COMMENT RESPONSE DOCUMENT (CRD) TO NOTICE OF PROPOSED AMENDMENT (NPA) 2011-17

amending Decision No 2003/14/RM of the Executive Director of the European Aviation Safety Agency of 14 November 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for normal, utility, aerobatic and commuter category aeroplanes (« CS-23 »)

and

amending Decision No 2003/02/RM of the Executive Director of the European Aviation Safety Agency of 17 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for large aeroplanes (« CS-25 »)

and

amending Decision No 2003/15/RM of the Executive Director of the European Aviation Safety Agency of 14 November 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for small rotorcraft (« CS-27 »)

and

amending Decision No 2003/16/RM of the Executive Director of the European Aviation Safety Agency of 14 November 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for large rotorcraft (« CS-29 »)

and

amending Decision No 2003/09/RM of the Executive Director of the European Aviation Safety Agency of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for engines (« CS-E »)

and

amending Decision No 2003/07/RM of the Executive Director of the European Aviation Safety Agency of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for propellers (« CS-P »)

and

amending Decision No 2003/05/RM of the Executive Director of the European Aviation Safety Agency of 17 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for auxiliary power units (« CS-APU »)

'Volcanic Ash'

Executive Summary

1. Relevant developments at ICAO International Volcanic Ash Task Force (IVAFT)

Since NPA 2011-17 was developed, based on the report and recommendations from the IVAFT airworthiness subgroup AIR04 team regarding the management of flight operations with known or forecast volcanic cloud contamination (draft version 7), ICAO has subsequently published an updated version as Doc No 9974.

One significant change in the concept introduced in Doc No 9974 is a recommendation that volcanic ash encounters by aircraft should be avoided. The guidance then focusses on assessing the risks to flights planned to operate into areas forecast to be affected by volcanic ash or aerodromes contaminated with volcanic ash. In order to plan such operations, a safety risk assessment must be developed by the operator as part of their management system that is accepted by the competent authority. If actual ash is encountered in flight, the aircraft is expected to vacate the contaminated airspace as safely and expeditiously as possible as soon as the flight crew is alerted to the ash encounter.

This change in the concept is adopted by the Agency. With the intention now to prohibit extended flight into an ash environment, the impact on this NPA has been to remove references to ash concentration levels and time periods that can be tolerated.

The need for flight operations within a known ash environment and the need for defined airworthiness limitations will be the subject of a future Agency A-NPA.

2. Summary of significant comments received together with the Agency's responses

Some commentators questioned the scope of the proposed rules and the lack of consistency in their application to aircraft, engines, propellers and APUs. The Agency accepts that the NPA was not clear on this point and did not fully reflect the intent, which has changed with ongoing developments within the ICAO IVATF. The basic aim of these proposals is to require TC holders of new or changed products to provide data to support commercial operators and non-commercial operators of complex motor-powered aircraft in developing volcanic cloud procedures for integration within their mandatory management systems. This will aid the operator in identifying and managing aviation safety hazards and, once accepted by the competent authority, would allow flights into a forecast volcanic ash environment or to aerodromes known to be contaminated with volcanic ash. The proposed changes to the airworthiness rules have therefore been amended to bound the scope of the rule changes in line with the applicability of management systems in Part-ORO (Organisation Requirements for Air Operations).

Many commentators questioned whether it was the right time to develop specific rules ahead of ICAO and before detailed volcanic ash test criteria have been developed. The Agency's proposals in the NPA are of limited scope and commentators may have been interpreting them more widely than was intended. The primary intent of the NPA was simply to ensure that manufacturers' data for new or changed products is made available earlier than may otherwise be the case (i.e. at type-certification as opposed to post-volcanic event in operation), with similar levels of investigation/analysis required in both cases. In the future, operators will only be able to avoid or minimise flight disruptions if they already have in place the necessary approvals at the onset of any volcanic event. Further EASA rulemaking activities, particularly in relation to operational safety risk assessments and engine volcanic ash ingestion limits, will be the subject of separate proposals.

Some commentators suggested that compliance with the proposed rule should be voluntary. The Agency does not agree as volcanic clouds are a known hazard to aviation and are a global phenomenon. All products that fall within the scope of the rules will therefore have to comply. However, the level of investigation performed by the TCH can be minimised by declaring a zero volcanic cloud tolerance for their product. While this is possible, such an approach may lead to

commercial disadvantages as a limitation will be placed in the flight manual and known at the time of certification.

Some commentators noted an ambiguity in the Explanatory Note of the NPA that suggested flight into airspace known to be contaminated with volcanic ash was permitted. The Agency accepts that the wording could be misleading and that the operational intent is to use the safety risk assessment approach as a tool for the operator to decide whether or not to operate into airspace forecast to be or aerodromes known to be contaminated with volcanic ash. This ambiguity has no bearing on the substantive proposals of the NPA.

Some commenters preferred Option 2, which extended the need for manufacturers' information from just new/changed products to include all existing in-service products. The Agency sees some benefits in this approach as it will reinforce the need for TCHs to ensure that data associated with existing products remains relevant and up-to-date as further experience is gained. However, as the Essential Requirements of Annex I of Regulation (EC) No 216/2008 ('Basic Regulation') already defines an obligation on TCH to provide information to operators, and those TCH affected by this proposal have been cooperative, there is at this time no necessity for further regulation.

Note: With this CRD, the Agency is of the opinion that the proposed changes should proceed to publication. The Agency considers the proposals as an integral part of its overall strategy on volcanic ash, which is fully in line with the operational safety risk approach developed by ICAO and adopted by EASA and many national authorities. It will also benefit industry by providing design organisations with an acceptable means of fulfilling their existing obligations under the Basic Regulation. However, the Agency also recognises the considerable opposition and negative feedback to the NPA proposals. Prior to publication of the proposals, the Agency will therefore take the opportunity of the next Volcanic Ash Workshop, planned to be held in Cologne on 4 December 2012, to discuss these proposals in depth and the resulting CRD. Based on the outcome of the workshop, the Agency will determine its final course of action. For further details on the workshop, please consult the Agency's Events webpage at: http://easa.europa.eu/events/events.php

Explanatory Note

I. General

1. The purpose of the Notice of Proposed Amendment (NPA) 2011-17, dated 23 September 2011 was to propose an amendment to Decision 2003/14/RM of the Executive Director of 14 November 2003[1], Decision 2003/02/RM of the Executive Director of 17 October 2003[2], Decision 2003/15/RM of the Executive Director of 14 November 2003[3], Decision 2003/16/RM of the Executive Director of 14 November 2003[4], Decision 2003/09/RM of the Executive Director of 24 October 2003[5], Decision 2003/07/RM of the Executive Director of 24 October 2003[6] and Decision 2003/05/RM of the Executive Director of 17 October 2003[7].

II. Consultation

2. The draft Executive Director Decision was published on the website (http://www.easa.europa.eu/) on 23 September 2011.

   By the closing date of 23 December 2011, the European Aviation Safety Agency (hereafter referred to as the 'the Agency') had received 119 comments from 32 National Aviation Authorities, professional organisations and private companies.

III. Publication of the CRD

3. All comments received have been acknowledged and incorporated into this Comment-Response Document (CRD) with the responses of the Agency.

4. In responding to comments, a standard terminology has been applied to attest the Agency's acceptance of the comment. This terminology is as follows:

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1 Decision No 2003/14/RM of the Executive Director of the Agency of 14 November 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for normal, utility, aerobatic and commuter category aeroplanes (« CS-23 »). Decision as last amended by Decision 2010/008/R of the Executive Director of the Agency of 28 September 2010.

2 Decision No 2003/02/RM of the Executive Director of the Agency of 17 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for large aeroplanes (« CS-25 »). Decision as last amended by Decision 2011/004/R of the Executive Director of the Agency of 27 June 2011.

