



NOTICE OF PROPOSED AMENDMENT (NPA) No 2012-07

DRAFT DECISIONS OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION SAFETY AGENCY

**amending Decision No 2012/xxx/RM of the Executive Director
of the European Aviation Safety Agency of xx/xx/2012
on acceptable means of compliance and guidance material to Commission
Regulation (EU) No XXXX/2012 of xx/xx/2012 laying down requirements and
administrative procedures related to Air Operations pursuant to Regulation (EC)
No 216/2008 of the European Parliament and of the Council**

and

**amending Decision No 2012/006/R of the Executive Director
of the European Aviation Safety Agency of 19 April 2012
on acceptable means of compliance and guidance material to Commission
Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical
requirements and administrative procedures related to civil aviation aircrew
pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the
Council.**

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**amending Decision No 2012/007/R of the Executive Director
of the European Aviation Safety Agency of 19 April 2012
on acceptable means of compliance and guidance material to Commission
Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical
requirements and administrative procedures related to civil aviation aircrew
pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the
Council.**

'Guidance material on volcanic ash safety risk assessment (VA SRA)'

EXECUTIVE SUMMARY

This NPA is aimed at providing detailed guidance for the development and the evaluation of a safety risk assessment for the management of operations with known or forecast volcanic ash cloud contamination.

To that end, this NPA proposes:

- AMC/GM to ORO.GEN.200 and ARO.GEN.200 which provide guidance to operators and approved training organisations (ATOs) on how to develop a volcanic ash safety risk assessment (VA SRA),
- AMC/GM to ARO.GEN.300 and ARA.GEN.300 which provide guidance to competent authorities on how to assess an operator or an ATO VA SRA .

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A. Explanatory Note

I. General

1. The purpose of this Notice of Proposed Amendment (NPA) is to envisage amending Decision 2012/XXX/R of the Executive Director of XX XXXX 2012 on AMC/GM material to Commission Regulation (EU) No XXXX/2012¹ Annex III Part-ORO, Decision 2012/XXX/R of the Executive Director of XX XXXX 2012 on AMC/GM material to Commission Regulation (EU) No XXXX/2012 Annex II Part-ARO, Decision 2012/006/R of the Executive Director of 19 April 2012 on AMC/GM material to Commission Regulation (EU) No 1178/2011² Annex VI Part-ARA and Decision 2012/007/R of the Executive Director of 19 April 2012 on AMC/GM material to Commission Regulation (EU) No 1178/2011 Annex VII Part-ORA. The scope of this rulemaking activity is outlined in Terms of Reference (ToR) Tor RMT.0460 and is described in more detail below.
2. The European Aviation Safety Agency (hereafter referred to as the 'Agency') is directly involved in the rule-shaping process. It assists the Commission in its executive tasks by preparing draft regulations, and amendments thereof, for the implementation of the Basic Regulation³ which are adopted as 'Opinions' (Article 19(1)). It also adopts Certification Specifications, including Airworthiness Codes and Acceptable Means of Compliance and Guidance Material to be used in the certification process (Article 19(2)).
3. When developing rules, the Agency is bound to follow a structured process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as 'The Rulemaking Procedure'⁴.
4. This rulemaking activity is included in the Agency's Rulemaking Programme for 2012. It implements the rulemaking task RMT.0460 'Guidance material for volcanic ash risk assessment'.
5. The text of this NPA has been developed by the Agency. It is submitted for consultation of all interested parties in accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.
6. The proposed Acceptable Means of Compliance and Guidance Material have taken into account the development of European Union and International law (ICAO), and the harmonisation with the rules of other authorities of the European Union main partners as

¹ Commission Regulation (EU) No XXX/2012 of XX XXXX 2012 laying down requirements and administrative procedures related to Air Operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council.

² Commission Regulation (EU) No 1178/2011 of 03 November 2011 (OJ L 311, 25.11.2011, p. 1) laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council. Regulation as last amended by Commission Regulation (EU) No 290/2012 of 30 March 2012 (OJ L 100, 05.04.2012, p.1)

³ Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.03.2008, p. 1). Regulation as last amended by Regulation 1108/2009 of the European Parliament and of the Council of 21 October 2009 (OJ L 309, 24.11.2009, p. 51).

⁴ These draft rules were developed in compliance with Management Board Decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material ('Rulemaking Procedure'), EASA MB 08-2007, 13.6.2007. However, this Decision has been amended and replaced by EASA MB 01-2012, 13.03.2012.

set out in the objectives of article 2 of the Basic Regulation. The proposed AMCs/GMs take into account ICAO guidance contained in Doc 9974 Flight safety and volcanic ash.

II. Consultation

7. To achieve optimal consultation, the Agency is publishing the draft decision of the Executive Director on its internet site. Comments should be provided within 3 months in accordance with Article 6 of the Rulemaking Procedure. Comments on this proposal should be submitted by one of the following methods:

CRT: Send your comments using the Comment-response Tool (CRT) available at <http://hub.easa.europa.eu/crt/>.

E-mail: Comments can be sent by e-mail only in case the use of CRT is prevented by technical problems. The(se) problem(s) should be reported to the [CRT webmaster](mailto:CRT_webmaster@easa.europa.eu) and comments sent by email to NPA@easa.europa.eu.

Correspondence: If you do not have access to the Internet or e-mail, you can send your comments by mail to:
Process Support
Rulemaking Directorate
EASA
Postfach 10 12 53
50452 Cologne
Germany

Comments should be submitted by **19 October 2012**. If received after this deadline, they might not be taken into account.

III. Comment-response document

8. All comments received in time will be responded to and incorporated in a comment-response document (CRD). The CRD will be available on the Agency's website and in the Comment-Response Tool (CRT).

