
Guidance Material

GM005EN

Subject:

Guidance for operations in Contaminated Volcanic Ash Areas.

Málsnúmer / code: FMS10050129

Target Group:

Icelandic operators licensed to provide commercial air transport for passengers, freight or mail
Icelandic operators licensed for aerial work
Icelandic training organisations
Emergency Medical Service

Version:

Entry into effect of this version: 23 May 2011
Version: 2

Date of approval / Approved by: 23 .05.2011 ICAA – PSP

Introduction

This Guidance Material forms the basis of operation for operators for flight to operate through or over an area where volcanic ash contamination is forecasted

These suggested procedures are not intended to establish or confirm a safe level of ash concentration. The threshold value is an agreed value to describe an area of forecast ash concentration as Area of Low Contamination, Area of Medium Contamination and Area of High Contamination. Operation through any area where volcanic ash is forecasted is at the sole risk of the operator.

This procedure is valid within Reykjavik FIR/CTA

This circular supersedes circular containing requirements for acceptance of operations in Volcanic Ash Zones effective 23 August 2010.

Operators already authorised to operate within contaminated areas do not need to re-apply for acceptance as specified in this Guidance Material.

Applicability

- All Icelandic operators with EU-OPS AOC with turbine powered aeroplanes and JAR-OPS 3 AOC with turbine powered helicopters.
- All Icelandic registered turbine powered aeroplanes and helicopters.
- This procedure is not applicable for Icelandic Coast Guard when operating in accordance with “Lög um Landhelgisgæslu Íslands nr. 52/2006”.

Effective date

From 22. May 2011

Terminology

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

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

It should be noted that “defined dimensions” refers to horizontal and vertical limits.

General

It is emphasised that a volcanic ash encounter is potentially extremely hazardous and areas of known contamination shall generally be avoided. Volcanic ash may extend for several hundred miles and the contaminated airspace may not be visible.

Background

Area of medium and high contamination will be notified as Danger Areas. These areas will be notified by NOTAM defining heights and coordinates. No IFR clearance will be issued for aircraft to enter or operate within these areas.

Outside of the Danger Areas as defined by NOTAM, normal ATC services will be provided and aircraft operators remain responsible for the safe operation of flight.

Areas of Contaminated Areas are established based on information from the Icelandic Meteorological Office

Contaminated Areas may be over-flown in accordance with the considerations stated below.

After the IMO has issued the +6, +12, +18 hrs forecasts of contaminated areas. SIGMETs and NOTAMs containing coordinates of Danger Areas are issued based on information from IMO.

Operations in Contaminated Areas

Operators intending to operate in Contaminated Areas shall ensure that following documents are available to ICAA upon request.

- 1) A "No technical Objection" (NTO) or equivalent must be obtained from the relevant aircraft and engine Type Certificate (TC) holder and all requirements related to the NTO, must be complied with.

Note: In the absence of aircraft and engine TC holder recommendations and until those instructions have been made available to operators and owners see EASA SIB No: 2010-17R2 (21May 2010)

- All conditions stated in the NTO shall be complied with.
- The NTO shall cover airframe and engines as a minimum.
- NTO conditions shall be implemented in the current approved Maintenance program.
- Any operational requirements shall be complied with.

- 2) A Risk assessment based on the NTO above (or equivalent) including any operational and maintenance restrictions required by the relevant aircraft and engine Type Certificate (TC) holder. The risk assessment shall include procedures to assess current and forecast areas of volcanic ash contamination areas and the associated risk involved in carrying out flights within a contaminated area and subsequent actions by crew members if an area of volcanic ash is entered unintentionally. Guidance for considerations for flights in airspace proximate to Volcanic Ash and an example of hazard log as part of risk assessment required can be found in Appendix 1 & 2 to this document.

- OPS procedures - Normal/Malfunction/Emergency/ETOPS/ RVSM/MNPS, etc.
- Maintenance procedures (C of A/Extra requirements/Supplementary procedures).
- Use of Volcanic Ash Encounter Procedures if available from Aircraft Manufacturer
- Rules and requirements for operations outside Icelandic airspace shall be taken into account.

- 3) An operator shall establish and maintain a system for technical follow-up after flight operation in Contaminated Areas.

- Procedures for compliance with this paragraph shall be established and documented (Follow-up inspection report).
- The operator shall establish and maintain a system for registration and monitoring of flight hours in Contaminated Areas

Flight operation in Volcanic Ash Areas

Preparation and planning of flight

Operators can expect deviations to requested routes.

Selection of en-route and/or destination alternates and/or ETOPS requirements must be observed considering the special circumstances.

Consideration to engine-out service ceiling must be given before flying over Contaminated Areas.

The operator shall establish and maintain a system for registration of flight hours in Contaminated Areas.