3 Decision No 2003/15/RM of the Executive Director of the Agency of 14 November 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for small rotorcraft (« CS-27 »). Decision as last amended by Decision 2008/09/R of the Executive Director of the Agency of 10 November 2008.

4 Decision No 2003/16/RM of the Executive Director of the Agency of 14 November 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for large rotorcraft (« CS-29 »). Decision as last amended by Decision 2008/10/R of the Executive Director of the Agency of 10 November 2008.

5 Decision No 2003/09/RM of the Executive Director of the Agency of 24. October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for engines (« CS-E »). Decision as last amended by Decision 2010/015/R of the Executive Director of the Agency of 16 December 2010.

6 Decision No 2003/07/RM of the Executive Director of the Agency of 24 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for propellers (« CS-P »). Decision as last amended by Decision 2006/09/R of the Executive Director of the Agency of 16 November 2006.

7 Decision No 2003/05/RM of the Executive Director of the Agency of 17 October 2003 on certification specifications, including airworthiness codes and acceptable means of compliance, for auxiliary power units (« CS-APU »).

- **Accepted** – The comment is agreed by the Agency and any proposed amendment is wholly transferred to the revised text.
- **Partially Accepted** – Either the comment is only agreed in part by the Agency, or the comment is agreed by the Agency but any proposed amendment is partially transferred to the revised text.
- **Noted** – The comment is acknowledged by the Agency but no change to the existing text is considered necessary.
- **Not Accepted** – The comment or proposed amendment is not shared by the Agency.

The resulting text highlights the changes as compared to the proposed NPA text.

5. The Executive Director Decision will be issued at least two months after the publication of this CRD to allow for any possible reactions of stakeholders regarding possible misunderstandings of the comments received and answers provided.

6. Such reactions should be received by the Agency not later than **31 December 2012** and should be submitted using the Comment-Response Tool at http://hub.easa.europa.eu/crt.

IV. CRD table of comments, responses and resulting text

(General Comments)	-

comment	*12* comment by: *Air Berlin* **General Air Berlin comment** Air Berlin supports the European safety risk assessment (SRA) approach to enable operating into areas with known or forecast volcanic ash contamination. We can finally assume responsibility through our transparent SRA within our SMS, using all forecast information and resolving any conflicts reliably and consistently. Consequently, Air Berlin supports this NPA ensuring relevant information is supplied by OEM to support us in developing our SRA. Without ensuring relevant information from the OEM, we are unable to make correct use of the volcanic ash charts issued by London VAAC. Air Berlin appreciates the progress made by the latter: e.g. use of all available observational sources, such as satellite imagery, to improve data source strength and verify prediction models.
response	*Noted*

comment	*16* comment by: *AIRBUS* **General comment 1:** Airbus supports the common AEA / IATA / ICCAIA position and comments Ref. ICCAIA/AC/058 provided in the framework of the commenting phase to the NPA 2011-17. Additional general and detailed comments are also submitted.
response	*Noted*

comment	*17* comment by: *AIRBUS* **General comment 2:** Airbus supports EASA opinion that the manufacturers should provide the data necessary for the operators to support their Safety Risk Assessment or, from a more general standpoint, the decision making process in order to decide whether or not to operate into airspace forecast to be, or aerodromes known to be contaminated with volcanic ash. Airbus nevertheless strongly believes that any initiative aiming at regulating the transmittal of data from the manufacturers should not preclude the flexibility and the adaptability of the manufacturers answer to the particularities of the situation.

Indeed, mandating the introduction of the data into a section of the Flight Manual would not allow reaching an adequate level of reactivity, should the situation and the nature of the hazard justify quick updates of the data package. The use of the Flight Manual for the introduction of the data would then be counterproductive with regard to the objective to support operations while maintaining the necessary level of safety.

In addition, the data include in particular recommendations regarding operating procedures, operational recommendations or specific maintenance instructions that are not supposed to be found in the Flight Manual.

Manufacturers should remain free to select the most adequate means to make the data and their updates available to the operators, both in a reactive and proactive mode. Consequently the final rule should not mandate the use of the Flight Manual as a repository for the data, nor being prescriptive with regard to the material that should be used for the transmittal of these data.

Concerning the data itself, it is Airbus understanding that the objective of the proposed rule is to create a regulatory framework for the data that is already provided by many manufacturers, and to prompt others to issue the same kind of data to support the fly/no-fly decision making process followed by the operators.

The level of data that is requested by the NPA nevertheless extends far beyond what is currently provided and far beyond what is currently achievable considering the current state of the art.

The AMC 25.1593 requests that manufacturers define the "*recommendations regarding the actual levels of ash concentrations levels and the time period that can be tolerated*". Substantial amount of data is currently missing for a good understanding of the potential effects on aircraft of the constituents of volcanic clouds, including a comprehensive characterization of the hazard.

Airbus notes that the proposed guidance material does not define the nature of the threat to be considered. Proposed AMC 25.1593 reads: "*A volcanic cloud comprises volcanic ash together with gases and other chemicals*". There is no indication in terms of composition or concentration of a volcanic cloud to be considered. While it is understood that establishing susceptibility means defining concentration thresholds against undesired effects, Airbus needs to have guidance about nominal constituents of a volcanic cloud, as it is done for other potential contaminants of the engine or aircraft: chemical nature of constituents, physical properties, relative concentration, phase, liquid or solid, size, mass distribution... It is not possible to base a thorough technical analysis or test program on an ambiguous description only referring to "*gases and other chemicals*" or "toxic chemical contamination". Even the term "volcanic ash" needs to be better characterized either in terms of particle composition and size distribution or in terms of sample origin in order to be able to unambiguously assess the threat.

Issuing the final rule with the text as proposed in the NPA would constitute a kind of prospect made on the future outcomes of research activities in this domain, making in addition the manufacturers liable for obtaining results in that domain by their own.

For the reasons outlined above, it appears premature to issue, at this time, Certification Specifications amendments requiring manufacturers to issue "*recommendations regarding the actual levels of ash concentrations levels and the time period that can be tolerated"*.

The usefulness of such a threshold for the operators is also questionable in the

	cases where time-critical in-situ concentration measurements would not be available. It is likely that this threshold will be considered as a "strong limit" for the NAAs in charge of the acceptance of the SRA. We can easily anticipate the case where, assuming this threshold will be made available by the manufacturers, the NAA will only accept flights in areas of forecast concentration levels lower than, or equal to the manufacturer's threshold, even though other information sources show that concentration levels in adjacent areas are far less that those predicted while not being quantified. From a more general point of view, it is Airbus opinion that the manufacturer has to draw the operator's attention on the aircraft components that are susceptible to be affected by a volcanic cloud, to provide the necessary operational recommendations and the specific maintenance instructions, as well as any relevant information linked to the specificities of the occurring volcanic eruption. The added value of requirements regulating a process that is based on an already existing and efficient time critical communication link between the manufacturers and the operators, introducing the intermediate contribution of the Authority, is nevertheless highly questionable.
response	Partially Accepted In the future, operators will only be able to avoid or minimise flight disruptions if they already have in place an accepted operational safety risk assessment as part of their management system at the onset of any volcanic event. Therefore, these proposals require manufacturers to provide information for new/modified products as part of the type-certification so that operators can develop their SRA and management system ahead of any future potential ash encounter. It is expected that manufacturers would continue to be proactive following individual volcanic events and support operators by providing additional supplementary information specific to that event, as necessary. The NPA proposes that information necessary for safe operation, including operational data, be placed in the flight manual. Flexibility to readily enable revisions of the flight manual by an appropriately approved DOA is currently the subject of a change to Part-21 (see EASA Opinion 01-2010). The Agency accepts that some data is more appropriately placed in the ICA and has changed AMC accordingly. Reference to "actual levels of ash concentration levels and the time period that can be tolerated" was not intended to reflect the maximum capability of the product, but values that had been selected by the TCH based on experience, and which provided a margin of safety. However, as ICAO has now moved away from the concept of operation in a known volcanic ash environment, this text is no longer relevant and is deleted. It is not possible at present to be more specific on the composition of ash, due to the lack of an accepted volcanic ash/cloud specification. Manufacturers already have a liability under the Essential Requirements of the Basic Regulation (EC 216/2008) to provide operators with limitations and other information necessary to ensure that no unsafe condition will occur from exposure to environmental hazards; these proposals have not created any additional liability. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing SRA may be satisfactory.