IV. Content of the draft Decision

Background

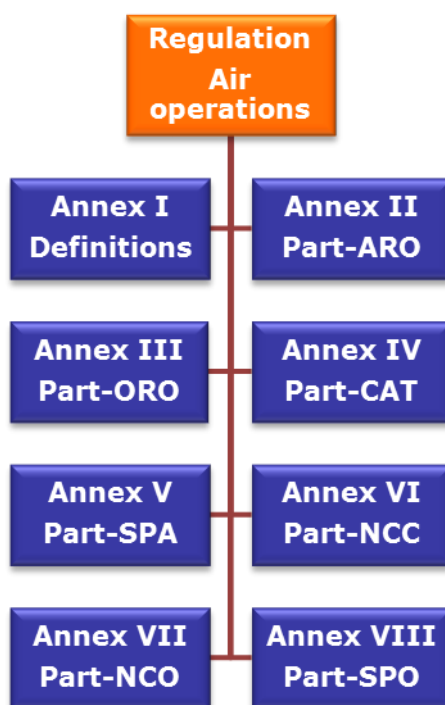
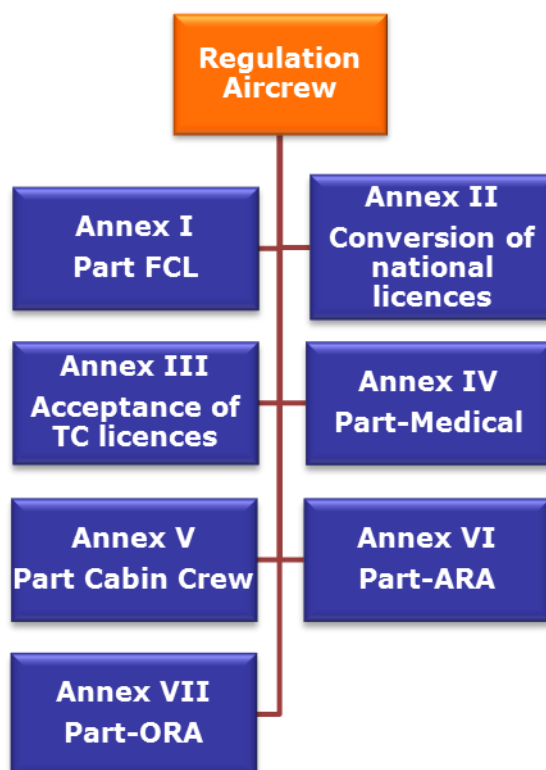
9. Following the last major eruptions of volcanos and considering the consequences of such eruptions on flight operations, discussion at an ICAO level reached the common position that an operator should not be prevented from operating through, under or over airspace forecast to be contaminated with volcanic ash or aerodromes/operating sites contaminated with volcanic ash, provided it has demonstrated in its management system, the capability to do so through a safety risk assessment.
10. ICAO created in July 2010 the International Volcanic ash task force (IVATF), in which the Agency was fully engaged, to assess the global aviation needs in relation to volcanic events. The IVATF has developed a proposal, which was supported by the Agency, for guidance material on the management of flight operations with known or forecast volcanic ash contamination. ICAO issued in February 2012 an advanced version of DOC 9974 'Risk management of flight operations with known or forecast volcanic ash contamination'. This document provides guidance material which States may recommend to operators and regulatory authorities where volcanic ash contamination may be a hazard for flight operations. The guidance is based on operators developing a volcanic ash safety risk assessment (VA SRA), within their management system, and regulatory

authorities assessing these VA SRA to establish the operator's capability to safely conduct flights.

11. The Agency issued an Advance Notice of Proposed Amendment (A-NPA 2011-06) on 03 May 2011 to support the work of ICAO IVATF Airworthiness Sub-Group AIR04 and to consult stakeholders on the implementation of such guidance material into the European regulatory framework. The feedback provided during this consultation indicated that stakeholders considered that rulemaking should be initiated in the short term in order to transpose ICAO guidance material into the European regulatory framework. Following this consultation, Decision 2011/014/R was then issued on the 12th December 2011, stating that a new rulemaking task RMT.0460 was going to be initiated.
12. The draft Regulation on Air Operations proposed to the Commission (the Agency's Opinion No 04/2011) requires in Annex III Part-ORO all commercial operators and non-commercial operators operating complex motor-powered aircraft to implement a management system within their organisation. The same requirements on management system are contained in Commission Regulation No 290/2012 related to civil aviation aircrew in Part-ORA which is applicable to all approved training organisations (ATO) whatever the type of aircraft they operate. This management system should include an identification of all hazards related to the type of operations performed and an assessment of the acceptability of the associated safety risks with the appropriate mitigation procedures.
13. Part-ORO, including all the management system requirements, is not applicable to non-commercial operations with other than complex motor-powered aircraft (NCO). Therefore, there is no obligation for an NCO operator to undertake a VA SRA. In order to keep Part-NCO proportionate, the Agency has decided to address NCO operations into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash, via the definition of best practices through EGAST. Consequently, the scope of this task is limited to commercial operators, non-commercial operators with complex motor-powered aircraft and approved training organisations.
14. Some generic guidance related to safety risk assessment is already included in draft Acceptable Means of Compliance and Guidance Material on Air Operations Annexes II Part-ARO and III Part-ORO and also in AMC/GM to Commission Regulation No 290/2012 annexes VI Part ARA and VII Part ORA, but nevertheless does not provide yet any specific guidance on SRA related to flight in volcanic ash nor guidance for authorities on the assessment of such VA SRA.
15. The Agency has produced SIB 2010-17, which is being continuously updated to provide information and guidance to operators on how to manage operations within airspace contaminated with volcanic ash. This SIB will be further revised when the Decision associated with this NPA is published.

Structure

16. The documents of the Decisions to the Regulation for Air Operations and to the Regulation for Aircrew are based on the rule structure for the Aircrew and OPS Regulations. The following tables provide an overview of the Annexes under the Regulation for Air operations and Regulation for Aircrew.

Table 1: Annexes of the Regulation for Air operations**Table 2: Annexes of the Regulation for Aircrew**

17. The Regulation for Air Operations is divided into eight Parts:

- Annex I - Definitions for Annexes II to VIII;
- Annex II - Part-ARO, authority requirements for air operations;
- Annex III - Part-ORO, organisation requirements for commercial air operators and non-commercial air operators with complex motor-powered aircraft;
- Annex IV - Part-CAT, commercial air transport operations;
- Annex V - Part-SPA, operations requiring specific approvals.
- Annex VI - Part-NCC, non-commercial operations with complex motor-powered aircraft;
- Annex VII - Part-NCO, non-commercial operations with other-than-complex motor-powered aircraft;
- Annex VIII - Part-SPO, specialised operations.

