

Presented by

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Volcanic Ash- Manufacturers View

Atlantic Conference on Eyjafjallajökull and Aviation, Iceland, September, 2010



AIRBUS

Overview

- *Airbus involvement since the eruption*
 - ▶ *CAA UK led immediate crisis management activity aiming at relief for EU Air traffic*
 - ▶ *Operation Advisory Material / Maintenance instructions for Operators*
 - ▶ *EU / NAT Volcanic ash task force*
 - ▶ *EASA Working Group on Volcanic Ash*
 - ▶ *ICAO International Volcanic Ash Task Force (through ICCAIA)*
- *Aircraft Exposure*
 - ▶ *Airbus share the understanding that Engines are in first line to the threat*
- *Probing Flights*
 - ▶ *We fly and try – our experience while probing EU Airspace*
- *Work Ahead: Airbus' action plan*
 - ▶ *ICCAIA activity / Airworthiness Subgroup in the ICAO IVATF*
 - ▶ *Lead European Research Project to address issues of specific atmospheric threat to flight*
 - *Ash / sand / ice crystals / Supercooled Large Droplets ...*
 - *Measurement / Detection / Characterization*

Airbus Ash Probing Flights

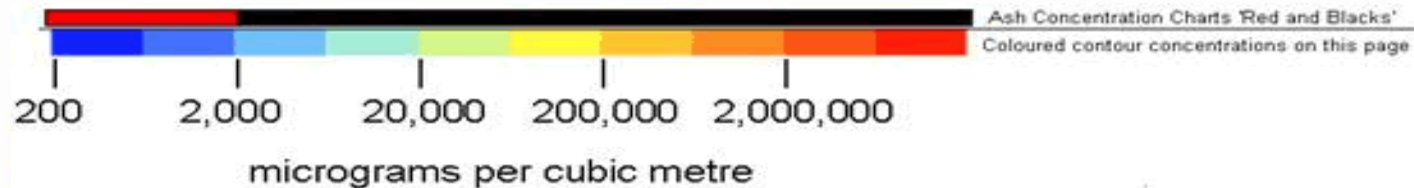
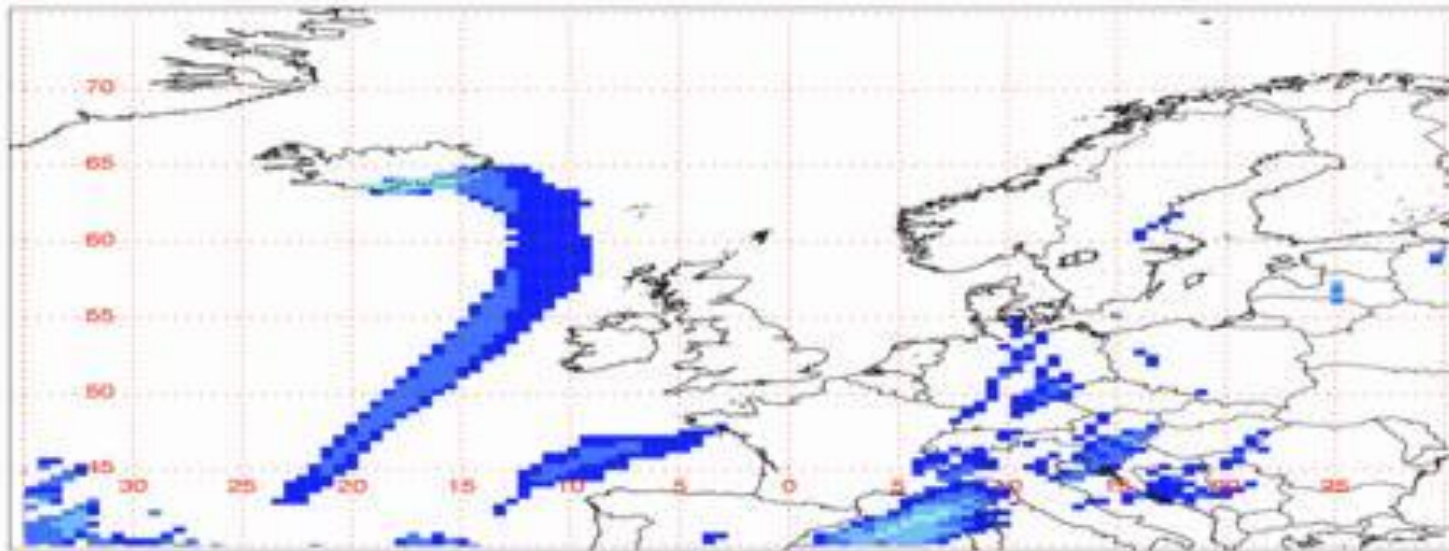
- **A340-600 flight on 19 APR 2010**, France – Belgium – Netherlands – Germany – back to Base
- **A380 flight 19 APR 2010** South-Eastern Part of France
 - ▶ Some visible ash bands over France (North of TLS, Overhead Paris nothing over Germany)
 - ▶ Concentration seen not in excess of industrial area pollution
 - ▶ Nil findings from engine boroscope inspection
- **A340-600 flight on 12 MAY 2010**
 - ▶ Aiming at 2^E-03 old cloud
 - ▶ Found rather low concentration, difficult to discern from clean sky
 - ▶ Nil findings from engine boroscope inspection
- **A340-600 / METMAN « Buddy » flight on 14 MAY 2010** North of Scotland
 - ▶ METMAN turned back before crossing 61 deg North (not allowed into black zone)
 - ▶ Further one hour search for ash cloud without success
 - ▶ Nil findings on engines during subsequent boroscope