comment	*32* comment by: *FAA* The FAA believes that it is premature to promulgate airworthiness standards rulemaking at this time. This is because of several reasons: (1) currently there are insufficient methods of measuring the atmospheric volcanic ash contaminants to the fidelity required to assure safe flight operations in visible ash, (2) currently there are insufficient forecasting tools to precisely predict the atmospheric volcanic ash concentrations to the fidelity required and at various flight levels for safe flight operations in visible ash, (3) currently there is insufficient data available on ash effects on aircraft, aircraft components, engines, and passengers, (4) currently there are no accepted standards for assessing ash effects on aircraft, aircraft components, and passengers, and (5) currently there are no international standards to assess the range of potential volcanic ejecta constituents or its severity with distance from the volcanic source. Prior to rulemaking, standards need to first be developed to assess the effects of ash on aircraft, engines, and passengers at various flight speeds, engine power levels, time period exposures, consideration of rain and snow coexistence, engine deterioration, engine control features, aircraft cabin environmental control system design features, etc. Without standards in these areas, the potential wide variation of "susceptibility" data provided by manufacturers to operators could be potentially of questionable use and may be misleading or misunderstood, which could lead to an inadvertent negative safety impact. Recommended Action Withdraw proposed rulemaking. Support development of international standards.
response	*Not accepted* The Agency disagrees that rulemaking is premature at this time. While it is recognised that further work is still necessary to address the issues listed, providing information as required by these rules will aid in future ash events and is fully in line with the recommendations of ICAO. Manufacturers already have an obligation under EU law to provide operators with limitations and other information necessary to ensure that no unsafe condition will occur from exposure to environmental hazards. These proposals aim to elaborate on this essential requirement to aid compliance for volcanic ash hazards. The European Council and Parliament have also called for action which necessitates that EASA move forward on this issue.

comment	*33* comment by: *FAA* The NPA focuses the total safety argument on the OEM supplied data and appears to have little regard for the current lack of accurate detection and precise forecasting of ash clouds. Precise identification of the threat must be established before flight into visible ash clouds is considered. Recommended Action Withdraw proposed rulemaking and support international development of accurate detection and forecasting of ash clouds that is useful in safely managing air traffic.

response	*Not accepted* What is proposed here is just one element of the total safety approach and will form one input into the operators' management systems. These proposals have been modified to reflect the ICAO concept of avoiding flight into visible ash clouds.

comment	*34* comment by: *FAA* The comments and recommendations listed below for CS25 can also be applied to the other proposed standards of CS23, CS27, and CS29. Recommended Action Consider applying comments and recommendations to all proposed standards changes.
response	*Noted*

comment	*35* comment by: *FAA* Throughout the NPA EASA has referred to safety risk analysis. This may be a result of using an early IVATF unaccepted version of the ICAO IVATF AIR04 document that used the term SRA. This was later corrected to reference SMS, or safety management systems, which is the internationally agreed and accepted term for the regulatory authority reviewed document. Recommended Action Change references of SRA to safety management systems (SMS
response	Partially Accepted "Management system" is the preferred EASA terminology replacing "SMS", as this better reflects the need for safety to be an intrinsic part of the overall management system rather than something separate. "Safety Risk Assessment" is retained and used in the context of forming part of a "management system".

comment	*36* comment by: *FAA* This proposed NPA neglects to state that flight operations should avoid "visible" ash. This is the international norm and has been, and continues to be, supported by ICAO, aircraft manufacturers and airworthiness authorities worldwide. The IVATF has reiterated support for this significant safety perspective. Without this warning, the reader could possibly misinterpret that safe flight can occur in visible ash. No aircraft or engine manufacturer supports the concept of flight into visible ash. Recommended Action Include statements that flight in visible ash is not recommended.

response

Not accepted

The intent of the new Certification Specifications and associated AMC is to require the TCH to establish the susceptibility of their products to the effects of volcanic cloud contaminates and to provide information to operators. As such, each TCH will need to perform an assessment based on a combination of factors, including experience, studies, analysis and possibly testing. While avoidance of visible ash may be the result of such an assessment, it should not be the starting point and it would be inappropriate for the Agency to recommend such an approach.

comment

43 comment by: *EUROCOPTER*

Eurocopter understands that the EASA proposed NPA comes, in complement to the ICAO process, to ask product manufacturers to provide operators with data defining the susceptibility to volcanic cloud of their products, in case of presence of volcanic ashes in the atmosphere, while the decision to operate or not remains at the operator's responsibility and accountability.

However, without the identification of the kind of volcanic ashes concentration that the helicopter may encounter, no such accurate data could be provided.

Eurocopter considers that, although the need of such NPA itself is not questioned, the requirement for identification of an immunity level cannot be fulfilled if the threat itself is not clearly described for all its characteristics which are necessary to assess potential hazardous situation on the helicopter operation.

Presently the NPA would therefore not be applicable in practice since it does not even provide only concentration values, which is by far insufficient. Moreover, according to Industry knowledge regarding sand and dust various effects, at least particles size and roughness would need also to be provided, but it may also be other aspects as temperatures….

When such description will be given in the rule, it should then be possible to develop advisory materials and test method which would provide for well acknowledged and standardized method for establishing the immunity level of helicopter against volcanic ashes.

Such development would require involvement of industry, authorities and research offices into an international regulatory research program.

response

Noted

As ICAO has now moved away from the concept of operation in a known volcanic ash environment, text related to defining levels of ash concentration levels and the time period that can be tolerated is no longer relevant and is deleted. The need for future engine ingestion airworthiness limits will be the subject of a future EASA A-NPA.

Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing SRA may be satisfactory.

comment	*44* comment by: *Luftfahrt-Bundesamt* Generally, we appreciate the new NPA 2011-17. However, some points need to be addressed more precisely: The application of CS 23.1593 is limited to turbine engine powered aeroplanes. This seems to be insufficient as several adverse effects of volcanic cloud contamination are independent of engine type. (eg. windscreen abrasion, blockage of pitot tubes and/or static pressure sensors, etc.). As already established in a similar manner for icing conditions, showing compliance with § 1593 should be not required for aircraft/helicopters that will be excluded (by limitations) from operation in known or forecasted volcanic ash cloud conditions. The latter would avoid undue burden especially on TC holders of small aircraft or helicopters by not requiring extensive certification activities.
response	Partially Accepted The applicability is amended to align with operational requirements (see also the executive summary). As volcanic clouds are a global phenomenon, all aircraft that fall within the scope of this rule will be required to comply with xx.1593. However, compliance can result in the TCH defining zero volcanic cloud tolerance for their product. While this is possible, such an approach may lead to commercial disadvantages as a limitation would be placed in the flight manual and known at the time of certification.

comment	*69* comment by: *Boeing* Attachment #1 GENERAL COMMENT: Boeing Commercial Airplanes fully concurs with the comments submitted to this NPA by the Association of European Airlines (AEA), the International Air Transport Association (IATA) and the International Coordinating Council of Aerospace Industries Associations (ICCAIA) in their combined letter (number ICCAIA/AC/058 & 059). We have no further comment.
response	*Noted*

comment	*70* comment by: *ICCAIA* Attachment #2 **General Comment 1:** Refer to attached document.
response	Noted

Information supplied by manufacturers is a key element within the operator's SRA to support the decision on whether to operate in airspace affected by volcanic clouds. However, the fact that most manufacturers are proactive and readily supply this information voluntarily is not the real concern being addressed in this NPA. In the future, operators will only be able to avoid or minimise flight disruptions if they already have in place the necessary accepted SRA within their management system at the onset of any volcanic event. Under the existing procedures, manufacturers' supplied information may not readily be available to new/modified aircraft types that have not previously encountered volcanic cloud events. The proposal is therefore that the manufacturer establishes tolerance levels for new/modified products as part of the type-certification, based on existing experience of volcanic events. It is expected that manufacturers would continue to be proactive following individual volcanic events and support operators by providing additional supplementary information specific to that event.