18. The Regulation for Aircrew is divided into seven Parts:

- Annex I - Part-FCL, pilot licensing;
- Annex II - conversion of national licences;
- Annex III - acceptance of third countries licences;
- Annex IV - Part-Medical;
- Annex V - Part-Cabin Crew;
- Annex VI - Part-ARA, authority requirements for Aircrew;
- Annex VII - Part-ORA, organisation requirements for Aircrew.

Proposed amendment

The aim of this Rulemaking task, as established in the Terms of Reference, is to produce acceptable means of compliance and guidance material for operators on the development of a safety risk assessment for the management of flight operations with known or forecast volcanic ash cloud contamination and also for States on how to assess these safety risk assessments. These new AMCs and GMs are based on ICAO Doc 9974 without any major modification to the original text. **The envisaged changes are:**

(i) To Decision 2012/XXX/R (Part-ORO):

A new GM GM3 ORO.GEN.200(a)(3) is added.

A new GM GM4 ORO.GEN.200(a)(3) is added.

(ii) To Decision 2012/XXX/R (Part-ARO):

A new AMC AMC2 ARO.GEN.300(a);(b);(c) is added.

A new GM GM2 ARO.GEN.300(a);(b);(c) is added.

(iii) To Decision 2012/007/R (Part-ORA):

A new GM GM3 ORA.GEN.200(a)(3) is added.

A new GM GM4 ORA.GEN.200(a)(3) is added.

(iv) To Decision 2012/006/R (Part-ARA):

A new AMC AMC1 ARA.GEN.300(a);(b);(c) is added.

A new GM GM1 ARA.GEN.300(a);(b);(c) is added.

V. Regulatory Impact Assessment

19. The purpose of a Regulatory Impact Assessment (RIA) is to assess the impacts and consequences of the rules which are being proposed. The assessment aims to support the decision making process by exploring the pros and cons of all possible options, as part of the implementation of the Basic Regulation.
20. In order to conduct a RIA, several options should be identified and assessed in terms of safety, environmental, economic, social, proportionality and regulatory harmonisation to establish the impacts on regulated persons and organisations. However, in this case, following the comments received after the publication of A-NPA 2011-06, no other option has been identified (see Decision 2012/XXX/R).
21. The aim of the task is to introduce Acceptable Means of Compliance (AMC) and Guidance Material (GM) on volcanic ash safety risk assessment to Part-ARO/ORO and Part-ARA/ORR based on the content of ICAO Doc 9974. Since safety risk assessment is already required by the management system and the GMs to ORO.GEN.200 and to ARO.GEN.200 are already providing some generic guidance on SRA, the impact of the task on operators is evaluated as very low. In addition, as stated in the ToR and as expressed by the stakeholders, the content of ICAO Doc 9974, based on version 7, which has already been extensively consulted, should be transposed into the Agency's AMCs and GMs without unnecessary changes.
22. Therefore, it is the decision of the Agency that no detailed RIA is necessary to support this specific task.

B. Draft Decisions

The text of the amendment is arranged to show deleted text, new text or new paragraph as shown below:

1. deleted text is shown with a strike through: ~~deleted~~
2. changed or new text is highlighted with grey shading: **new**
3. ... indicates that remaining text is unchanged in front of or following the reflected amendment.

I. Draft Decision Part-ORO

- 1) A new GM, GM3 ORO.GEN.200(a)(3) is added:

GM3 ORO.GEN.200(a)(3) Management system

RISK MANAGEMENT OF FLIGHT OPERATIONS WITH KNOWN OR FORECAST VOLCANIC ASH CONTAMINATION

(a) Responsibilities

The operator is responsible for the safety of its operations, including within an area with known or forecast volcanic ash contamination.

The operator should complete this assessment of safety risks related to known or forecast volcanic ash contamination as part of its management system before initiating operations into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash.

This process is intended to ensure the operator takes account of the likely accuracy and quality of the information sources it uses in its management system and to demonstrate its own competence and capability to interpret data from different sources in order to achieve the necessary level of data integrity reliably and correctly resolve any conflicts among data sources that may arise.

In order to decide whether or not to operate into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash, the operator should make use of the safety risk assessment within its management system as required by ORO.GEN.200.

The operator's safety risk assessment should take into account all relevant data including data from the type certificate holders (TCHs) regarding the susceptibility of the aircraft they operate to volcanic cloud-related airworthiness effects, the nature and severity of these effects and the related pre-flight, in-flight and post-flight precautions to be observed by the operator.

(b) Procedures

The operator should have documented procedures for the management of operations into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash.

These procedures should ensure that, at all times, flight operations remain within the accepted safety boundaries as established through the management system allowing for

any variations in information sources, equipment, operational experience or organisation. Procedures should include those for flight crew, flight planners, dispatchers, operations, continuing airworthiness personnel such that they are in a position to evaluate correctly the risk of flights into airspace forecast to be contaminated by volcanic ash and to plan accordingly.

Continuing airworthiness personnel should be provided with procedures allowing them to correctly assess the need for and to execute relevant continuing airworthiness interventions.

The operator should retain sufficient qualified and competent staff to generate well supported operational risk management decisions and ensure that its staff are appropriately trained and current. It is recommended that the operator make the necessary arrangements for its flight operations staff to take up opportunities to be involved in volcanic ash exercises conducted in their areas of operation.

(c) Volcanic activity information and operator's potential response

Before and during operations, information valuable to the operator is generated by various volcano agencies worldwide. The operator's risk assessment and mitigating actions need to take account of, and respond appropriately to, the information likely to be available during each phase of the eruptive sequence from pre-eruption through to end of eruptive activity. It is nevertheless noted that eruptions rarely follow a deterministic pattern of behaviour. A typical operator's response may consist of the following:

(1) Pre-eruption

The operator should have in place a robust mechanism for ensuring that it is constantly vigilant for any alerts of pre-eruption volcanic activity relevant to its operations. The staff involved need to understand the threat to safe operations that such alerts represent.