The operator shall establish and maintain a system for technical follow-up after flight operations in Contaminated Areas.

Conduct of Flight

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.
- 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.
- Any abnormal indications in airspeed and engine parameters.

Standard procedures for "Encountering volcanic ash" should be considered if any of these signs are observed.

If volcanic ash is encountered 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 deposits in the engines.

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.

ISAVIA (Icelandic ANSP) will ensure, in terms of flight operations within Contaminated Areas, that air traffic controllers are informed that it can be expected that aircraft may need, without delay, to revert to one or all of the following:

- Execute 180 degree turn
- Descent
- Reduce thrust
- Disconnect autothrottle

Reporting of Volcanic Ash activity during flight

If volcanic ash activity is identified during a flight, the following information shall be transmitted to the nearest ATS unit:

1. Call Sign
2. Position
3. Time
4. Flight Level
5. Position, bearing, distance to volcanic activity, level of contamination experienced
6. Vertical and lateral extent of ash cloud, rate, growth etc
7. Air temperature
8. Wind.

The report shall be transmitted when the commander of the aircraft deems that it is safe to do so.

Follow Up Inspection

When an aircraft has been operated in Contaminated Areas, an inspection in accordance with aircraft and engine manufacturer guidelines for inspection after flying in volcanic ash shall be performed. The inspection shall be carried out after landing at home-base, or any other base where approved maintenance facilities are available to carry out the inspection. The inspection shall as a minimum include the following:

- Wing leading edges.
- Stabilizer
- All extruding structure
- Pitot tubes & Static ports
- Windows
- Engine inlet and nacelles
- Boroscope inspection of Compressors and Turbines (or as per manufacturer recommendation)
- Engine oil filters
- Inspection report shall be accomplished at the end of inspection.

All observations which may indicate that the flight has encountered volcanic ash activity shall be reported to the Icelandic CAA as soon as possible, using the Mandatory Occurrence Reporting system.

Appendix 1

Safety Risk Assessment Process

1 Introduction

- 1.1 The safety risk assessment process is described in ICAO Document 9859 – Safety Management Manual. The process involves identifying the hazards associated with the activity (in this case airspace proximate to volcanic ash or flying to and from aerodromes affected by volcanic ash), considering the seriousness of the consequences of the hazard occurring (the severity), evaluating the likelihood or probability of it happening, deciding whether the consequent risk is acceptable and within the organisation's safety performance criteria (acceptability), and finally taking action to reduce the safety risk to an acceptable level (mitigation).

2 Hazard Identification

- 2.1 A hazard is any situation or condition that has the potential to cause adverse consequences. A suggested list of topics, that is not necessarily exhaustive, to be considered is in table 1 below.

3 The Safety Risk Assessment

- 3.1 Risk is an assessment of the likelihood and the severity of adverse consequences resulting from a hazard.
- 3.2 To help an operator decide on the likelihood of a hazard causing harm, and to assist with possible mitigation of any perceived safety risk, all relevant stakeholders should be consulted.
- 3.3 The safety risk from each hazard should be assessed using a suitably calibrated safety risk assessment matrix. An example risk assessment matrix is given in ICAO Document 9859 – Safety Management Manual but an alternative which aligns with an organisation's own SMS would be equally appropriate. The safety risk should be derived by considering the severity of the safety outcome arising from the hazard, together with the likelihood of the outcome.
- 3.4 The severity of any adverse consequences resulting from a particular hazard should be assessed using a suitably calibrated severity scale. Example scales are given in ICAO Document 9859 – Safety Management Manual, but an alternative, which aligns with an organisation's own SMS would be equally appropriate. Note that, for any flight, the safety outcome of a volcanic ash encounter may be significant.

3.5 Risk Likelihood

- 3.5.1 The likelihood or probability of adverse consequences resulting from a particular hazard should then be assessed. The likelihood should be agreed using a suitably calibrated likelihood or probability scale. An example probability scale is given in ICAO Document 9859 – Safety Management Manual, but an alternative which aligns with an organisation's own SMS would be equally appropriate.
- 3.5.2 When assessing likelihood or probability the following factors should be taken into account:
- The degree of exposure to the hazard.

- Any historic incident or safety event data relating to the hazard. This can be derived from data from industry, regulators, other operators, Air Navigation Service Providers, internal reports etc.
- The expert judgement of relevant stakeholders.

3.5.3 The results of the assessment should be recorded in a hazard log, sometimes referred to as a risk register. An example of a hazard log is at **Appendix 2**.

3.6 Risk Tolerability

3.6.1 At this stage of the process the safety risks should be classified in a range from acceptable to unacceptable. A suitable set of definitions for Risk Classification is given in ICAO Document 9859 – Safety Management Manual.