As the primary intent of the NPA is simply to ensure manufacturers' data is made available earlier than may otherwise be the case (i.e. at type-certification as opposed to post-volcanic event in operation), with similar levels of investigation/analysis required, the impact on costs is considered to be small. As this activity is performed as part of type-certification, the involvement of the Agency will remain as one of oversight during operational volcanic events.

It is not the intent for EASA to become more involved in the interface and transfer of data between manufacturers and operators during a volcanic event. The NPA proposes that information necessary for safe operation will be placed in an unapproved part of the flight manual where changes can be readily incorporated by an appropriately approved DOA (currently subject to a change to Part-21 – see EASA Opinion 01-2010).

It is not possible at present to be more specific as to the type of information required due to the great variety of systems in operation and the lack of an accepted volcanic ash/cloud specification. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing SRA may be acceptable.

The figures quoted are related to the financial loss based on the procedures existing at the time. Acknowledgment is made in the NPA that the new approach introduced since spring 2010 would greatly reduce this impact. The specific cost impacts associated with the proposed rule change are considered to be small.

comment	*71* comment by: *ICCAIA* Attachment #3 **General Comment 2:** Refer to attached document.
response	Noted

comment	*72* comment by: *ICCAIA* ICCAIA recommends EASA not go forward with the proposed rulemaking. 1) AEA, IATA and the airlines they represent currently have excellent dialogue with the Original Equipment Manufacturers (OEMs) with regard to information flow, response and dialogue where volcanic ash is concerned and regulation is not the path forward. Regulation comes with burden, even in cases where the activity is already taking place. While sometimes this is seen as an additional requirement that does not carry a cost, it is a significant step whenever a regulator becomes involved. This is particularly germane for this instance given the operational use of the proposed rule and the numerous national authorities that will determine (separately by review of an airline's SRA) whether or not the information is sufficient. 2) AEA, IATA and ICCAIA are concerned that any forthcoming regulation may in fact unintentionally impede the current dialogue that exists with potentially unacceptable consequences. Forcing information already provided by most manufacturers into a regulation will undoubtedly decrease the operational flexibility needed during a volcanic eruption. Past experience with the Agency indicates that any change to the information connected to the proposed rule will require evaluation by the Agency. The Agency, thus, becomes an additional stop for critical information to reach operators during periods when extra time is not available. Each volcanic ash event presents a unique situation which may require a multitude of operational considerations and potentially new or different information from manufacturers. Past performance from the OEMs demonstrates they can provide necessary information or recommendations to operators in an expeditious manner. Past performance has also demonstrated that certification of new information or recommendations can not be completed in a timely manner to support an operator, thereby limiting the airline's flexibility to decide how to operate in a safe and most efficient manner. 3) EASA has not adequately defined the threat, which, if regulation were to be put in place, would be required to ensure each OEM was appropriately considering the many variables associated with volcanic ash. Unlike a metrological hazard such as ice, a standard for a volcanic cloud has not been established. As noted in the NPA, "a volcanic cloud comprises volcanic ash together with gases and other chemical"; however, each eruption will produce different ash and gas constituents. A given density of ash particles does not guarantee safe operation; a safe spectrum of ash density or time limits must conservatively define ash particle composition and size, in addition to gas/chemical potential. As this has not been possible, the approach to avoid visible ash remains to be the safest approach, rather than a quantified exposure limit. This question of threat definition also applies to contaminated aerodromes and the unknown consistency level that exists in how each aerodrome entity will determine when "contamination" has occurred and the accuracy of the descriptions that will be made available to operators.
response	*Not accepted* 1) As the primary intent of the NPA is simply to ensure manufacturers' data is made available earlier than may otherwise be the case (i.e. at type-certification as opposed to post-volcanic event in operation), with similar levels of investigation/analysis required, the impact on costs is considered to be small.

	As this activity is performed as part of type-certification, the involvement of the Agency will remain as one of oversight during operational volcanic events. 2) It is not the intent for EASA to become more involved in the interface and transfer of data between manufacturers and operators during a volcanic event. The NPA proposes that information necessary for safe operation will be placed in the flight manual where changes can be readily incorporated by an appropriately approved DOA (currently subject to a change to Part 21 – see EASA Opinion 01-2010). 3) It is not possible at present to be more specific as to the type of information required due to the lack of an accepted volcanic ash/cloud specification. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing accepted SRA, may be satisfactory.
comment	*93* comment by: *Rasmussen* "Comments from CAA-Norway: Regarding the contents of the CS's we don't have any comments. However we would like for EASA to reconsider implementing these CS's following option 1. CAA-Norway would like to propose option 2 as the most suitable option which also put some pressure on the very few manufacturers that have been reluctant in providing relevant airworthiness information. Although it wouldn't give additional safety effect we think it may give some positive social and economic effects on the operators and the public. For the few reluctant manufacturers there may be some negative economic effects, but we think that they too, need to produce the relevant information."
response	Not Accepted EASA will continue to pursue manufacturers who have not provided data separately from this rulemaking activity (see also Executive Summary).
comment	*95* comment by: *Bombardier Aerospace* Bombardier Aerospace supports the position put forth by the International Coordinating Council of Aerospace Industries Associations (ICCAIA) in its letter ICCAIA/AC/059 as well in its detailed comments. We also support the joint letter submitted by ICCAIA, the Air Transport Association (ATA) and the Association of European Airlines (AEA) (reference ICCAIA/AC/058).
response	*Noted*
comment	*96* comment by: *Bell Helicopter* Bell Helicopter supports the comments submitted by ICCAIA and summarized in ICCAIA/AC/058 letter to EASA dated December 21, 2011 in reference to NPA 2011-17 Volcanic Ash in which AEA, IATA, and ICCAIA recommend EASA **NOT** go forward with the proposed rulemaking.
response	*Noted*

comment	*98* comment by: *Gulfstream Aerospace Corporation* Attachment #4 Gulfstream Aerospace Comments on NPA 2011-17: Volcanic Ash Gulfstream appreciates the opportunity to review and provide comments on this NPA concerning the new approach proposed by the International Civil Aviation Organisation (ICAO) International Volcanic Ash Task Force (IVATF) to manage flight operations with known or forecast volcanic cloud contamination of the airspace, and have the following comments: Although this new approach has been offered by the ICAO, it does not appear to be a viable alternative at this point in time. There is insufficient data available to be able to provide the operators with the information they would need to perform a safety risk assessment (SRA) that would be acceptable to the NAA of the State of the operator. At the aircraft level, Gulfstream has no test data to date that would substantiate flight operations in areas contaminated by volcanic ash clouds. Additionally, there is no test data to date available from the engine manufacturers to enable Gulfstream to provide guidelines to operators regarding the maximum allowable concentrations of volcanic ash and to ensure that this will not have detrimental long term effects upon the engine. At the present time, Gulfstream disagrees with Option No. 2, No. 3, and No. 4 and strongly recommends Option No. 1 – Baseline option (No change to CSs – Reliance on voluntary information supplied by the manufacturers) as there is no test data available to provide operators to substantiate flight operations in areas contaminated by volcanic ash clouds or to allow the operator to perform a SRA. The severity of the safety risk from encounters with volcanic clouds due to the lack of available manufacturer's data in the preparation of an operator's SRA is Minor, according to Section 1.3 of this NPA. Requiring the manufacturer to evaluate flight operations into these infrequent conditions is unrealistic. It is Gulfstream's recommendation to avoid operating in these conditions.
response	Not Accepted The NPA does not address the totality of the IVATF approach but is limited to one aspect – ensuring manufactures' data related to a new/changed product's susceptibility to volcanic clouds is made available to operators. It is not accepted that insufficient data is available, as most TCH have already provided data for existing products which have been used to develop operational procedures and limitations as part of a management system, and which have been accepted by the competent Authorities. The proposals of the NPA are only intended to ensure a similar level of assessment of volcanic cloud susceptibility as is currently the case. Future rulemaking will look at the possibilities of defining ash ingestion standards and related means of compliance.

