EASA Safety Information Bulletin

SIB No.: **2010-17R5**
Issued: **11 march 2013**

Subject: **Flight in Airspace with Contamination of Volcanic Ash**

Ref. Publications:
- Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds, ICAO Document 9691-AN/954 (ISBN 92-9194-888-8), second edition 2007, or later editions.
- ICAO Volcanic Ash Contingency Plan EUR and NAT Regions (EUR Doc 19)
- ICAO Document 9974: Risk Management of Flight Operations with known or forecast volcanic ash contamination.

Abbreviations:

ICAO:	International Civil Aviation Organisation
IVATF:	ICAO Volcanic Ash Task Force
VAAC:	Volcanic Ash Advisory Centre(s)
SIB:	Safety Information Bulletin
IATA:	International Airline Transport Association
TC:	Type Certificate

Revision 5:

This SIB revises EASA SIB 2010-17R4 dated 24 May 2011 for the following reasons:

- to accommodate the safety risk assessment approach methodology – further developed and globally adopted in the IVATF and published as ICAO document 9974,
- to recommend that European Member States and operators continue to use the concept of 'zoning systems' and the use of VAAC ash concentration charts to depict forecasted levels of volcanic ash in the airspace, until new concepts for robust operational use will have been developed and accepted,
- to provide background information about recent developments that have taken place in EASA, the IVATF and in industry, and
- to take into account the entry into force of European Regulation (EU) 965/2012.

Applicability:

All aircraft operators, owners and maintenance organisations with aircraft operating into airspace that is known or suspected to be contaminated with volcanic ash.

This is information only. Recommendations are not mandatory.

Description: The recommendations in this revised EASA SIB are based on the progress that has been made in reviewing and discussing the volcanic ash airspace contamination threat with the associations from the manufacturing industry, operators, the scientific community, the VAAC, the Air Traffic Management Service Providers and Airworthiness Authorities in the ICAO IVATF.

For detailed information on the discussions please refer to Appendix B attached to the SIB.

Further to the progress that has been made in the IVATF, the EASA continues with rulemaking activities that are aimed at the following:

- implementing the Volcanic Ash Risk Assessment methodology in the requirements for Safety Management Systems for operators of complex aircraft;
- to develop changes to the certification specifications for CS 23, CS 25, CS 27, CS 29 and CS-Engines to require Type Certificate Holders to describe the susceptibility of their product to volcanic ash and to provide data to operators to assist in Volcanic Ash Risk Management;
- to further develop the understanding of the aircraft and engine tolerance to ingestion of volcanic ash, including the margins for safe operation, with the aim to prevent the use of overly conservative assumed aircraft and engine ash tolerance (or ingestion limits) that could have severe negative economic and societal effects and could disrupt the aviation transport system.

This SIB will in the near future be revised in steps, following the successful ending and implementation of the EASA rulemaking tasks.

Recommendations: EASA makes the following recommendations:

(1) Avoid operation in visible volcanic ash.

(2) Forecasted presence of volcanic ash should primarily be presented in the form of a zoning system that depicts areas of low, medium and high concentrations in 3 altitude bands.

EASA continues to recommend that ash concentration charts provided by the London VAAC and Toulouse VAAC should, for operations in European airspace, identify the three zones as described in the ICAO Volcanic Ash Contingency Plan EUR and NAT Regions (EUR Doc 019), being:

- Area of Low Contamination (to be displayed in Cyan): an airspace of defined dimensions where volcanic ash may be encountered at concentrations greater than 0,2 x 10E-03 grams/m3, but less than or equal to 2 x 10 E-03 grams/m3.

- Area of Medium Contamination (to be displayed in Grey): an airspace of defined dimensions where volcanic ash may be encountered at concentrations greater than 2 x 10 E-03 grams/m3, but less than 4 x 10 E-03 grams/m3.

- Area of High Contamination (to be displayed in Red): an airspace of defined dimensions where volcanic ash may be encountered at concentrations equal to or greater than 4 x 10 E-03 grams/m3, where no ash concentration guidance is available.

(3) When ash is forecast to be present within European airspace, it is recommended that an operator conduct flight operations in areas with Medium or High Forecast Ash Contamination, only if they have secured the agreement of the National Aviation Authority supervising their operations to their safety risk assessment for such operations.