3.6.2 Appropriate mitigations for each identified hazard should then be considered, recorded on the hazard log and implemented. Mitigations must be adopted in order to reduce the safety risks to an acceptable level, but additional mitigation wherever reasonably practicable should also be considered where this might reduce an already acceptable safety risk even further. Thus, the mitigation process should reduce the safety risk to be as low as reasonably practicable.

3.6.3 Not all hazards can be suitably mitigated in which case the operation cannot proceed.

3.7 Mitigating Actions

3.7.1 Mitigating actions by themselves can introduce new hazards. Where an organisation has an effective SMS then procedures will exist for continual monitoring of hazard, risk and involvement of qualified personnel in accepting the mitigating actions or otherwise. Operators without an effective SMS should repeat the safety risk assessment following any mitigation process and at regular intervals as the circumstances on which the original assessment was predicated may have changed. This ensures ongoing safety management or monitoring.

3.8 Records

3.8.1 The results of the safety risk assessment should be documented and promulgated throughout the organisation and submitted to the operator's national safety authority. Actions should be completed and mitigations verified and supported by evidence prior to the start of operations.

3.8.2 Any assumptions should be clearly stated and the safety risk assessment reviewed at regular intervals to ensure the assumptions and decisions remain valid.

3.8.3 Any safety performance monitoring requirements should also be identified and undertaken through the organisation's safety management processes.

Table 1

| Considerations | Guidance |
|--|--|
| Operator Procedures | |
| Type Certificate Holder Guidance | Operators must obtain advice from the Type Certificate Holder and engine manufacturer concerning both operations in potentially contaminated airspace and/or to/from aerodromes contaminated by volcanic ash, including subsequent maintenance action. |
| Guidance for Company Personnel | Publish procedures for flight planning, operations and maintenance. Review of flight crew procedures for detection of volcanic ash and associated escape manoeuvres. Type Certificate Holder advice on operations to/from aerodromes contaminated by volcanic ash including performance. |
| Flight Planning | These considerations will be applicable to all flights that penetrate the <i>Enhanced Procedures Zone</i> and/or are to/from aerodromes contaminated by volcanic ash. |
| NOTAMs | The operator must closely monitor NOTAMs to ensure that the latest information concerning volcanic ash is available to crews. |
| SIGMETs | The operator must closely monitor SIGMETs to ensure that the latest information concerning volcanic ash is available to crews. |
| Departure, Destination and any Alternates | Degree of contamination, additional performance, procedures and maintenance consideration. |
| Routing Policy | Shortest period in and over contaminated area. |
| Diversion Policy | Maximum allowed distance from a suitable alternate. Availability of alternates outside contaminated area. Diversion policy after an ash encounter. |

| Considerations | Guidance |
|---|---|
| Operator Procedures | |
| Minimum Equipment List / Dispatch Deviation Guide | <p>Consider additional restrictions for dispatching aircraft:</p> <ul style="list-style-type: none"> • air conditioning packs; • engine bleeds; • air data computers; • standby instruments; • navigation systems; • Auxiliary Power Unit (APU); • Airborne Collision Avoidance System (ACAS); • Terrain Awareness Warning System (TAWS); • provision of crew oxygen; and • supplemental oxygen for passengers. <p>(This list is not necessarily exhaustive.)</p> |
| Provision of Enhanced Flight Watch | Timely information to and from crew of latest information. |
| Fuel Policy | Consideration to the carriage of extra fuel. |

| Considerations | Guidance |
|-------------------------------|--|
| Crew Procedures | These considerations will be applicable to all Enhanced Procedures Zone and/or are to/from aerodromes contaminated by volcanic ash. |
| Pilot Reports | <p>Requirements for reporting in the event of an airborne encounter.</p> <p>Post-flight reporting.</p> |
| Mandatory Occurrence Reports | Reminder regarding the necessity for filing MORs following an encounter. |
| Standard Operating Procedures | <p>Review changes to normal and abnormal operating procedures:</p> <ul style="list-style-type: none"> • pre-flight planning; • operations to/from aerodromes contaminated with volcanic ash; • supplemental oxygen; • engine-out procedures; and • escape routes. <p>(This list is not necessarily exhaustive.)</p> |

| Considerations | Guidance |
|-----------------|--|
| Crew Procedures | These considerations will be applicable to all Enhanced Procedures Zone and/or are to/from aerodromes contaminated by volcanic ash. |
| Technical Log | Any actual or suspected volcanic ash encounter will require a tech log entry and appropriate maintenance action prior to subsequent flight. Penetration (detail and duration) of the <i>Enhanced Procedures Zone</i> and/or operations to/from aerodromes contaminated with volcanic ash will require a tech log entry. |

| Considerations | Guidance |
|------------------------|---|
| Maintenance procedures | Additional maintenance inspections may be required |

Note: The above list is not necessarily exhaustive and operators must make their own assessments of the hazards on the specific routes they fly