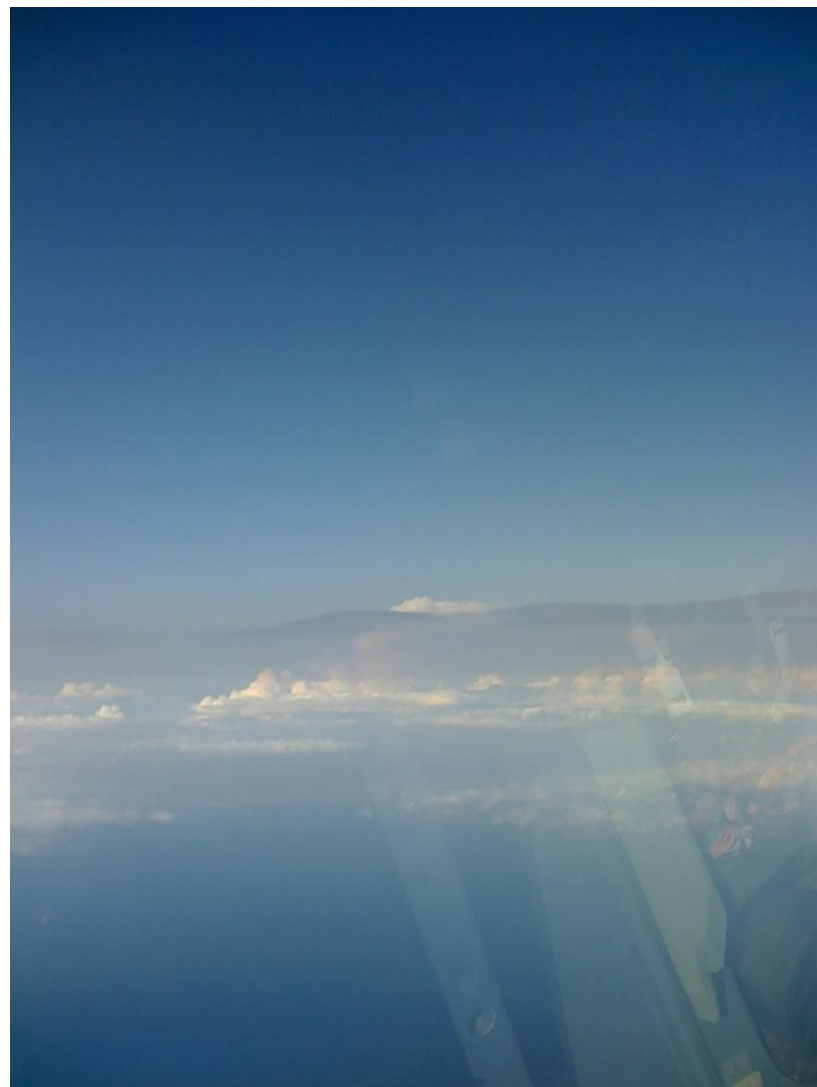
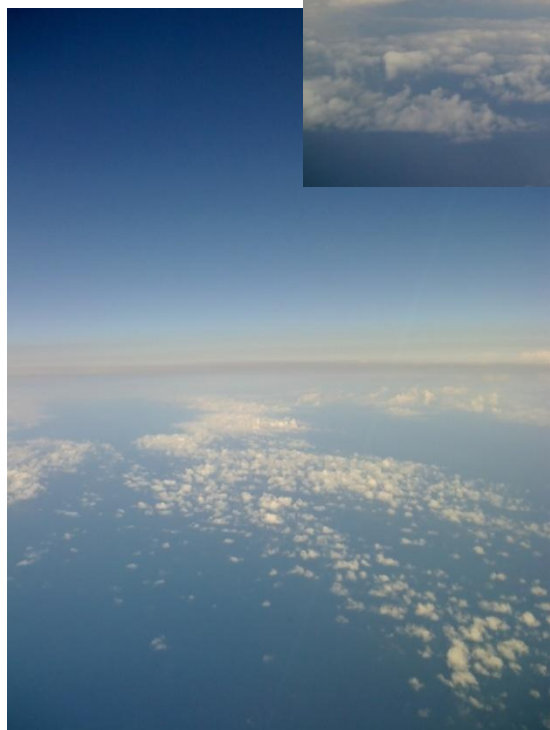
A340-600 flight on May 12