(i) Pending the end of the EASA rulemaking task on Volcanic Ash Safety Risk Management, the Safety Risk Assessment should be developed and agreed in accordance with the guidance provided in ICAO Document 9974: 'Risk management of flight Operations with known or forecast volcanic ash contamination'. The ICAO Document 9974 may be adopted at a version 'best suited to the operators needs'.

(ii) EASA draws the attention of operators to the specific advice of TC holders to avoid flight into visible ash at all times, regardless of the forecast conditions.

(iii) For the benefit of the aviation community and the Air Traffic Management Service Providers, EASA requests the operators to report the acceptance of the Volcanic Ash Safety Risk Assessment to EASA (volcano@easa.europa.eu).

EASA will keep a database of accepted VA SRA as a living document, for operational use in time of eruptions and volcanic ash exercises. Access to this information will be shared only with Member State institutions authorised by EASA to have such access.

(iv) It is recommended that Member States will not normally close airspace that is forecast to contain ash contamination, except for conditions under (v), in order to allow the safety assurance process vested in the Safety Risk Assessment approach to have effect. Airspace closure should be an action of last resort contemplated only in situations in which the Safety Risk Assessment approach can no longer be relied upon to secure safe operations; no such situations are presently foreseen.

(v) Member States may decide to close airspace in the immediate vicinity of a volcano where volcanic ashes and gasses form a direct threat for the safety of flight.

(4) In accordance with Article 11.1 of the Basic Regulation, European Member States shall, without further technical requirements or evaluation, recognise certificates issued in accordance with Regulation (EU) 965/2012. This recognition includes the Volcanic Ash Safety Risk Assessment as part of the Safety Management System that has been accepted by the National Competent Authority of the Operator. It is recommended that European Member States mutually accept the Volcanic Ash Safety Risk Assessments accepted by Aviation Authorities from non-European Member States provided that those VA SRA are based on a suitable adopted version of the ICAO Document 9974.

(5) In close vicinity to volcanoes that are observed on a 24 hour, 7 days a week basis, and where such equipment is present to accurately observe the movement of the plume and volcanic ash, local airport and air traffic management procedures may exist to guide the aircraft outside airspace where volcanic ash is present. The short range continuous observation of the volcanic ash may produce an equivalent result as the ash dispersion modelling and concentrations charts that are in principle for the longer distances from the volcano. Such local procedures should be acceptable to the National Competent Authority.

(6) When the aircraft and engine TC-Holders have not developed instructions for continued airworthiness for operation in airspace with a low contamination of volcanic ash, EASA recommends the inspections to be performed as listed in Appendix A, attached to this SIB.

(7) EASA requests the feedback from EU Member States and associated countries, the airspace management organisations and operators for improvement of this SIB, be informed of any difficulties that are being experienced on implementing the safety recommendations contained in this SIB. The SIB will be revised as necessary.

Contacts:

For further information contact the Airworthiness Directives, Safety Management & Research Section, Certification Directorate, EASA; E-mail: ADs@easa.europa.eu.

Reports can be submitted to EASA by E-mail: volcano@easa.europa.eu.

To obtain a copy of ICAO Documents, contact the ICAO Customer Services Unit,
telephone +1 514-954-8022, facsimile +1 514-954-6769,
or by e-mail request to sales@icao.int.

Websites:

Additional information on the subject addressed by this SIB can be found on the following websites:
www.icao.int
www.easa.europa.eu

This is information only. Recommendations are not mandatory.

Appendix A - General advice for aircraft (all turbine and piston powered aircraft, including rotorcraft) **maintenance inspections when operating in airspace with a low contamination of volcanic ash**

(1) The following is provided as advice to operators if their aircraft and/or engine TC Holders have not developed instructions for continued airworthiness for operation in airspace with a low contamination of volcanic ash.

(a) Accomplish daily inspections when operating in an area of low volcanic ash airspace contamination, to detect any erosion, accumulation of volcanic ash, or any aircraft- and/or engine damage or system degradation. Turbine engines as well as piston engines operation can be adversely affected by volcanic ash on the ground or in the air.

The inspections should include the following:

- wing leading edges
- navigation and landing lights, radomes
- landing gear
- horizontal stabiliser
- all extruding structure
- pitot tubes and static ports
- windows and windshields
- engine inlets and nacelles (turbine), induction air filter (piston)
- engine cooling system components
- engine compressor and turbines
- engine oil systems
- fuel tank venting system
- rotor blades
- ventilation and pressurization systems (e.g., the air cycle machines, ozone converter, recirculation fans, HEPA filters, etc.)
- smoke detectors (e.g., detectors located in the cargo compartment, lavatory, electrical equipment bay, remote crew rest areas, etc.)