comment	*99* comment by: *Snecma* Attachment #5

	General comment Snecma was involved in the ICCAIA review process of the NPA 2011-17 and supports the comments and recommendations published by the ICCAIA under reference ICCAIA/AC/059 and the 15 associated comments in the EASA CRT.
response	*Noted*

comment	*105* comment by: *Snecma* General comment Snecma main objectives are: - to provide the necessary data in due time to operators to support their SRA process - to avoid supplying information which could potentially impact the safety due to uncertainties on ash concentration forecasts.
response	Noted It is the Agency's view that the supply of data in due time can best be achieved during type certification of new or changed products. Avoiding the supply of data will not enhance safety or operational utility.

comment	*107* comment by: *Japan Civil Aviation Bureau (JCAB)* Regarding EASA NPA 2011-17, JCAB have sent following comments. We recognize that the ICAO International Volcanic Ash Task Force(IVATF) has been proposing the new approach to manage flight operators with volcanic cloud contamination of the airspace, including the responsibilities of both manufacturers and operators. However, the proposed approach has not yet been finalized within the ICAO. Therefore, in order to achieve a global harmonization, we suggest that the EASA's airworthiness requirements should be established after the ICAO finalizes their decision.
response	*Not accepted* The Agency disagrees that rulemaking is premature at this time. While it is recognised that further work is still necessary, providing information as required by these rules will aid in future ash events and is fully in line with the recommendations of ICAO. Manufacturers already have an obligation under EU law to provide operators with limitations and other information necessary to ensure that no unsafe condition will occur from exposure to environmental hazards. These proposals aim to elaborate on this essential requirement to aid compliance for volcanic ash hazards. The European Council and Parliament have also called for action which necessitates that EASA move forward on this issue.

comment	*108* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

	The Swedish Transport Agency, Civil Aviation Department has no comments to NPA 2011-17.
response	*Noted*

comment	*110* comment by: *Deutsche Lufthansa AG* Lufthansa generally supports the comments submitted by the Association of European Airlines (AEA) except where extra comments are given by Lufthansa. Lufthansa agrees to the EASA NPA as it shows up a way to enable the use of the enhanced procedure zone. The guidance of the manufacturers, as a part of the operations manual, not to operate in visible ash should be respected by the airlines. Therefore additional information from the manufacturers should be mandatory for operations above an ash concentration of 2mg/m3 The acceptance of an airlines SRA by the national NAA should be mandatory to ensure safe operations and to enable harmonised European procederes. "See and avoid " seems not to be possible as Volcanic ash clouds in low concentrations can not be distinguished from normal clouds. Trying to stay clear of clouds, even under VMC seems not to be possible to us. Additional information from the OEMs is absolutely mandatory for the use of the enhanced procedure zone if ash concentrations above the visibility limit are predicted and not disproved by other common established and accepted methods.
response	*Noted* ICAO has now moved away from the 3 zone system to a single zone. This is reflected in the revised proposals in this CRD.

comment	*123* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* Embraer appreciates being given the opportunity to comment on this NPA, and in summary, asks EASA to reconsider the net safety benefit that would be provided when considering the current practices that were implemented in Europe after the 2010 eruption of Eyjafjallajökull, as well as the adverse safety impacts that could be created by the implementation of NPA 2011-17 as proposed.
response	Noted Due consideration has been given to the impact of these proposals. The Agency is of the opinion that the proposals, as revised, offer a net benefit to industry and are fully aligned with ICAO.

comment	*124* comment by: *Cessna Aircraft Company* Attachment #6 Cessna suggests that the proposed rulemaking does not provide sufficient definition to allow compliance to be shown with respect to susceptibility. In order for a manufacturer to assess the susceptibility, a regulatory definition of the ash particle density, size and concentration within the atmosphere is

	necessary. The trajectory paths of particles in the atmosphere can be significantly affected by local air flow effects around the aircraft and can form concentration areas and shadow zones similar to those observed with icing particles. Without knowledge of the specific particle variables, the specific levels of ash content at mounting locations for pitot tubes, static ports, or inlet scoops cannot be established. Cessna believes that without more detailed knowledge of the environment, most of the features of concern in the AMC list cannot be effectively evaluated (such as windscreen abrasion, erosion, cabin air quality, or reduced electronic cooling efficiencies, volcanic cloud static discharge). The AMC materials also declare that volcanic clouds comprise volcanic ash combined with gases and other chemicals that should be assessed. Again, without definition of the gases and other chemicals, there is no means to assess their effect as directed. Similar issues exist with other concerns noted in the AMC, without definition of the runway effects of wet ash concentrations; there is no method to assess stopping performance in such an environment. Aircraft manufacturers do not have the resources to address the basic science that is required to provide sufficient information to allow compliance with the rule as drafted. Characterization of the volcanic ash environment similar to current icing standards (particle density, size, concentration, gases and chemical concentrations) would be necessary to set up meaningful ground tests. While some large transport manufacturers have participated with major operators in assessing the effects of flights through low concentrations of volcanic ash, this information is not available to all Part 23 and Part 25 manufacturers. For most general aviation type aircraft, no significant field experience is available to assess the susceptibility to the aircraft. The economic impact assessment for Option 1 characterizes the effort required by manufacturers to comply with the proposed rule as small relative to the overall certification costs for a new/changed product or APU. Given the lack of methods available to show compliance, Cessna suggests that this assessment should be revisited. If manufacturers have to define the environments, create testing procedures and techniques required to assess susceptibly, the costs could approach that required for certification for flight in icing. As such, it is not apparent that the costs are insignificant. Due to the lack of a means of addressing the concerns stated in the draft AMC materials, it is likely most manufacturers will find it necessary to prohibit all operations in such an environment, which will not provide the benefits as proposed in the NPA. The characterization of volcanic ash environments is an effort best addressed by the scientific communities prior to attempting to regulate flight in such an environment. Aircraft manufacturers do not have the resources necessary to fly research missions, or developing the instrumentation suites that would be required to measure particle sizes and concentrations, gases present, characterize the static discharge properties, or the wet runway braking performance. The only technically viable option with the current state of knowledge of the volcanic ash environment is Option 1. Without further knowledge of the environment, no compliance methods are available. As flights into volcanic ash are an international issue, the decision to not harmonize with the FAA and TCCA is recommended to be revisited.
response	Noted While it is recognised that further work is still necessary, providing information as required by these rules will aid in future ash events and is fully in line with the recommendations of ICAO. Manufacturers already have an obligation under

EU law to provide operators with limitations and other information necessary to ensure that no unsafe condition will occur from exposure to environmental hazards. These proposals aim to elaborate on this essential requirement to aid compliance for volcanic ash hazards.

It is not possible at present to be more specific as to the type of information required due to the lack of an accepted volcanic ash/cloud specification. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing accepted SRA, may be satisfactory.

comment *125* comment by: *AEA*

General AEA comment

The AEA supports any move to improve the design of new aircraft and components in order to make them more tolerant to the potential hazards of volcanic ash. However, we disagree with the approach of this NPA which appears to mix certification criteria with operational decision making criteria.

In addition, in the absence of clear certification criteria related to volcanic ash, the proposed additional information from OEMs will not enhance airline Safety Risk Assessment (SRA) procedures. On the contrary, it could lead to some OEMs publishing overly conservative limits which have no safety justification and could lead to operational restrictions which have not been justified on safety grounds. This would be contrary to the objective in para 4.4.

