NAT OPS BULLETIN

Serial Number: 2010-009	Issued: 14 May 2010
Subject: Temporary Addendum to NAT Doc 006	Effective: 16 May 2010 at 0001 UTC

The purpose of North Atlantic Operations Bulletin 2010-009 is to promulgate a temporary addendum to NAT Doc 006. This temporary addendum constitutes recommended interim enhanced procedures to be implemented by States in the event of a volcanic eruption. These procedures become applicable on 16 may 2010 at 0001 UTC.

It should be noted that 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 "LOW" as opposed to "HIGH". Operation through any area where volcanic ash is forecast is at the discretion of the operator.

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RECOMMENDED INTERIM ENHANCED PROCEDURES TO BE IMPLEMENTED BY STATES IN THE EVENT OF A VOLCANIC ERUPTION

APPLICABILITY DATE – 16 MAY 2010 at 0001 UTC

These procedures should form the basis of operation for operators, Area Control Centres (ACC) and Volcanic Ash Advisory Centres (VAAC) for flights to operate through or over an area where volcanic ash contamination is forecast

EXCLUSION – 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 "LOW" as opposed to "HIGH". Operation through any area where volcanic ash is forecast is at the discretion of the operator.

Applicability: OPERATORS

SAFETY RISK ASSESSMENTS FOR FLIGHTS IN AIRSPACE PROXIMATE TO VOLCANIC ASH

1 Introduction

1.1 It is recommended that States consider requiring operators to carry out a safety risk assessment prior to planned operations in areas where the presence of volcanic ash is forecast.

1.2 Safety risk assessments should be completed prior to planned operations in airspace or to/from aerodromes which may be contaminated by volcanic ash.

2 Applicability

2.1 All operators conducting flights in airspace or to/from aerodromes which are forecast to be affected by volcanic ash.

3 Terminology

3.1 a) Areas where it is forecast that the concentration of volcanic ash will be at or below $2x10^{-3}$ g/m^3 are referred to as "Areas of Low Contamination".

3.1 b) Areas where it is forecast that the concentration of volcanic ash will be greater than $2x10^{-3}$ g/m^3 are referred to as "Areas of High Contamination".

3.1 c) Danger Area – an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specific times (Source – ICAO Annex 2).

3.2 Over High Seas airspace, Areas of High Contamination may be declared as Danger Areas. These Danger Areas will be notified by regular NOTAMs containing the relevant co-ordinates. The Danger Areas may exist within or outside Areas of Low Contamination.

4 Recommendation

4.1 In accordance with ICAO Annex 6, Chapter 3, paragraph 3.3 Safety Management, it is recommended that States require all operators, planning to operate in areas where the presence of volcanic ash is forecast, to carry out a safety risk assessment prior to planned operations. The safety risk assessment should include a requirement for the operator to:

a) conduct their own risk assessment and develop operational procedures to address any remaining risks;

b) put in place an intensive maintenance ash damage inspection before and after each flight; and

c) report any ash related incidents to a reporting scheme run by the applicable ACC or Flight Information Centre (FIC).

4.2 Guidance in the preparation of such a safety risk assessment is provided in **Attachment 1** to this guidance.

APPLICABILITY: ACCs

RECOMMENDATIONS FOR PROMULGATION OF INFORMATION CONCERNING AREAS WHERE ASH CONTAIMINATION IS FORECAST AND PROVISION OF ATC SERVICES IN SUCH AREAS

1. Introduction

1.1 This guidance to Air Traffic Control (ATC) and Flight Information Service (FIS) providers is in respect to NAT Region airspace when ash concentrations are forecast.

2. Purpose

2.1 The purpose of this guidance is to outline the procedures to follow and give Air Navigation Service (ANS) providers advice in respect of the provision of ATC and Flight Information Services when ash concentrations are forecast.

3. Terminology

3.1 a) Areas where it is forecast that the concentration of volcanic ash will be at or below $2x10^{-3}$ g/m^3 are referred to as "Areas of Low Contamination".

3.1 b) Areas where it is forecast that the concentration of volcanic ash will be greater than $2x10^{-3}$ g/m^3 are referred to as "Areas of High Contamination".

3.1 c) Danger Area – an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specific times (Source – ICAO Annex 2).

4. Procedures for ACCs

4.1 The VAAC will issue charts showing the areas of ash differentiated by concentration. Areas of High Contamination will be notified as Danger Areas. These Danger Areas shall be notified by NOTAM, the heights and co-ordinates for which will be issued by the State responsible for the provision of Air Traffic Services in the particular NAT Region Flight Information Region/Oceanic Control Area (FIR/OCA).

4.2 ATC should not provide an IFR clearance for an aircraft to enter or operate within an Area of High Contamination.Assistance to enable an aircraft to exit such an area in the most expeditious and appropriate manner should be provided.

4.3 Outside of the Danger Areas as defined by NOTAM, and within Areas of Low Contamination shown on the VAAC chart normal services may be provided and aircraft operators remain responsible for the safe operation of flight. However, ATC and FIS Providers should ensure that ATCOs and FISOs are aware that should an aircraft encounter a significant concentration of volcanic ash, the pilot may, possibly without first advising Controllers or FISOs, do any or all of the following actions:

- Execute a 180° turn;
- Descend;
- Adjust speed (by reduction of engine power/ disconnection of auto-throttle).