Based on the findings of the above inspections, more detailed inspections (such as boroscope inspections of the engine, oil analysis, inspection of filters, cleaning of parts) may be necessary.

Unless specific instructions have already been provided by aircraft and engine TC holders to be applied after encountering a volcanic ash, the above inspections should also be performed after each flight, whenever the following phenomena are observed or detected or experienced during flight

- Acrid odours similar to electrical smoke
- Rapid onset of engine problems
- St. Elmo’s fire
- Bright white/orange glow appearing at the engine inlets
- Dust in the cockpit or cabin
- Sudden (unexpected) outside darkness
- Airspeed fluctuations
- Landings lights casting sharp, distinctly visible beam

(b) Protect and cover aircraft that are parked in areas that may be contaminated by the fall out or settling of volcanic ash in accordance with the aircraft- and

engine TC-holder's advice where possible. Any volcanic ash residues must be removed prior to operations and following the TC Holder's recommendations when available.

(2) Report any encounter with volcanic ash, or any other relevant maintenance and airworthiness related findings, to the engine and aircraft TC holders, the State of Registry of the aircraft and to the National Aviation Authority of the State through which the flight was conducted.

In addition, operators should report to EASA any serious airworthiness- and maintenance related findings after encounters with volcanic ash, for EASA to produce a synthesis of findings and trends resulting from these inspections, so that improvements could be brought to the procedures recommended by this SIB.

Appendix B – The ICAO Volcanic ash Task Force and industry initiatives

In June 2012, the ICAO IVATF held its fourth and final meeting. The IVATF was created in 2010 to review the global aviation standards that are applied when airspace is forecasted to be contaminated with volcanic ash. In 2010, EASA and the European Commission committed – besides EASA's own defined Volcanic Ash work programme - to work with ICAO on reviewing and developing improved global standards for flight operations with known or forecast volcanic ash contamination. In a multi-disciplinary approach, the ICAO Task Force developed a significant further understanding of the many aspects associated with the effects of volcanic ashes on the aviation transport system. With this improved understanding, it was hoped that the global approach to managing flight safety when ash is a potential hazard could be improved in order to assure safety whilst minimising flight disruption. The areas of expert review and development of guidance material were among aircraft airworthiness and operational aspects, also the aspects associated with air traffic management, meteorological forecasting, volcanology and technology to detect volcanic ash in the atmosphere. Many interdependencies between these expert fields existed and needed to be reviewed to realise the areas for improvements for the aviation transport system sector as a whole. Improved and new ICAO guidance material was proposed with regard to global aspects of flight operations with known or forecast volcanic ash contamination.

The aviation manufacturing industry and associations, VAAC and the operators associations (IATA) developed initiatives to define the Best Practices for global operational use. A new concept for Volcanic Ash dispersion forecasting and presentation (being a single line that delineates areas where visible ash can be expected to be present with low, medium or levels of confidence in the forecasting accuracy) was initially developed in the Volcanic Ash Best Practices Workshop. The concept looks promising as a way to standardise VAAC products globally, however further development of this concept is necessary in order to generate a robust operational safety assurance approach; ICAO is to task its International Airways Volcanic Watch Operations Group (IAVWOPSG) accordingly. ICAO intends that this Group be re-launched early in 2013 with new terms of reference and a wider membership.

Concepts of avoidance of volcanic ash as planning and/or tactical means:

In considering flight in airspace with a forecast contamination of volcanic ash which may be hazardous to aviation, manufacturers have determined that aircraft engines are by far the most susceptible aircraft parts to volcanic ash. The accepted guidance from these manufacturers is to avoid flight into "visible ash".

Volcanic ash may be present close to an erupting volcano, where the ash plume can be readily visible to the human eye in daylight conditions. It can also be present in the form of very fine ash particles - volcanic dust – that travels at very long distances (>1 000 km) from the volcano. These more distant ash clouds typically exist in thin layers and at very low concentrations.

Close to the volcanic source, the avoidance of a well-defined and highly visible ash plume is a useful tactical means of assuring safety of flight. Further from the source, however, there are limitations to the usefulness of "visible ash" as a safety assurance technique.