We therefore urge EASA to abandon this NPA and to wait for the final ICAO guidance material based on the work of the ICAO International Volcanic Ash Task-Force. This should be completed by July 2012.

response *Not accepted*

Certification criteria are specifically aimed at the manufacturers, who are best placed to address the design related issues. Information generated by the manufacturers is then used in support of operational approvals. It is not possible at present to be more specific as to the type of information required due to the lack of an accepted volcanic ash/cloud specification. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. It is not expected that ICAO will develop a volcanic ash ingestion standard in the short-term.

It is true that TCHs could publish overly conservative limits. However, if the TCH did nothing, the operator would have to assume that the product had no tolerance to volcanic clouds as it is not approved for such a hazard.

The European Council and Parliament have called for action which necessitates that EASA move forward on this issue. Harmonisation remains a goal and may result in further changes in the future.

comment *132* comment by: *Rolls-Royce*

Rolls-Royce plc. comment on NPA 2011-17

Rolls-Royce plc would like to register their support for the general comments

	sent jointly by AEA/IATA/ICCAIA and the detailed response to the NPA which have been submitted separately by ICCAIA.
response	*Noted*

comment	*133* comment by: *Pratt & Whitney* Pratt&Whitney Canada Corp. (P&WC) and Pratt&Whitney Division (P&W) are world leaders in design, development, manufacturing and support of aircraft gas turbine engines. P&WC and P&W have been actively engaged in all industry/authority/ICAO activities involving the volcanic ash issue since the Icelandic eruption of Eyjafjallajökull in Spring 2010. We have reviewed the EASA volcanic ash NPA 2011-17 in detail. We fully endorse the comments provided by ICCAIA/IATA/AEA and ICCAIA in their letters to EASA dated December 21, 2011 on the subject. We sincerely hope that EASA will carefully consider the comments and recommend not to proceed with the rulemaking proposed in NPA 2011-17.
response	*Noted*

comment	*134* comment by: *Ken Dickenson* Attachment #7 Please refer to the attached document.
response	*Noted* Thank you for your extensive insight into volcanic ash and other issues. It is not possible at present to be more specific as to the type of information required due to the lack of an accepted volcanic ash/cloud specification. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing accepted SRA may be satisfactory. The RIA forming part of this NPA is intended to give a general indicator of risk specifically to support rulemaking. Individual aircraft that are susceptible to higher levels of risk must be addressed through existing continuing airworthiness practices and as part of an operator's management system. Information supplied by manufacturers is a key element within the operator's management system to support the decision on whether to operate in airspace forecast to be affected by volcanic ash clouds. In the future, operators will only be able to avoid or minimise flight disruptions if they already have in place the necessary procedures, acceptable to the competent authority, at the onset of any volcanic event. Under the existing procedures, manufacturers' supplied information may not readily be available to new/modified aircraft types that have not previously encountered volcanic cloud events. The proposal is therefore that the manufacturer establishes tolerance levels for new/modified products as part of the type-certification, based on existing experience of volcanic events. It is expected that manufacturers would continue to be

proactive following individual volcanic events and support operators by providing additional supplementary information specific to that event.

comment

135 comment by: *Tyler Clark - Transport Canada Civil Aviation*

The European Aviation Safety Agency (EASA) has invited comments regarding NPA No. 2011-17, "Volcanic Ash." Transport Canada provides these comments for your consideration.

We have reviewed the NPA and wish to express, among other things, that the absence of a reliable or commonly-accepted volcanic ash encounter model(s) to be used for establishing susceptibility of aircraft, engines, propellers, and parts may result in different levels of compliance among manufacturers and between authorities. This will affect how we accept each other's certification or approval. Further, the NPA must take into account encounters where the volcanic ash may not be visible to flight planners or the flight crew, therefore putting into question how the established susceptibility data will be used for deciding flight dispatch or continued flight. We believe your proposed measure to address volcanic cloud contamination is an important subject that the international community has to collaborate together to establish a harmonized policy.

It is our recommendation that we convene a technical working group composed of authorities, and industry as necessary, and deal with the subject under our cooperative rulemaking agreement.

In the meantime, the avoidance approach, as in the past cases, should be used by the operators.

response

Noted

The NPA does not address the totality of the IVATF approach but is limited to one aspect – ensuring manufactures' data related to a new/changed product's susceptibility to volcanic clouds is made available to operators. How the data is used by operators to derive volcanic cloud procedures and limitations for inclusion in a management system is not the main focus of these proposals. The NPA only intended to ensure a similar level of assessment of volcanic cloud susceptibility as is currently the case for in-service products. Future rulemaking may look at the possibilities of defining ash ingestion standards and related means of compliance.

Technical work, together with acceptance of operators SRAs by foreign authorities, are subjects being addressed by the IVATF and so no new working group is necessary.

EXECUTIVE SUMMARY p. 2

comment

37 comment by: *FAA*

The NPA states, "*The Agency supports the approach adopted within the AIR04 proposal and this NPA intends to aid its application by mandating the supply of relevant information from manufacturers to support operators in developing their safety risk assessment.*"

There is no apparent need to mandate the supply of relevant information. Other atmospheric hazards covered within SMS don't require the mandating of relevant information. Flight in volcanic ash can be avoided so it is primarily an issue of commerce and not an issue of safety since safe avoidance is possible, as demonstrated by decades of service experience which has shown no accident history. Detection and avoidance techniques have continued to improve over the years and should be supported for continued future improvements. Mandating airworthiness requirements to support economic decision making and not safety is not usually part of most airworthiness authority's fundamental precepts.

Recommended Action

Withdraw proposed rulemaking

And

Change wording in this section to clarify that the rulemaking is primarily supporting commerce since decades of experience has shown avoidance preserves safety as demonstrated by no accident history.

response

Not Accepted

Under the Essential Requirements of Annex I of the Basic Regulation (EC 216/2008), which is hard law in Europe, a TCH already has an obligation to ensure that limitations and information necessary for safe operation is made available to operators, including from environmental factors. The NPA is therefore not creating a new obligation but simply mandating that this information is made available at type certification. Volcanic ash clouds are perhaps unique in terms of atmospheric hazards to aircraft in that they do not have an associated Certification Specification for which compliance is demonstrated at type-certification.

Recent experience in Europe and elsewhere has shown that detection and avoidance techniques have limitations. The possible need for future airworthiness limitations will be the subject of a separate A-NPA to be published by the Agency.

While this issue has been driven by political and commercial considerations, the lack of a rigorous airworthiness safety assessment has also been of primary concern.

comment

64 comment by: *IACA International Air Carrier Association*

IACA supports the European safety risk assessment (SRA) approach to enable operating into areas with known or forecast volcanic ash contamination. Aircraft operators can finally assume responsibility through their transparent SRA within their SMS, using all forecast information and resolving any conflicts reliably and consistently. Consequently, IACA supports this NPA ensuring relevant information is supplied by OEM to support aircraft operators in developing their SRA.

response

Noted

comment	*65* comment by: *IACA International Air Carrier Association* IACA understands that OEM supplied already the relevant information for the aircraft and engine combinations currently operated by (large) commercial air transport. Without this, aircraft operators are unable make correct use of the volcanic ash charts issued by London VAAC. IACA appreciates the progress made by the latter: e.g. use of all available observational sources, such as satellite imagery, to improve data source strength and verify prediction models.
response	Noted

comment	*97* comment by: *Sikorsky Aircraft* Sikorsky Aircraft supports the comments submitted by ICCAIA and summarized in ICCAIA/AC/058 letter to EASA dated December 21, 2011 in reference to NPA 2011-17 Volcanic Ash in which AEA, IATA, and ICCAIA recommend EASA **NOT** go forward with the proposed rulemaking.
response	Noted

A. Explanatory Note - I. General p. 4-5

comment	*88* comment by: *European Cockpit Association* While NPA 2011-17 addresses airworthiness aspects, it must not be forgotten that decisions on flight operations when volcanic contamination exists must also take into account the protection of aircraft occupants that might be exposed to the whole suite of contaminants, in particular if operation WITHIN contaminated airspace would be contemplated.
response	Noted The AMCs to the various CSs already make reference to noxious fumes in the cabin. This aspect must, therefore, be considered by manufacturers and relevant information provided to operators.