4.4 Therefore, ATC and flight information service providers are to ensure that:

- ATCOs and FISOs are appropriately briefed, before they assume responsibility for an operational position, on the potential pilot actions in the event of a significant volcanic ash encounter;
- ATCO and FISO workloads are managed such that sufficient capacity is maintained at all times to react appropriately to a volcanic ash encounter;
- Adequate resources are available to accommodate planned aircraft movements, including an unexpected emergency/diversion incident.

APPLICABILITY: VAAC

PROCEDURES FOR THE PRODUCTION OF ASH CONCENTRATION CHARTS TO DEPICT AREAS OF LOW CONTAMINATION AND AREAS OF HIGH CONTAMINATION

1 Introduction

1.1 This section outlines the guidance for the VAAC for charting the different levels of ash concentration.

2 Purpose

2.1 The purpose of this guidance is to outline the procedures to follow that will distinguish Areas of Low Contamination from Areas of High Contamination when forecast.

3 Scope

3.1 The guidance is addressed to the VAAC responsible for the production of the ash concentration chart.

4 Terminology

4.1 a) Areas where it is forecast that the concentration of volcanic ash will be at or below 2x10-3 g/m3 are referred to as "Areas of Low Contamination".

4.1 b) Areas where it is forecast that the concentration of volcanic ash will be greater than 2x10-3 g/m3 are referred to as "Areas of High Contamination".

4.1 c) Danger Area – an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specific times (Source – ICAO Annex 2).

5 Procedures for the VAAC

5.1 The VAAC advisory graphics should be prepared in the standard manner.

5.2 Additionally where applicable, VAAC ash concentration charts showing the different ash concentrations shall be created. These charts will show forecast Areas of Low Contamination and Areas of High Contamination. (see Figure 1 below).

5.3 Two sets of coordinate data shall be generated detailing the areas and heights of the different ash concentrations in order that States can issue SIGMET and appropriate NOTAMs and warnings.

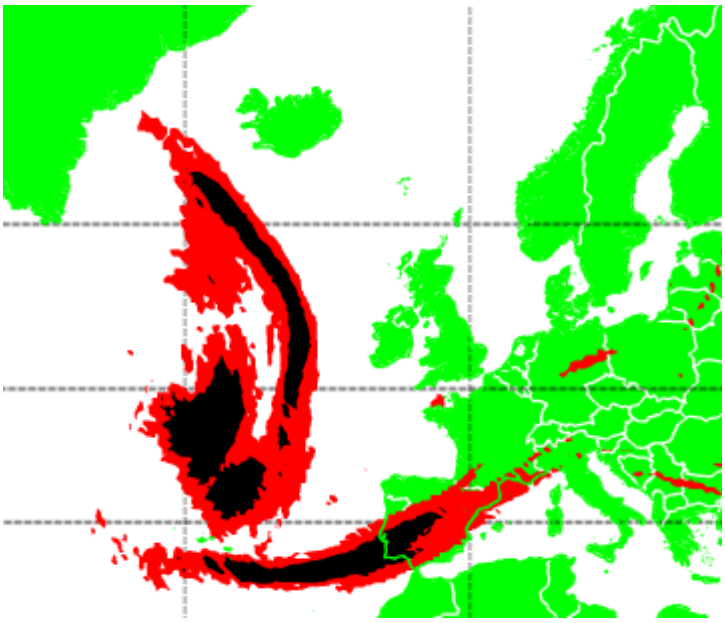

Figure 1 – Ash concentrations FL200-FL 350 1800 UTC 10/5/2010

Note: ***The red area outlines the Area of Low Contamination.***

The black area outlines the Areas of High Contamination

ATTACHMENT 1 - THE 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 attached at **Appendix 1**.

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.

ATTACHMENT 1, Appendix 1 - Table of Considerations for planned operations in airspace or to/from aerodromes which may be contaminated by volcanic ash.

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 plan to operate in airspace or to/from aerodromes which may be 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.
Minimum Equipment List / Dispatch Deviation Guide	Consider additional restrictions for dispatching aircraft: • 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. (This list is not necessarily exhaustive.)

Considerations	Guidance
Operator Procedures	
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 flights that plan to operate in airspace or to/from aerodromes which may be contaminated by volcanic ash.
Pilot Reports	Requirements for reporting in the event of an airborne encounter. Post-flight reporting.
Mandatory Occurrence Reports	Reminder regarding the necessity for filing MORs following an encounter.
Standard Operating Procedures	Review changes to normal and abnormal operating procedures: • pre-flight planning; • operations to/from aerodromes contaminated with volcanic ash; • supplemental oxygen; • engine-out procedures; and • escape routes. (This list is not necessarily exhaustive.)
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 airspace or operations to/from aerodromes which may be contaminated by 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.

ATTACHMENT 1, Appendix 2 Example of a Hazard Log (Risk Register)

HAZARD		Incident Sequence Description	Existing Controls	Outcome (Pre-Mitigation)			Additional Mitigation Required	Outcome (Post-Mitigation)			Actions and Owners	Monitoring and Review Requirements
No.	Description			Severity	Likelihood	Risk		Severity	Likelihood	Risk		