An operator whose routes traverse large, active volcanic areas for which immediate International Airways Volcano Watch (IAVW) alerts may not be available, should define its strategy for capturing information about increased volcanic activity before pre-eruption alerts are generated. Such an operator should also ensure that its crews are aware that they may be the first to observe an eruption and so need to be vigilant and ready to ensure that this information is made available for wider dissemination as quickly as possible.

(2) Start of an eruption

Given the likely uncertainty regarding the status of the eruption during the early stages of an event and regarding the associated volcanic cloud, the operator's procedures should include a requirement for crews to initiate or accept re-routes to avoid the affected airspace.

The operator should ensure that flights are planned to remain clear of known or forecasted affected area and that consideration is given to available alternate aerodromes and fuel requirements.

It is expected that the following initial actions will be taken by the operator:

- (i) determine if any aircraft in flight could be affected, alert the crew and provide advice on re-routing as required;
- (ii) alert management;

- (iii) for flight departures, brief flight crew and revise flight and fuel planning in accordance with the safety risk assessment;
- (iv) alert flight crew and operations staff to the need for increased monitoring of information (e.g. special air report (AIREP), volcanic activity report (VAR), significant weather information (SIGMET) and NOTAMs);
- (v) initiate the gathering of all data relevant to determining the risk; and
- (vi) apply mitigations identified in the safety risk assessment.

(3) On-going eruption

As the eruptive event develops, the operator can expect the responsible Volcanic Ash Advisory Centre (VAAC) to provide volcanic ash advisory messages (VAA/VAGs) defining, as accurately as possible, the vertical and horizontal extent of areas and layers of volcanic clouds. As a minimum, the operator should monitor, and take account of, this VAAC information as well as of relevant SIGMETs and NOTAMs.

Other sources of information are likely to be available such as VAR/AIREPs, satellite imagery and a range of other information from State and commercial organisations. The operator should plan its operations in accordance with its safety risk assessment taking into account additional sources of information that it considers accurate and relevant.

The operator should carefully consider and resolve differences or conflicts among the information sources, notably between published information and observations (pilot reports, airborne measurements, etc.).

Given the dynamic nature of the volcanic hazards, the operator should ensure that the situation is monitored closely and operations adjusted to avoid areas of forecast or known volcanic ash.

The operator should be aware that, the affected or danger area may be established and presented in a different way than the one currently used in Europe as described in EUR Doc 019-NAT Doc 006.

The operator should require reports from its crews concerning any encounters with volcanic emissions. These reports should be passed immediately to the appropriate air traffic services (ATS) unit and to the operator's competent authority.

For the purpose of flight planning, the operator should treat the horizontal and vertical limits of the temporary danger area (TDA) to be overflown as they would mountainous terrain, modified in accordance with their safety risk assessment. The operator should take account of the risk of cabin depressurisation or engine failure resulting in the inability to maintain level flight above a volcanic cloud, especially when conducting ETOPS operations. Additionally, minimum equipment list (MEL) provisions should be considered in consultation with the TCHs.

(d) Safety risk assessment

When made specific to the issue of intended flight into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash, the process should involve the following:

(1) Identifying the hazards

The generic hazard, in the context of this document, is airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash, and whose characteristics are harmful to the airworthiness and operation of the aircraft.

Within this generic hazard, the operator should develop its own list of specific hazards taking into account its specific aircraft, experience, knowledge and type of operation, and any other relevant data stemming from previous eruptions.

- (2) Considering the severity and consequences of the hazard occurring (i.e. the nature and actual level of damage expected to be inflicted on the particular aircraft from exposure to that volcanic ash cloud).
- (3) Evaluating the likelihood of encountering volcanic ash clouds with characteristics harmful to the safe operation of the aircraft.

For each specific hazard within the generic hazard, the likelihood of adverse consequences should be assessed, either qualitatively or quantitatively.

- (4) Determining whether the consequent risk is acceptable and within the operator's risk performance criteria.

At this stage of the process, the safety risks should be classified as acceptable or unacceptable. It is recognised that the assessment of tolerability will be subjective, based on qualitative data and expert judgement, until specific quantitative data are available in respect of a range of parameters.

- (5) Taking action to reduce the safety risk to a level that is acceptable to the operator's management.

Appropriate mitigation for each unacceptable risk identified should then be considered in order to reduce the risk to a level acceptable to the operator's management.

(e) Procedures to be considered when identifying possible mitigations actions

When conducting a volcanic ash safety risk assessment, the operator should consider the following non-exhaustive list of procedures and processes as mitigation:

(1) Type certificate holders

Obtaining of advice from the TCHs and other engineering sources concerning operations into contaminated airspace and/or aerodromes/operating sites contaminated by volcanic ash.

This advice should set out:

- (i) the features of the aircraft that are susceptible to airworthiness effects related to volcanic ash;
- (ii) the nature and severity of these effects;
- (iii) the effect of volcanic ash on operations to/from contaminated aerodromes/operating sites;
- (iv) the related pre-flight, in-flight and post-flight precautions to be observed by the operator including any necessary amendments to aircraft operating manuals, aircraft maintenance manuals, master minimum equipment list/dispatch deviation or equivalents; and
- (v) the recommended inspections associated with operations in volcanic ash contaminated airspace and to/from volcanic ash contaminated aerodromes/operating sites; this may take the form of instructions for continuing airworthiness or other advice.