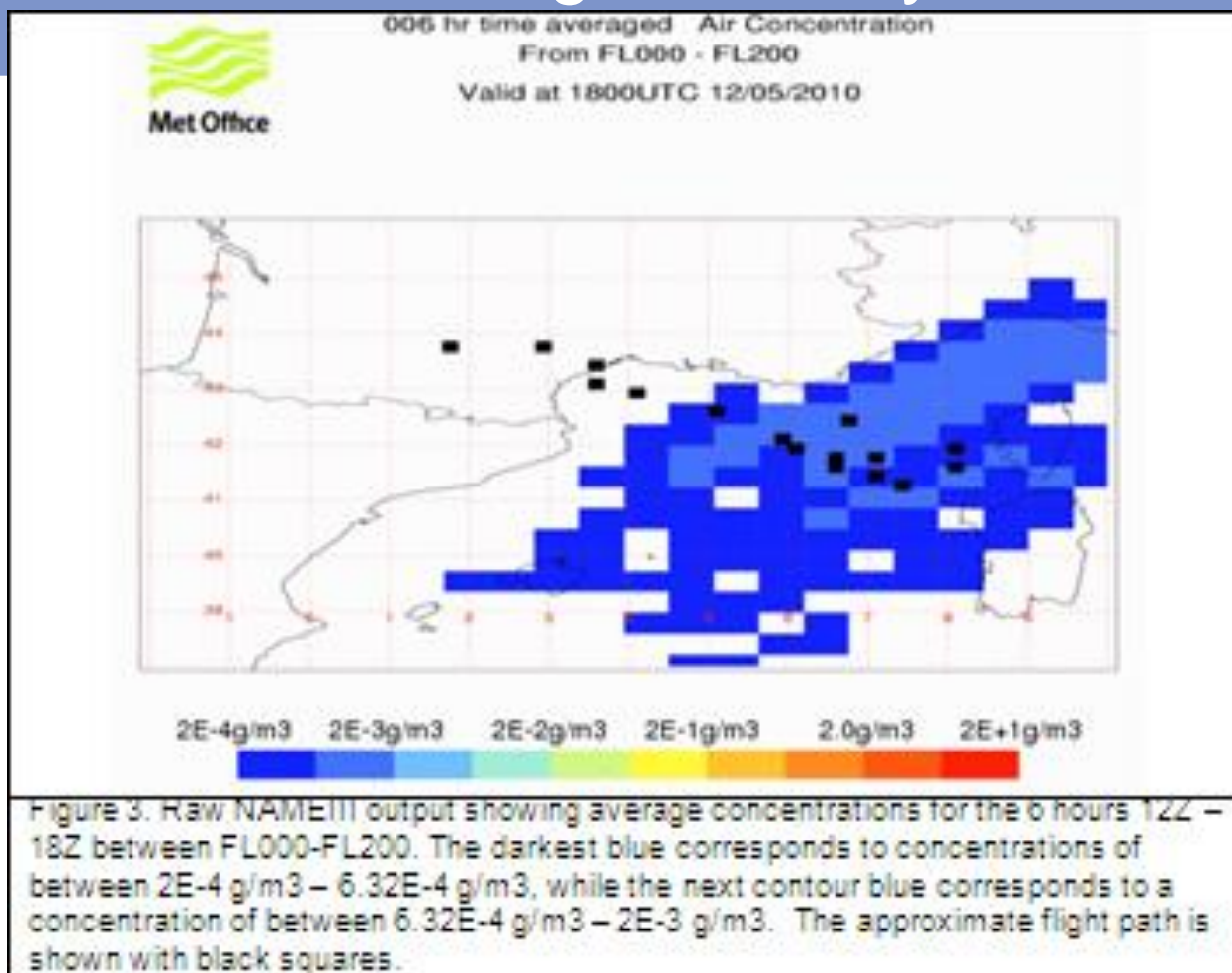
006 hr time averaged Air Concentration
From FL150 - FL200
Valid at 1200UTC 12/05/2010