A. Explanatory Note - IV. Content of the draft Decision p. 5-6

comment	*38* comment by: *FAA* The NPA states, "*….Central to this approach is the development of a safety risk assessment (SRA) that is acceptable to the NAA of the State of the Operator. In order to successfully produce such a SRA, it is essential that the operator is provided with, or has access to, specific technical data and information regarding the susceptibility of the aircraft they operate to volcanic cloud related effects and any precautions that need to be taken into account*."

Reliance on a Safety Risk Assessment is predicated on having a valid data set that shows the impact on airplane, systems, powerplant and occupant health in a volcanic ash contaminated environment. It also requires precise, accurate forecasting. That data does not exist. Who will be required to expend resources to obtain such data? Presently FAA has no research budget or active plans to conduct or sponsor research on the impact to aviation safety (i.e., airplane structure, systems, powerplant and occupant health) from volcanic ash. Proposed FAA research received low ratings in priority and will not be completed in the near term (i.e., 3 – 5 years).

Recommended Action

Rulemaking and creation of the safety risk assessment must wait until research is completed. EASA should wait to impose this NPA until the necessary research on the impact to aviation safety from volcanic ash has been completed.

Change reference of SRA to SMS per our comment General-4, above.

response

Not Accepted

It is not possible at present to be more specific as to the type of information required due to the lack of an accepted volcanic ash/cloud specification. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing accepted SRA may be satisfactory.

comment *39* comment by: *FAA*

Objective 11

The NPA states, *"To propose a new obligation on manufacturers to identify any susceptibility of aircraft features to the effects of volcanic cloud contamination and to ensure that information necessary for safe operation is provided to operators."* Does EASA recognize the extent of the research needed to evaluate the impact on airplane, systems, powerplant and occupant health in a volcanic ash contaminated environment? Has EASA conducted any cost analysis of this research? FAA believes that substantial resources are needed to complete the research needed to determine the impact of volcanic ash on airplane safety.

Recommended Action

Withdraw proposed rulemaking, at least until the necessary research on the impact to aviation safety from volcanic ash has been completed.

response

Not Accepted

It is not possible at present to be more specific as to the type of information required due to the lack of an accepted volcanic ash/cloud specification. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing accepted SRA may be satisfactory.

comment	*77* comment by: *ICCAIA* **Page: 6** **A. Explanatory Note** **IV. Content of the draft Decision, Objectives** **12.** ICCAIA recommends the proposed text be revised as follows: "12. This NPA builds ~~on and supports the work of the IVATF by proposing~~ changes to EASA airworthiness codes (CS-23, CS-25, CS-27, CS-29, CS-E, CS-P and CS-APU). It creates a new obligation on type-certificate, restricted type-certificate, supplemental type-certificate holders, and holders of an ETSO authorisation for APU, to ~~investigate and understand~~ provide information and recommendations regarding the hazards associated with exposure to the harmful effects of volcanic clouds. Such ~~investigations~~ information and recommendations may be based on a combination of experience, studies, analysis, and/or testing of parts, sub-assemblies or products (i.e. engines or propellers). Information that can be readily used by operators in preparing their SRAs, including recommendations regarding ~~the actual levels of ash tolerance and~~ any operational precautions that need to be taken, will then have to be prepared and distributed." The statement proposed in the NPA is misleading, as ICAO's IVATF does not make any recommendation for States to issue airworthiness regulations. Also, paragraph 12 of this explanatory note, rather than providing clarification as intended by these notes, seems to set an additional requirement inconsistent with the intent of this NPA. Elsewhere in the NPA it indicates the intent is to obligate manufacturers to supply information regarding the susceptibility of new or modified products or parts and appliances to volcanic cloud contamination; whereas, in paragraph 12, it indicates the NPA obligates manufacturers to conduct investigations and to determine the actual level of ash tolerance of their equipment. Previously, EASA has indicated the intent of this NPA was to ensure existing information from the manufacturers was made available to operators and determination of whether actual ash tolerance levels were needed would be the subject of a future A-NPA. (See EASA's Volcanic Ash Work Plan for 2012 Action No. XYZ.3.)
response	Partially accepted In the forward to ICAO Doc 9974, it is stated that "*This document provides guidance which states may recommend to operators and regulatory authorities*". As the Agency's CSs are non-binding in themselves, the intent of the recommendation is fully met. There is no difference in the intent as manufactures will need to investigate and understand their products susceptibility to volcanic ash before they can provide information and recommendations. Reference to "actual levels of ash concentration levels and the time period that can be tolerated" was not intended to reflect the maximum capability of the product, but values that had been selected by the TCH based on experience, and which provided a margin of safety. However, as ICAO has now moved away from the principle of operations in airspace known to be contaminated with volcanic ash, the need for limits is no longer necessary and the text is deleted.

comment	*100* comment by: *Snecma* Page 5 - A.IV.9 - Background - NPA text : "Central to this approach is the development of a safety risk assessment (SRA) that is acceptable to the NAA of the State of the Operator" Snecma comment : - The SRA should be accepted/recognized by all Airworthiness Agencies worldwide - An SRA accepted by a NAA should be recognized by another state's NAA
response	Noted This is background information and not directly related to the NPA proposals.

comment	*102* comment by: *Snecma* Page 6 - A.VI.12 - Objectives - NPA text : "Information that can be readily used by operators in preparing their SRAs, including recommendations regarding the actual levels of ash tolerance and any operational precautions that need to be taken, will then have to be prepared and distributed" Snecma comment The basic safety instruction is not to fly in visible ash cloud
response	Accepted To align with the latest development in the IVATF, all references to ash tolerance levels have been deleted.

comment	*104* comment by: *Snecma* Page 5 - A.IV.10 - Background - NPA text : "Experience to date has shown that most manufacturers are supportive of operators and readily provide such information." Snecma comment : So far IATA considers having received adequate data. Priority to be put on harmonization of information provided by the VAACs worldwide
response	Noted This is not directly related to the NPA proposals.

comment	*111* comment by: *Deutsche Lufthansa AG* Para No. 9: To reach a harmonised European procedure that gives safety priority before other interests, it is necessary that the NAA is deeply involved in the process of establishing a SRA. Therefore an acceptance seems to be the right way for us. Only the European NAAs as a community would be strong enough to put some pressure onto the OEMs to provide clearly defined ash

tolerances.

Para No. 10: A reliable statement about the influence of volcanic ash onto airplane systems and engines when operating an aircraft in visible ash can only come from the manufacturers and is mandatory for such operation.

response

Noted

This is not directly related to the NPA proposals.

comment

117 comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

In regards to the content of the NPA, the principal point Embraer would like to raise is the proposal that OEMs provide recommendations regarding "actual levels of ash tolerance," a requirement that is repeated in all of the respective certification specifications. Embraer believes it would be ineffective to attempt to define an acceptable level of ash/cloud contamination given the current state of the art of eruption monitoring and ash contamination forecasting. Even if it were technically feasible to define an approved envelope (which Embraer presumes would be in the form of level of contamination versus time), the operators have no way to effectively control or forecast, in sufficient detail, the level of contamination (ash cloud constituents, contamination level) or extent (time exposure) across a planned route. It would be a reduction in safety to attempt to specify a tolerable level of exposure in order to permit operation in areas of known contamination rather than use the current standard that calls for the avoidance of visible ash, a norm that has been successfully used throughout the world for several decades.

response

Noted

Reference to actual levels of ash tolerance was not intended to reflect the maximum capability of the product, but values that have been selected by the TCH based on experience, and which provide a margin of safety. However, as ICAO has now moved away from the principle of operations in airspace known to be contaminated with volcanic ash, the need for limits is no longer necessary and the text is deleted.

comment

126 comment by: *AEA*

Page 5

Background

9….. Central to this the development of a safety risk assessment (SRA) that is acceptable to the NAA of the State of the Operator.