(2) Operator/contracted organisations' personnel

Definition of procedures for flight planning, operations, engineering and maintenance ensuring that:

- (i) personnel responsible for flight planning are in a position to evaluate correctly the risk of encountering volcanic ash contaminated airspace, or aerodromes/operating sites, and can plan accordingly;
 - (ii) flight planning and operational procedures enable crews to avoid areas and aerodromes/operating sites with unacceptable volcanic ash contamination;
 - (iii) flight crew are aware of the possible signs of entry into a volcanic ash cloud and execute the associated procedures; and
 - (iv) continuing airworthiness personnel are able to assess the need for and to execute any necessary maintenance or other required interventions.
- (3) Provision of enhanced flight watch
- This should ensure:
- (i) close and continuous monitoring of VAA, VAR/AIREP, SIGMET, NOTAM and ASHTAM information, and information from crews, concerning the volcanic ash cloud hazard;
 - (ii) access to plots of the affected area from SIGMETs and NOTAMs for crews and personnel responsible for the management and the supervision of the flight operations; and
 - (iii) communication of the latest information to crews and personnel responsible for the management and the supervision of the flight operations in a timely fashion.
- (4) Flight planning
- Flexibility of the process to allow re-planning at short notice should conditions change.
- (5) Departure, destination and alternate aerodromes
- For the airspace to be traversed, or the aerodromes/operating sites in use, parameters to evaluate and take account of:
- (i) the probability of contamination;
 - (ii) any additional aircraft performance requirements;
 - (iii) required maintenance considerations;
 - (iv) fuel requirements for re-routeing and extended holding.
- (6) Routing policy
- Parameters to evaluate and take account of:
- (i) the shortest period in and over the forecast contaminated area;
 - (ii) the hazards associated with flying over the contaminated area;
 - (iii) drift down and emergency descent considerations.
- (7) Diversion policy
- Parameters to evaluate and take account of:
- (i) maximum allowed distance from a suitable alternate;
 - (ii) availability of alternates outside the forecast contaminated area;
 - (iii) diversion policy after an volcanic ash encounter.
- (8) Minimum equipment list (MEL)

Additional provisions in the MEL for dispatching aircraft with unserviceabilities that might affect the following non-exhaustive list of systems:

- (i) air conditioning packs;
- (ii) engine bleeds;
- (iii) pressurisation system;
- (iv) electrical power distribution system;
- (v) air data computers;
- (vi) standby instruments;
- (vii) navigation systems;
- (viii) de-icing systems;
- (ix) engine driven generators;
- (x) auxiliary power unit (APU);
- (xi) airborne collision avoidance system (ACAS);
- (xii) terrain awareness warning system (TAWS);
- (xiii) autoland systems;
- (xiv) provision of crew oxygen;
- (xv) supplemental oxygen for passengers.

(9) Standard operating procedures

Crew training to ensure they are familiar with normal and abnormal operating procedures and particularly any changes regarding but not limited to:

- (i) pre-flight planning;
- (ii) in-flight monitoring of volcanic ash cloud affected areas and avoidance procedures;
- (iii) diversion;
- (iv) communications with ATC;
- (v) in-flight monitoring of engine and systems potentially affected by volcanic ash cloud contamination;
- (vi) recognition and detection of volcanic ash clouds;
- (vii) in-flight indications of a volcanic ash cloud encounter;
- (viii) procedures to be followed if a volcanic ash cloud is encountered;
- (ix) unreliable or erroneous airspeed;
- (x) non-normal procedures for engines and systems potentially affected by volcanic ash cloud contamination;
- (xi) engine-out and engine relight;
- (xii) escape routes; and
- (xiii) operations to/from aerodromes/operating sites contaminated with volcanic ash.

(10) Provision for aircraft technical log

This should ensure:

- (i) Systematic entry in the aircraft technical log related to any actual or suspected volcanic ash encounter whether in-flight or at an aerodrome/operating site ; and
- (ii) Checking, prior to flight, of the completion of maintenance actions related to an entry in the aircraft technical log for a volcanic ash cloud encounter on a previous flight.

(11) Incident reporting

Crew requirements for:

- (i) reporting an airborne volcanic ash cloud encounter (VAR);
- (ii) post-flight volcanic ash cloud reporting (VAR);
- (iii) reporting non-encounters in airspace forecast to be contaminated; and
- (iv) filing a mandatory occurrence report in accordance with ORO.GEN.160.

(12) Continuing airworthiness procedures

Procedures when operating in or near areas of volcanic ash cloud contamination:

- (i) enhancement of vigilance during inspections and regular maintenance and appropriate adjustments to maintenance practices;
- (ii) definition of a follow-up procedure when a volcanic ash cloud encounter has been reported or suspected;
- (iii) thorough investigation for any sign of unusual or accelerated abrasions or corrosion or of volcanic ash accumulation;
- (iv) reporting to TCHs and the relevant authorities observations and experiences from operations in areas of volcanic ash cloud contamination;
- (v) completion of any additional maintenance recommended by the TCH.

(f) Reporting

The operator should ensure that reports are immediately submitted to the nearest ATS unit using the VAR/AIREP procedures followed up by a more detailed VAR on landing together with, as applicable, a report as defined in Regulation (EU) No 996/2010 and Directive 2003/42/EC, and an aircraft technical log entry for:

- (1) any incident related to volcanic clouds;
- (2) any observation of volcanic ash activity; and
- (3) any time that volcanic ash is not encountered in an area where it was forecast to be.

(g) References

Further guidance on volcanic ash safety risk assessment is given in ICAO Doc. 9974 (Flight safety and volcanic ash – Risk management of flight operations with known or forecast volcanic ash contamination).

- 2) A new GM, GM4 ORO.GEN.200(a)(3) is added:

GM4 ORO.GEN.200(a)(3) Management system**SAFETY RISK ASSESSMENT – RISK REGISTER**

The results of the assessment of the potential adverse consequences or outcome of each hazard may be recorded by the operator in a risk register, an example of which is provided below.

II Draft Decision PART-ARO

- 1) A new AMC, AMC2 ARO.GEN.300(a);(b);(c) is added:

AMC2 ARO.GEN.300(a);(b);(c) Oversight

ASSESSMENT OF OPERATORS' VOLCANIC ASH SAFETY RISK ASSESSMENT

During the initial certification or the continuing oversight of an operator, the competent authority should normally evaluate the operator's safety risk assessment for operations into or avoiding areas forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash. This safety risk assessment should be an identifiable process of the operator's management system.

As part of its continuing oversight, the competent authority should also remain satisfied as to the continuing validity of this safety risk assessment.

(a) Methodology

The competent authority should establish a methodology for evaluating the safety risk assessment process particular to volcanic ash of the operator's management system.