Pictures A340-600 flight on May 12



Pictures A340-600 flight on May 12



- When the flight path is compared with Met Office ash concentration predictions it is found that this flight would have only encountered ash below the engine manufacturer tolerance level of 2E-3 g/m³. Therefore the flight only entered the 'red' zone and not the 'black' zone according to the 'black and red' product plots. Further investigation shows that the majority of the ash should have been between FL100-FL200.

A340-600 flight on May 14



Met Office

Modelled Ash Concentration from FL000 to FL200 at 1800 UTC 14/05/2010

Issue time: 201005141200

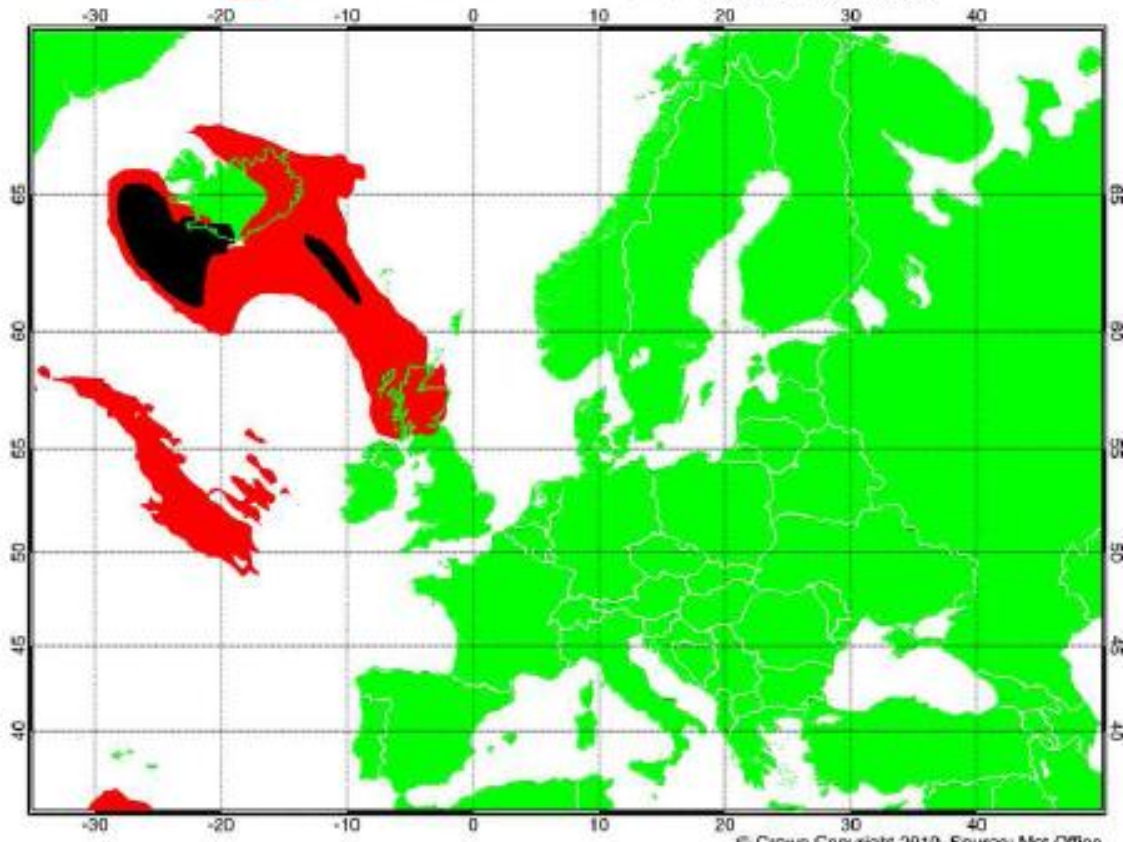
This is a guidance product generated from model data and is supplemental to the official VAAC London Volcanic Ash Advisory and Volcanic Ash Graphic products.



