principle be impeded (subject to agreed risk assessments and measures) even though some ash is present and where the decisions about operations will be taken by national authorities;
- a third zone which is not affected by ash.

Eurocontrol Press conference announces new zoning to take effect 0600 20 April.

Third International Teleconference. Data examined from further instrumented Dornier flights which show low level contamination. Still no uniform agreement from engine manufacturers about changing the tolerance level.

UK FIR open for overflight, above area of volcanic ash, above FL200.

## Tuesday 20 April

At morning meeting with Transport Secretary, airlines, tour operators and NATS, CAA updates on progress towards a solution, explains evidence base and informs all that CAA Board is on standby for emergency meeting.

Fourth International Teleconference happens.

CAA Emergency Board meeting held at 17.30 and agrees way forward:

- $2 \times 10^{-3}$  g of ash per cubic metre of air set as an acceptable safety limit.
- Requirements to be placed on Aircraft Operators, Air Navigation Service Providers and Aerodromes; including range of inspections to

reduce risk based around continued serviceability of engines and airframes between flights, and requiring airlines to conduct their own safety risk assessments.

- Instrumented flights to continue to check on density.
- Use banding model delineated by Eurocontrol.

CAA briefs Transport Secretary and airlines on Board decision, distributes position statement to International Teleconference Group and makes press announcement that airspace will be reopened at 2200.

Nine engine manufacturers go public with support for new safety threshold.

## 3 - 5 May

Ash plume returns to cover parts of UK airspace at levels above the  $2 \times 10^{-3}$  g per cubic metre threshold for several days, resulting in airports being closed in Scotland and Northern Ireland.

## 8 - 10 May

High concentrations of ash in airspace over parts of south west, southern and central Europe lead to airport closures.

## Monday 10 May

CAA announces that the 60nm buffer zone in place around areas of high ash concentrations can safely be removed following two more weeks of examination of the data, thereby safely reducing the maximum extent of the no fly zone around areas of higher ash density.

**More information about volcanic ash, the monitoring of ash flows, and the authorities' response can be found from the following websites:**

**The CAA - [www.caa.co.uk](http://www.caa.co.uk)**

**The UK Met Office - [www.metoffice.gov.uk](http://www.metoffice.gov.uk)**

**NATS - [www.nats.co.uk](http://www.nats.co.uk)**

**The British Geological Survey - [www.bgs.ac.uk](http://www.bgs.ac.uk)**