The competent authority's evaluation under its normal oversight process should be considered satisfactory if the operator demonstrates its competence and capability to:

- (1) understand the hazards associated with volcanic ash clouds and the effect on the equipment being operated;
- (2) be clear on where these hazards may exceed acceptable safety risk limits;
- (3) identify and implement mitigations including suspension of operations where mitigation cannot reduce the risk to within safety risk limits;
- (4) develop and execute effectively robust procedures for planning and operating flights through, or avoiding, potentially contaminated airspace safely;
- (5) correctly choose which information sources to use, interpret the information and resolve any conflicts among such sources;
- (6) take account of detailed information from its type certificate holders (TCHs) concerning volcanic ash-related airworthiness aspects of the aircraft it operates, and the related pre-flight, in-flight and post flight precautions to be observed;
- (7) assess the competence and currency of its staff in relation to the duties necessary to operate safely into areas forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash and implement any necessary training; and
- (8) ensure sufficient numbers of qualified and competent staff for such duties.

The competent authority should take into account that:

- (1) those of the operator's recorded mitigations of most significance to a safe outcome are in place;
- (2) those of the operational procedures specified by the operator with the most significance to safety appear to be robust; and
- (3) the staff on whom the operator depends in respect of those duties necessary to operate safely into areas forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash are trained and assessed as competent in the relevant procedures.

- 2) A new GM, GM2 ARO.GEN.300(a);(b);(c) is added:

GM2 ARO.GEN.300(a);(b);(c) Oversight**VOLCANIC ASH SAFETY RISK ASSESSMENT - ADDITIONAL GUIDANCE**

Further guidance on the assessment of an operator's volcanic ash safety risk assessment is given in ICAO Doc 9974 (Flight safety and volcanic ash – Risk management of flight operations with known or forecast volcanic ash contamination).

III. Draft Decision Part-ORA

- 1) A new GM, GM3 ORA.GEN.200(a)(3) is added:

GM3 ORA.GEN.200(a)(3) Management system**APPROVED TRAINING ORGANISATIONS - RISK MANAGEMENT OF FLIGHT OPERATIONS WITH KNOWN OR FORECAST VOLCANIC ASH CONTAMINATION****(a) Responsibilities**

The ATO is responsible for the safety of its operations, including within an area with known or forecast volcanic ash contamination.

The ATO should complete this assessment of safety risks related to known or forecast volcanic ash contamination as part of its management system before initiating operations into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash.

This process is intended to ensure the ATO takes into account the likely accuracy and quality of the information sources it uses in its management system and to demonstrate its own competence and capability to interpret data from different sources in order to achieve the necessary level of data integrity reliably and correctly resolve any conflicts among data sources that may arise.

In order to decide whether or not to operate into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash, the ATO should make use of the safety risk assessment within its management system as required by ORA.GEN.200.

The ATO's safety risk assessment should take into account all relevant data including data from the type certificate holders (TCHs) regarding the susceptibility of the aircraft they operate to volcanic cloud-related airworthiness effects, the nature and severity of these effects and the related pre-flight, in-flight and post-flight precautions to be observed by the ATO.

(b) Procedures

The ATO should have documented procedures for the management of operations into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash.

These procedures should ensure that, at all times, flight operations remain within the accepted safety boundaries as established through the management system allowing for any variations in information sources, equipment, operational experience or organisation. Procedures should include those for flight crew and any other relevant personnel such

that they are in a position to evaluate correctly the risk of flights into airspace forecast to be contaminated by volcanic ash and to plan accordingly.

Continuing airworthiness personnel should be provided with procedures allowing them to correctly assess the need for and to execute relevant maintenance or continuing airworthiness interventions.

The ATO should retain sufficient qualified and competent staff to generate well supported operational risk management decisions and ensure that its staff are appropriately trained and current. It is recommended that the ATO make the necessary arrangements for its relevant staff to take up opportunities to be involved in volcanic ash exercises conducted in their areas of operation.

(c) Volcanic activity information and the ATO's potential response

Before and during operations, information valuable to the ATO is generated by various volcano agencies worldwide. The ATO's risk assessment and mitigating actions need to take account of and respond appropriately to the information likely to be available during each phase of the eruptive sequence from pre-eruption through to end of eruptive activity. It is nevertheless noted that eruptions rarely follow a deterministic pattern of behaviour. A typical ATO's response may consist of the following:

(1) Pre-eruption

The ATO should have in place a robust mechanism for ensuring that it is constantly vigilant for any alerts of pre-eruption volcanic activity relevant to its operations. The staff involved need to understand the threat to safe operations that such alerts represent.

An ATO whose areas of activity include large, active volcanic areas for which immediate International Airways Volcano Watch (IAVW) alerts may not be available, should define its strategy for capturing information about increased volcanic activity before pre-eruption alerts are generated. Such an ATO should also ensure that its crews are aware that they may be the first to observe an eruption and so need to be vigilant and ready to ensure that this information is made available for wider dissemination as quickly as possible.

(2) Start of an eruption

Given the likely uncertainty regarding the status of the eruption during the early stages of an event and regarding the associated volcanic cloud, the ATO's procedures should include a requirement for crews to initiate or accept re-routes to avoid the affected airspace.

The ATO should ensure that flights are planned to remain clear of known or forecasted affected area and that consideration is given to available alternate aerodromes and fuel requirements.

It is expected that the following initial actions will be taken by the ATO:

- (i) determine if any aircraft in flight could be affected, alert the crew and provide advice on re-routing as required;
- (ii) alert management;
- (iii) for flight departures, brief flight crew and revise flight and fuel planning in accordance with the safety risk assessment;
- (iv) alert flight crew to the need for increased monitoring of information (e.g. special air report (AIREP), volcanic activity report (VAR), significant weather information (SIGMET) and NOTAMs);

- (v) initiate the gathering of all data relevant to determining the risk; and
- (vi) apply mitigations identified in the safety risk assessment.

(3) On-going eruption

As the eruptive event develops, the ATO can expect the responsible Volcanic Ash Advisory Centre (VAAC) to provide volcanic ash advisory messages (VAA/VAGs) defining, as accurately as possible, the vertical and horizontal extent of areas and layers of volcanic clouds. As a minimum, the ATO should monitor, and take account of, this VAAC information as well as of relevant SIGMETs and NOTAMs.