Volcanic ash will generally not be visible to the crew under Instrument Meteorological Conditions or at night. Also, even under good visibility conditions, ash and dust clouds that travel over long distances can be very difficult to distinguish from normal clouds, smoke, haze etc and can, therefore, be difficult to avoid.

These limitations in the usefulness of visible ash have led to exploration of the "discernible ash", detected by using remote sensing techniques, when available. Using technology to detect, and so help to forecast how the volcanic ash will spread in the airspace, is another concept which might prove useful as a planning means to avoid encounters with volcanic ash.

However, "discernible ash" has limited tactical usefulness either because of limitations in data gathering (e.g. obscuration of remote sensing imagery) or in timeliness in acquiring, analysing and utilizing the data. The best avoidance of ash is based on an intelligent combination of concepts that use the 'human eye', remote sensing technology, human communication (collaborative decision making) and medium to long range forecast models to predict the presence of volcanic ash.

In the future, given the frailties of visible ash (night, IMC, ash misidentification by day) and of discernible ash (availability of data, limited tactical usefulness), further improvements and capabilities are being progressed. These improvements, some still in their infancy, focus on better forecasting the presence of ash, better understanding what ash exposure represents a hazard (in terms of ash concentration and duration of exposure) and capability on-board aircraft to alert crews to hazardous ash concentrations on the aircraft's intended flight path. These initiatives are very welcome.

Safety Risk Assessment: more responsibility for the operator:

This SIB accommodates the safety risk assessment approach methodology as developed and globally accepted under the ICAO IVATF. The published version is ICAO document 9974 'Risk management of flight operations in areas known or forecasted to be affected by volcanic ash'.

The document sets out the principles to be applied to help operators to assess if flights in airspace contaminated with volcanic ash can be executed safely because the risks are controlled and mitigated.

The IVATF recommended that States adopt ICAO Document 9974 at a version best suited to their needs.

This unique guidance for safety risk assessment has been evaluated and tested successfully. It forms a fundamental part of a safety assurance system whereby the operators can demonstrate to the satisfaction of the National Aviation Authority that they have the means to be able to manage and control their risks when volcanic ash may represent a hazard to safe flight operations.

Airworthiness effects, continued airworthiness:

Flights in airspace with a low contamination with volcanic ash, where no imminent threat to the safety of the aircraft exists, might have medium and long term consequences for the airworthiness of aircraft.

With regard to flights in airspace with a low volcanic ash contamination, it is essential that priority continues to be given to maintaining the continuing airworthiness of aircraft in order to support the continuation of safe operations.

Aircraft and Engine TC-Holders have been requested by EASA to develop and improve the instructions necessary for continued safe flight, such as specific pre- and post-flight inspections, and those for continued airworthiness, taking into account the effects of operation of aircraft in airspace with low contamination volcanic ash. Those instructions are also requested for aircraft parked in areas that may be contaminated by the fall out and settling of volcanic ash. Special emphasis is requested for those systems that are most sensitive to any exposure to volcanic ash.

The sensitive systems are known to be, but may not be limited to, engine compressors and turbines, engine oil systems, aircraft pitot- and air data systems, aircraft environmental control systems, and those aircraft systems that provide cooling air for computer systems installed on the aircraft.

Prediction of the ash dispersion in the airspace - volcanic ash concentration charts and 'best practice charts under development':

In addition to the charts required by international regulations produced by the London VAAC, the U.K. meteorological office supporting the London VAAC produces volcanic ash concentration charts that depict predicted areas of volcanic ash contamination. These charts show forecast ash concentration levels in 3 altitude bands and in 3 different zones. This information is produced to assist operators in operational planning and to facilitate coherent and consistent decision-making by national authorities with regards to their airspace management and safety assurance duties.

Given the particular needs of European airspace in respect of managing a high traffic density, it is essential that the best available volcanic ash dispersion forecasts information is provided that allows for robust operational use. Given that the IAVWOPSG work on the concept of a safety assurance approach based on "visible" and "discernible" ash criteria is not yet ready for operational use, EASA recommends the continued use of meteorological ash concentration charts for operations in European airspace.

EASA does not object to the future concept that is to be developed by IAVWOPSG which is expected to result in volcanic ash prediction charts comprising a single line for visible ash together with three confidence levels.