Predicted area where volcanic ash may be encountered

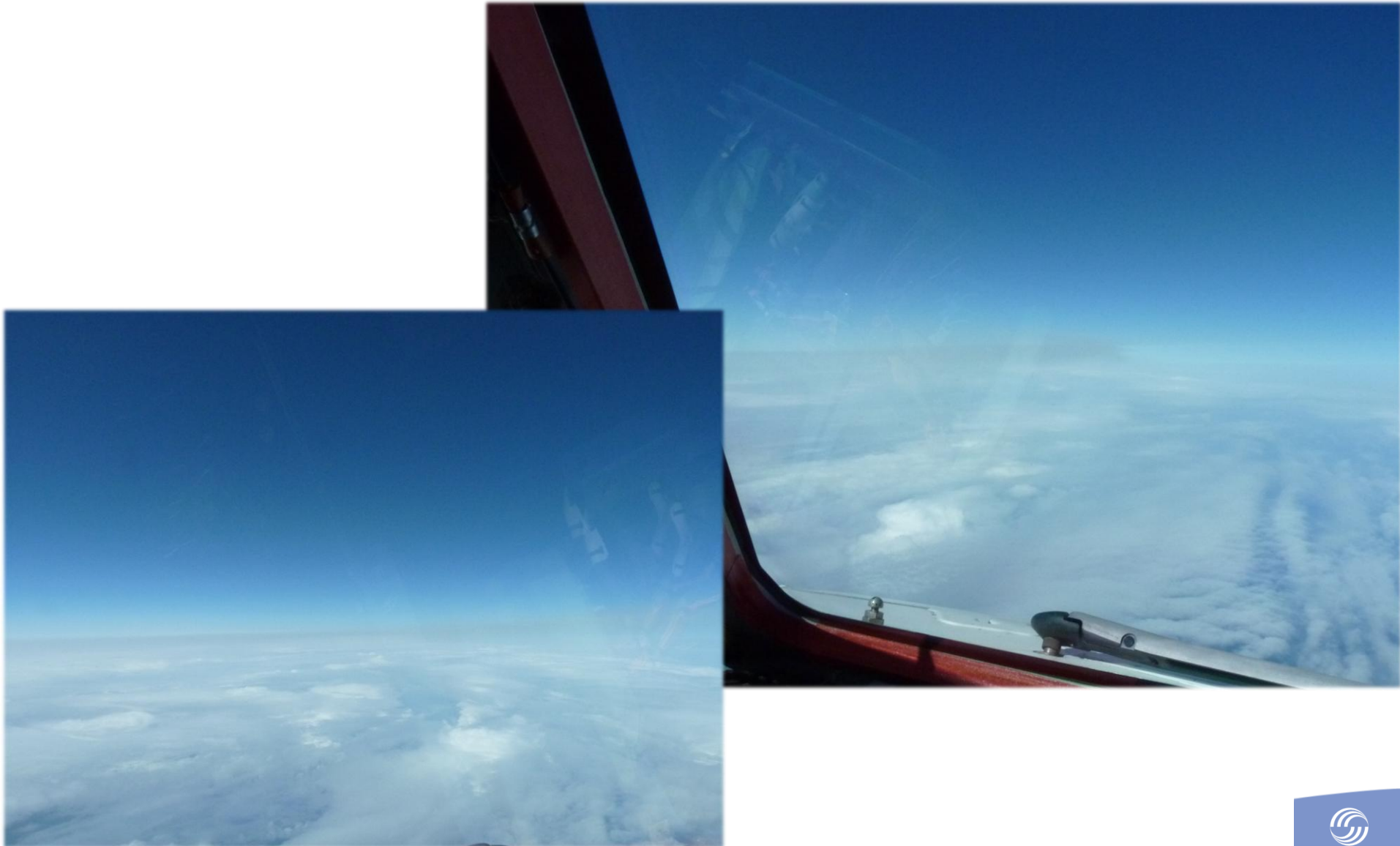


Predicted area of ash concentrations that exceed acceptable engine manufacturer tolerance levels