Other sources of information are likely to be available such as VAR/AIREPs, satellite imagery and a range of other information from State and commercial organisations. The ATO should plan its operations in accordance with its safety risk assessment taking into account additional sources of information that it considers accurate and relevant.

The ATO should carefully consider and resolve differences or conflicts among the information sources, notably between published information and observations (pilot reports, airborne measurements, etc.).

Given the dynamic nature of the volcanic hazards, the ATO should ensure that the situation is monitored closely and operations adjusted to avoid areas of forecast or known volcanic ash.

The ATO should be aware that, depending on the State concerned the affected or danger area may be established and presented in a different way than the one currently used in Europe as described in EUR Doc 019-NAT Doc 006.

The ATO should require reports from its crews concerning any encounters with volcanic emissions. These reports should be passed immediately to the appropriate air traffic services (ATS) unit and to the ATO's competent authority.

For the purpose of flight planning, the ATO should treat the horizontal and vertical limits of the temporary danger area (TDA) to be over-flown as they would mountainous terrain, modified in accordance with their safety risk assessment. The ATO should take account of the risk of cabin depressurisation or engine failure resulting in the inability to maintain level flight above a volcanic cloud. Additional minimum Equipment List (MEL) provisions, if applicable, should be considered in consultation with the TCHs.

(d) Safety risk assessment

When made specific to the issue of intended flight into airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash, the process should involve the following:

(1) Identifying the hazards

The generic hazard, in the context of this document, is airspace forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash, and whose characteristics are harmful to the airworthiness and operation of the aircraft.

Within this generic hazard, the ATO should develop its own list of specific hazards taking into account its specific aircraft, experience, knowledge and type of operation, and any other relevant data stemming from previous eruptions.;

(2) Considering the severity and consequences of the hazard occurring (i.e. the nature and actual level of damage expected to be inflicted on the particular aircraft from exposure to that volcanic ash cloud).

- (3) Evaluating the likelihood of encountering volcanic ash clouds with characteristics harmful to the safe operation of the aircraft.

For each specific hazard within the generic hazard, the likelihood of adverse consequences should be assessed, either qualitatively or quantitatively.

- (4) Determining whether the consequent risk is acceptable and within the ATO's risk performance criteria.

At this stage of the process, the safety risks should be classified as acceptable or unacceptable. It is recognised that the assessment of tolerability will be subjective, based on qualitative data and expert judgement, until specific quantitative data are available in respect of a range of parameters.

- (5) Taking action to reduce the safety risk to a level that is acceptable to the ATO's management.

Appropriate mitigation for each unacceptable risk identified should then be considered in order to reduce the risk to a level acceptable to the ATO's management.

- (e) Procedures to be considered when identifying possible mitigations actions

When conducting a volcanic ash safety risk assessment, the ATO should consider the following non-exhaustive list of procedures and processes as mitigation:

- (1) Type certificate holders

Obtaining of advice from the TCHs and other engineering sources concerning operations into contaminated airspace and/or aerodromes/operating sites contaminated by volcanic ash.

This advice should set out:

- (i) the features of the aircraft that are susceptible to airworthiness effects related to volcanic ash;
- (ii) the nature and severity of these effects;
- (iii) the effect of volcanic ash on operations to/from contaminated aerodromes/operating sites;
- (iv) the related pre-flight, in-flight and post-flight precautions to be observed by the ATO including any necessary amendments to aircraft operating manuals, aircraft maintenance manuals, master minimum equipment list/dispatch deviation or equivalents required to support the ATO; and
- (v) the recommended inspections associated with operations in volcanic ash contaminated airspace and to/from volcanic ash contaminated aerodromes/operating sites; this may take the form of instructions for continuing airworthiness or other advice.

- (2) ATO/contracted organisations' personnel

Definition of procedures for flight planning and operations ensuring that:

- (i) flight crews are in a position to evaluate correctly the risk of encountering volcanic ash contaminated airspace, or aerodromes/operating sites, and can plan accordingly;
- (ii) flight planning and operational procedures enable crews to avoid areas and aerodromes/operating sites with unacceptable volcanic ash contamination;

- (iii) flight crew are aware of the possible signs of entry into a volcanic ash cloud and execute the associated procedures; and
 - (iv) continuing airworthiness personnel are able to assess the need for, and to execute, any necessary maintenance or other required interventions.
- (3) Provision of enhanced flight watch

This should ensure:

 - (i) close and continuous monitoring of VAA, VAR/AIREP, SIGMET, NOTAM and ASHTAM information, and information from crews, concerning the volcanic ash cloud hazard;
 - (ii) access to plots of the affected area from SIGMETs and NOTAMs to crews; and
 - (iii) communication of the latest information to crews in a timely fashion.
- (4) Flight planning

Flexibility of the process to allow re-planning at short notice should conditions change.
- (5) Departure, destination and alternate aerodromes

For the airspace to be traversed, or the aerodromes/operating sites in use, parameters to evaluate and take account of:

 - (i) the probability of contamination;
 - (ii) any additional aircraft performance requirements;
 - (iii) required maintenance considerations;
 - (iv) fuel requirements for re-routeing and extended holding.
- (6) Routing policy

Parameters to evaluate and take account of,:

 - (i) the shortest period in and over the forecast contaminated area;
 - (ii) the hazards associated with flying over the contaminated area;
 - (iii) drift down and emergency descent considerations.
- (7) Diversion policy

Parameters to evaluate and take account of:

 - (i) maximum allowed distance from a suitable alternate;
 - (ii) availability of alternates outside the forecast contaminated area;
 - (iii) diversion policy after an volcanic ash encounter.
- (8) Minimum equipment list

Additional provisions in the MEL, if applicable, for dispatching aircraft with unserviceabilities that might affect the following non-exhaustive list of systems:

 - (i) air conditioning packs;
 - (ii) engine bleeds;
 - (iii) pressurisation system;
 - (iv) electrical power distribution system;
 - (v) air data computers;

- (vi) standby instruments;
- (vii) navigation systems;
- (viii) de-icing systems;
- (ix) engine driven generators;
- (x) auxiliary power unit (APU);
- (xi) airborne collision avoidance system (ACAS);
- (xii) terrain awareness warning system (TAWS);
- (xiii) autoland systems;
- (xiv) provision of crew oxygen; (xv) supplemental oxygen for passengers.

