BATA Meeting on Volcanic Ash
Friary Court, 65 Crutched Friars, London EC3N 2AE
15th October 2013

Presented by - Harry Nelson
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Initial response

**TIMELINE**

- **Day to Day Evolutions**
- **Airbus Probing Flights 19/04/10 to 14/05/10**
  - A380 – Flight around South East of France
  - A340-600 Toulouse – Corsica – Toulouse
- **Provision of support to our Customers throughout**

**What was next?**

- Take a breath (of fresh air) and think about it all
- Make provisions for specialised instrumentation
- Set up cooperation requirements
- Assist in the establishment of a strategy for concerted action
What did we learn?

The level uncertainty associated with:

- Eruption Height Estimation - The height of the volcano thrust gives basis for speed at the vent
- Eruption Volume flow - Effective size of the vent unknown
- Eruption Mass flow - Density of the eruptive material unknown

Ash Mass Distribution
- How much of the eruptive material comes at which grain size?
- Coarse ash and lapilli fall close to volcano
- Fine ash is carried by winds (which also have a degree of uncertainty)

Ash Fallout - How far is how much ash of what concentration carried over what period of time?
Ash Washout - Meteorology of water in atmosphere has its own uncertainties
Altitudes at which the ash layers establish depend on particle size, density, convections
Distribution models calculation update rate

And what is « ash » anyway?
The challenge

The term "Volcanic Ash" covers a huge range of variables and ash is only part of the threat

- Chemical composition
- Mineral composition
- Variation in size
- Variation in density
- Variations in volume of material
- Variations in threat to various aircraft and engine parts
**Orders of Magnitude**

Amount of Ash exposed to in flight with a uniform concentration of 2 mg/m³

* All ash retained

<table>
<thead>
<tr>
<th>capture area</th>
<th>dimension</th>
<th>capture area m²</th>
<th>1 hr tube length m</th>
<th>scooped air quantity m³</th>
<th>ash qty 1 hr cumulated gr</th>
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The challenge

Bearing in mind the risk and uncertainty associated with any end results, trying to define certification limits and prove compliance may well be a bridge too far and may represent the wrong way to go.

Providing better data for planning flights
Providing better data in flight to allow avoidance

Would seem to offer better and more effective solutions
What can we do?

- Take a more pragmatic approach by looking at certain facts
  - Use the previous history of Volcano behaviour
  - Build on the past operational experience (use the people who know)
  - Apply the best operational procedures

and

- Put the emphasis on a requirement to avoid
  - Need to know what to avoid (Visual Ash Cloud)
  - Need to know how best to put such a requirement into operational practice
  - Give the crews some help (as in other threats like thunderstorms)
5. THE TYPE CERTIFICATE HOLDER

In fulfilling its primary responsibility for the safety of operations, the operator is dependent on the Type Certificate Holders (TCH) of the equipment it operates for some information, such as maintenance monitoring, recognition of encounter, etc. necessary to inform its safety risk assessment when volcanic clouds are a hazard. Therefore, TCHs should make available to operators a range of information important to the operator’s safety risk assessment related to the hazards associated with volcanic clouds. This information should be kept updated as future knowledge is acquired.

Note.— An indication of the range of information that an operator might require is provided in Section 3 and in Appendix B”

This we all do and will continue to do so
Airbus recommendations for Flight Crews

Airplane manufacturers provide training and instructions for detecting and exiting a Volcanic Ash encounter

Key points:

- Airlines should provide updated information to crews flying in regions likely to be affected by volcano activity
- Flight crews should solicitate updating of the preflight information when en route
- Flight crews should report to the ATC any observation of volcanic activity or any encounter with ash

Avoid visible volcanic ash cloud

If volcanic ash cannot be avoided, the flight crew should immediately apply the procedure recommended by aircraft manufacturer documentation:

- Make a 180° turn
- Decrease the thrust if conditions permit (to decrease the risk of particles melting)
- Don crew oxygen masks (100%)
- Report to the ATC
- Increase bleed demand (wing & engine anti-ice ON) to limit the engine surge or flameout
- Start the APU (to supply the electric network in case of engine failure)
- Monitor engine parameters and airspeed indications (could be unreliable by ash)

On ground:

- Aircraft inspections after the flight, if volcanic ash encounter confirmed

Note: There still seems to be a possible contradiction in documentation data from ICAO Doc 019 and advice from the ICAO IVATF working group.
AIRBUS roadmap for Operations Information Telex (OIT) and Flight Operations Telex (FOT)

29 JUNE 2011

Airline's feedback

IVATF2 outcome

OIT/FOT update

30 JULY 2011

16 AUGUST 2011
The AVOID system
The AVOID system

AVOID (Airborne Volcanic Object Imaging Detector)
To use A/C and on-board detection and awareness technologies as a sensor in a global process for safety improvement
Summary of the Airbus recommendations

1. Do not fly in visible or discernable ash

2. Whenever flight conditions do not allow visual avoidance of volcanic ash, flight planning should be performed using all available information to monitor and anticipate the position of the visible ash cloud

3. Operations in predicted ash concentration may be undertaken at operators' discretion, provided that flight into visible ash is avoided and that the recommended inspections are performed

4. If and when equipment is made available that allows crews to see ash threats, the operational use of such equipment needs to be defined.