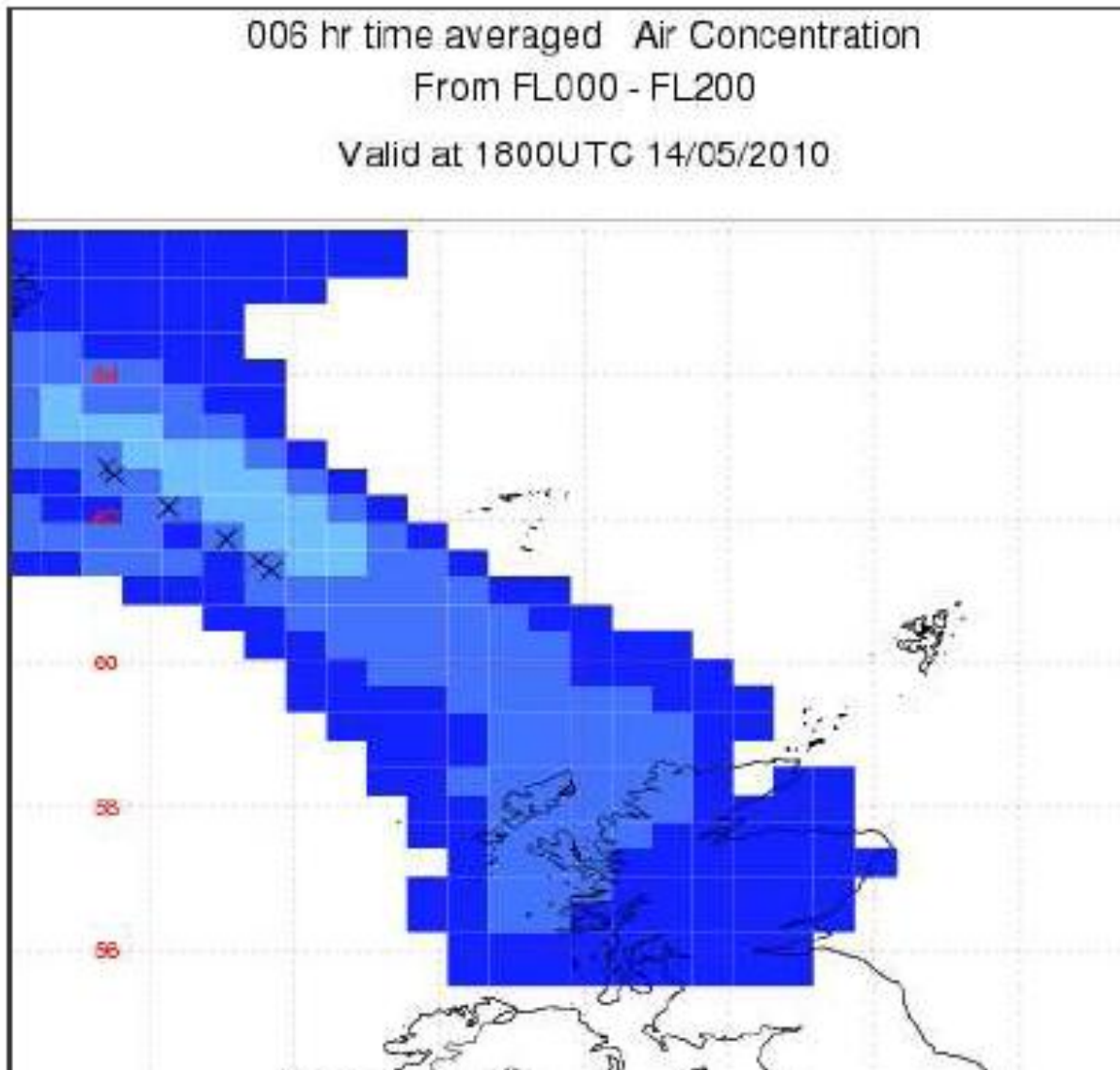


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Pictures A340-600 flight on May 14



Pictures A340-600 flight on May 14



it is found that this flight would have only encountered

ash below the engine manufacturer tolerance level of 2,000 micrograms per cubic metre.

Therefore the flight only entered the 'red' zone and not the 'black' zone according to the 'black and red' product plots ...

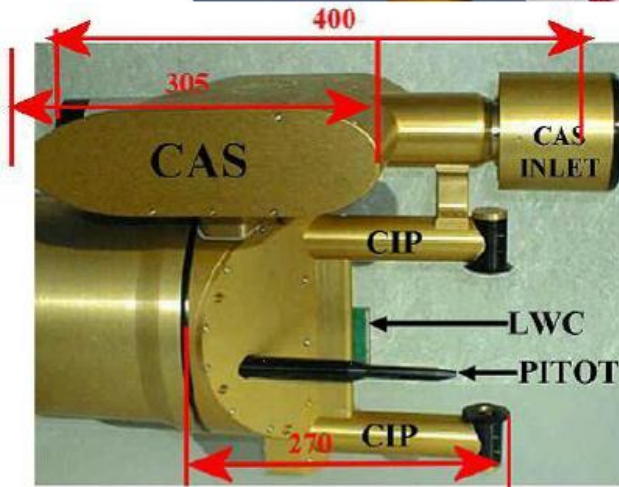
What did we understand ?

- Airspace excessively closed due to overestimation of concentrations
- Ash probing flights were intended to prove that tolerance values established do not generate potentially hazardous effects
- Ash probing is meaningful only together with precise measurement of what is encountered
 - ▶ Intruder equipped with measurement equipment
 - ▶ Intruder joined with research / sampling aircraft
- All three research aircraft holders were unavailable to enter area of predicted concentration at and above $2E-03$ g / m³
- Further Flights without instrumentation halted
 - ▶ Results cannot be correlated to concentrations encountered
 - ▶ Need to be able to measure
- Providing Useful Information
 - ▶ in-situ measurement can enhance the predictions, if model up-dating is enabled

What can we do?