(9) Standard operating procedures

Crew training to ensure they are familiar with normal and abnormal operating procedures and particularly any changes regarding but not limited to:

- (i) pre-flight planning;
- (ii) in-flight monitoring of volcanic ash cloud affected areas and avoidance procedures;
- (iii) diversion;
- (iv) communications with ATC;
- (v) in-flight monitoring of engine and systems potentially affected by volcanic ash cloud contamination;
- (vi) recognition and detection of volcanic ash clouds;
- (vii) in-flight indications of a volcanic ash cloud encounter;
- (viii) procedures to be followed if a volcanic ash cloud is encountered;
- (ix) unreliable or erroneous airspeed;
- (x) non-normal procedures for engines and systems potentially affected by volcanic ash cloud contamination;
- (xi) engine-out and engine relight;
- (xii) escape routes; and
- (xiii) operations to/from aerodromes/operating sites contaminated with volcanic ash.

(10) Provision for aircraft technical log

This should ensure:

- (i) Systematic entry in the aircraft continuing airworthiness records or aircraft log if available related to any actual or suspected volcanic ash encounter whether in-flight or at an aerodrome/operating site; and
- (ii) Checking, prior to flight, of the completion of maintenance actions related to an entry in the continuing airworthiness records or aircraft log if available for a volcanic ash cloud encounter on a previous flight.

(11) Incident reporting

Crew requirements for:

- (i) reporting an airborne volcanic ash cloud encounter (VAR);

- (ii) post-flight volcanic ash cloud reporting (VAR);
- (iii) reporting non encounters in airspace forecast to be contaminated; and
- (iv) filing a mandatory occurrence report in accordance with ORA.GEN.160.

(12) Continuing airworthiness procedures

Procedures when operating in or near areas of volcanic ash cloud contamination:

- (i) enhancement of vigilance during inspections and regular maintenance and appropriate adjustments to maintenance practices;
- (ii) definition of a follow-up procedure when a volcanic ash cloud encounter has been reported or suspected;
- (iii) thorough investigation for any sign of unusual or accelerated abrasions or corrosion or of volcanic ash accumulation;
- (iv) reporting to TCHs and the relevant authorities observations and experiences from operations in areas of volcanic ash cloud contamination;
- (v) completion of any additional maintenance recommended by the TCH.

(f) Reporting

The ATO should ensure that reports are immediately submitted to the nearest ATS unit using the VAR/AIREP procedures followed up by a more detailed VAR on landing together with, as applicable, a report as defined in Regulation (EU) No 996/2010 and Directive 2003/42/EC, and an aircraft technical log entry for:

- (1) any incident related to volcanic clouds;
- (2) any observation of volcanic ash activity and
- (3) anytime that volcanic ash is not encountered in an area where it was forecast to be.

(g) Additional guidance

Further guidance on volcanic ash safety risk assessment is given in ICAO Doc. 9974 (Flight safety and volcanic ash – Risk management of flight operations with known or forecast volcanic ash contamination).

2) A new GM, GM4 ORA.GEN.200(a)(3) is added:

GM4 ORA.GEN.200(a)(3) Management system

SAFETY RISK ASSESSMENT – RISK REGISTER

The results of the assessment of the potential adverse consequences or outcome of each hazard may be recorded by the ATO in a risk register, an example of which is provided below.

IV. Draft Decision Part-ARA

- 1) A new AMC, AMC1 ARA.GEN.300(a)(b)(c) is added:

AMC1 ARA.GEN.300(a);(b);(c) Oversight

ASSESSMENT OF APPROVED TRAINING ORGANISATIONS' VOLCANIC ASH SAFETY RISK ASSESSMENT

During the initial certification or the continuing oversight of an ATO, the competent authority should normally evaluate its safety risk assessment for operations into or avoiding areas forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash. This safety risk assessment should be an identifiable process of the ATO's management system. As part of its continuing oversight, the competent authority should also remain satisfied as to the continuing validity of this safety risk assessment

(a) Methodology

The competent authority should establish a methodology for evaluating the safety risk assessment process particular to volcanic ash of the ATO's management system.

The competent authority's evaluation under its normal oversight process should be considered satisfactory if the ATO demonstrates its competence and capability to:

- (1) understand the hazards associated with volcanic ash clouds and the effect on the equipment being operated;
- (2) be clear on where these hazards may exceed acceptable safety risk limits;
- (3) identify and implement mitigations including suspension of operations where mitigation cannot reduce the risk to within safety risk limits;
- (4) develop and execute effectively, robust procedures for planning and operating flights through, or avoiding, potentially contaminated airspace safely;
- (5) correctly choose which information sources to use, interpret the information and resolve any conflicts among such sources;
- (6) take account of detailed information from its type certificate holders (TCHs) concerning volcanic ash-related airworthiness aspects of the aircraft it operates, and the related pre-flight, in-flight and post flight precautions to be observed;
- (7) assess the competence and currency of its staff in relation to the duties necessary to operate safely into areas forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash and implement any necessary training; and
- (8) ensure sufficient numbers of qualified and competent staff for such duties.

The competent authority should take into account:

- (1) those of the ATO's recorded mitigations of most significance to a safe outcome are in place;
- (2) those of the operational procedures specified by the ATO with the most significance to safety appear to be robust; and
- (3) that the staff on whom the ATO depends in respect of those duties necessary to operate safely into areas forecast to be or aerodromes/operating sites known to be contaminated with volcanic ash are trained and assessed as competent in the relevant procedures.

- 2) A new GM, GM1 ARA.GEN.300(a);(b);(c) is added:

GM1 ARA.GEN.300(a);(b);(c) Oversight

VOLCANIC ASH SAFETY RISK ASSESSMENT - ADDITIONAL GUIDANCE

Further guidance on the assessment of an ATO volcanic ash safety risk assessment is given in ICAO Doc. 9974 (Flight safety and volcanic ash – Risk management of flight operations with known or forecast volcanic ash contamination).