- AIRBUS aim at making provisions for Installation of Instruments

CAPS – Cloud Aerosol and Precipitation Spectrometer



- CAS: aerosols 0.5-50 μ m
- CIP: larger particles 25-1550 μ m
- Airspeed, Altitude, Temperature, liquid water content, relative humidity
- Size: 1200*400*300, 20kg
- Speed range: 10-300m/s



What can we do?

▶ **Airbus has competence in operation of test aircraft in challenging environment**

- Flight Test Instrumentation and Engineering Expertise
 - Engine Survey and Real Time Analysis during flight
 - System Survey, real time analysis, reconfiguration
 - Expert Decision Making during flight
- Aircraft operate under Flight Test Airworthiness Control
 - Aircraft configuration monitored by Flight Test special instructions
 - Crew and maintenance staff can adapt to operational environment
 - Risk assessment made by Management and Flight Crew



▶ **Atmospheric research activity is not necessarily within Airbus competences**

- Instrument ownership should be with research organization, but held available in case of need
- maintenance of Instruments to be assured by appropriate Lab's
- Scientific on-site support necessary for Interpretation of measurements
 - full time availability of experts (shared betw. Institutes ?)
 - scientists on board during sampling ?

What can we do?

▶ Probing flights of Airbus test aircraft need to be guided

- equipped research aircraft for guidance
 - METMAN UK
 - DLR FALCON
 - METEO France ATR or FALCON
 - others ?

- equipped aircraft must be available for probing and sampling
 - priorities for operation must be established
 - staffed for flight into ash (training, insurance, contract)
 - fitted for sampling flights (instrumentation, protection and rescue provisions)
 - operating procedures allowing sampling flights
 - spares solutions available (aircraft, engines and equipment)
 - resources available to support encounter flights



Where are we involved ?

- ICAO IVATF / Airbus Participation through ICCAIA
 - ▶ Four IVATF working groups:.. Airbus participates mainly in the AIR group, can support the ATM, Sciences & IAVW groups if required
 - ▶ **Airworthiness Group**: « Airworthiness considerations / Risk Assessment & Guidance Material », Airbus participation through ICCAIA.
 - ▶ **ATM Group**: Airbus available for participation
 - ▶ **Sciences Group**: Airbus available for activities in interdependence with Airworthiness considerations
 - ▶ **IAVW Coordination group** (IAVWOPSG): Airbus available for participation if required.

IVATF Tasks – Key Items

- **Airworthiness Group:** « Airworthiness Considerations & Guidance Material for Risk Assessment »
 - ▶ Assessment of Product Susceptibility (Engines /Airframe/ Equipment....)
 - ▶ Establish Acceptable Operational Criteria
 - ▶ Validate or Amend threshold values (EU/NAT Contingency Plan). Note: Industry position allows operation in avoidance of « Visible Ash » (« Visible ash » to be further defined)
 - ▶ GM for Authorities and Operators establishing process to perform operational safety analysis and safety management.

Initial OEM Philosophy for Operations in Vicinity of Volcanic Ash in Europe

Waiting for IVATF outcome, current Airbus position maintained:

- Engines are the leading items exposed to ash ingestion
- Extensive operations in predicted ash concentrations up to 2 mg/m³ have yielded nil or negligible findings
- The UK MET model has shown over-conservative when compared to flight test sampling and operator experience in the UK and European airspace.
- Flight in predicted concentrations slightly higher than 2 mg/m³ may be undertaken at operator discretion provided flight into visible ash cloud is avoided.
- The most pragmatic use of all available information must be made in order to avoid closure of airspace

Airbus Perspectives

Airbus' understanding is that activities aiming at the acceptability of operation in airspace susceptible to contamination with volcanic ash must be coordinated with the ICAO IVATF



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