AEA Comment

This background information has been superseded due to developments at the ICAO IVATF. The ICAO work will not be concluded until June 2012. In this context, the AEA believes that 'formal' acceptance of the SRA by the NAA is too strong. Instead, we believe it should be sufficient for the SRA to be "evaluated" by the NAA during the normal safety oversight procedure

Such an approach would be in line with the key principle that the airlines are responsible for safety of operations as part of their safety management system.

	The role of the NAA is to ensure that airlines have the right procedures in place to deal with any safety issues but not to interfere in individual safety cases.
response	Noted This is not directly related to the NPA proposals.

comment	*127* comment by: *AEA* 10.0 Experience to date has shown that most manufacturers are supportive of operators and readily provide such information **AEA comment** Current guidance provided by manufacturers is to avoid flight through visible volcanic ash. In the absence of clear certification criteria and with the inherent limitations of the VAAC charts, it is essential to avoid more scientific limits which are subject to significant errors that could inhibit the possibility for aircraft operators to use other information sources (which do not produce ash concentration levels but only predict ash presence). In the absence of clear and proven certification criteria, any information provided by OEMs cannot be the limiting factor for real time operations. Risk, related to operations, needs to be managed by aircraft operators as is the case for other operational risks (e.g. bird strikes, thunderstorms, etc.).
response	Noted This is not directly related to the NPA proposals.

A. Explanatory Note - V. Regulatory Impact Assessment p. 7

comment	*40* comment by: *FAA* The NPA states, "*…. As part of this endeavour, a new approach has been proposed to ICAO that will allow flight operations in areas of known or forecast low concentrations of volcanic ash. The approach centres on a SRA produced by an operator, together with a methodology for use by that operator's state in evaluating the robustness of the process and the competence of the operator in using the process. The operator is accountable for assessing the risk of operations and should take into account information from manufacturers in establishing any airworthiness effects on the aircraft they operate, the nature of these effects, the level of exposure that can be tolerated, and any related pre-flight, in-flight and post-flight precautions to be observed by the operator.*" This action relies upon the manufacturers and operators to obtain data needed to perform the safety risk assessment. This research should include component and complete system (airplane) testing. In addition, who will assess the impact to occupant safety (e.g., from inhalation of volcanic ash)? Recommended Action Creation of the safety risk assessment (or SMS) must wait until research is completed and international standards developed. Meanwhile visible ash should continue to be avoided. EASA should withdraw this NPA until the necessary

	research on the impact to aviation safety from volcanic ash has been completed.
response	Not Accepted It is not possible at present to be more specific as to the type of information required due to the lack of an accepted volcanic ash/cloud specification. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing accepted SRA may be satisfactory. ICAO has now moved away from the principle of operating in airspace known to be contaminated with volcanic ash clouds.

comment	*41* comment by: *FAA* The NPA states, *"….Application by States of the ICAO procedures led to widespread and prolonged closure of airspace leading to significant social impacts and economic consequences for air transport industry. This highlighted the ineffectiveness of existing procedures in providing a balanced approach between safety and enabling continued flight operations."* This paragraph is misleading. It was not the application of ICAO procedures that led to widespread closure of airspace since the ICAO procedures do not recommend closure. Additionally, this section of the NPA appears to recognize that the forecast cloud which approached Europe was primarily a social and economic consequence. Recommended Action Reword this section to state that the closure of airspace was primarily due to Eurocontrol and NAA self imposed procedures and not ICAO recommendations
response	Noted This is background information not directly related to the NPA proposals.

comment	*42* comment by: *FAA* The NPA states, *"….As part of this endeavour, a new approach has been proposed to ICAO that will allow flight operations in areas of known or forecast low concentrations of volcanic ash."* Flight operations were never disallowed in these areas by the ICAO standards. This has always been and continues to be a responsibility of the Operator to assure safe operations. Therefore rulemaking at this time is not warranted. Recommended Action Reword this section to clarify that flight operations were never disallowed by ICAO procedures.
response	Noted This is not directly related to the NPA proposals.

A. Explanatory Note - V. Regulatory Impact Assessment - 1. Issue analysis and risk assessment p. 7-9

comment *1* comment by: *Norwegian Air Sports Society*

1.2 Who is affected?

The document does not explicitly state that the application of the SRA procedure is not intended to include piston engine powered aircraft in general aviation operations. To avoid confusions and to ensure a harmonised implementation of the rules in the various Member States, it would be of great value to the piston powered general aviation community to add a statement that precludes piston powered aircraft in general aviation operations from this NPA.

In the event that piston engines with variable pitch propellers used in general aviation operations are supposed to be included by the SRA procedure, we would suggest that this is included as a separate bulletpoint. If piston engine aircraft with variable pitch propellers used in general aviation operations are not included, we also suggest that this is explicit of the same reason.

We have seen in the past that general aviation aircraft powered by piston engines have been exempt from restrictions in some European countries while not in others. It is of high importance to avoid national variances due to the inherent international nature of aviation.

response Partially Accepted

The applicability is amended to align with mandatory operational requirements (see also the executive summary).

comment *3* comment by: *CRT - Gyroplanes Foundation*

The last line of 1.1 says: ... pilots remain clear of **visible** ash clouds.'

Proposal to remove the bold word '**visible**' to cover IMC (Instrument Meteorological Conditions) to cover all meteorological conditions.

response Noted

This is not directly related to the NPA proposals.

comment *10* comment by: *Hebridean Air Services Limited*

Para 1.2 Who is affected?

The NPA specifically refers to

Turbine engine aircraft

Turbine engines

Variable Pitch Propellers

Essential (Category 1) Auxillary power units (APU)

Is it the case that the NPA is addressed to type-certificate holders, restricted type-certificated holders, supplemental type-certicated holders who are engaged in the manufacture, change or repair of:

Piston engine aircraft

Piston engines

response

Partially Accepted

The applicability is amended to align with mandatory operational requirements (see also the executive summary).

comment

13 comment by: *Air Berlin*

Table 1: Risk index matrix

While Air Berlin can agree with the suggested severity of occurrence as minor (operational limitations), given the current operational procedures, the probability of occurrence seems over-estimated. The probability of a real encounter with volcanic ash is rather improbable than occasional: due to the current avoidance policy, the number of volcanic ash incidents is extremely low compared to the number of flight hours accumulated by commercial air transport, and had negligible impact on air safety.

response

Partially Accepted

The risk index was derived based on the then new approach which would permit flights into low levels of known volcanic ash contamination. This approach has since been amended by ICAO (also see Executive summary).

comment

18 comment by: *AIRBUS*

Page 8

1.3 What are the risks (probability and severity)?

The paragraph reads:

"The adoption of a new approach based on an accepted operator's SRA, will enable flight operations into, or avoiding, areas of known or forecast volcanic ash. As part of the SRA, operators will establish a level of volcanic cloud contamination deemed tolerable from an airworthiness standpoint based on manufacturers' supplied information."

This paragraph introduces an ambiguity that should be corrected. As written, it gives the feeling that flight into volcanic ash is allowed, which should not be insinuated. The very last versions of the document "Flight Safety and Volcanic Ash - Risk Management of flight operations with known or forecast volcanic ash contamination" include a wording that should be preferred:

"In order to decide whether or not to operate into airspace forecast to be or aerodromes known to be contaminated with volcanic ash [...]"

response

Accepted

(Also see Executive Summary.)

comment 19 comment by: *AIRBUS*

Page 8

1.3 What are the risks (probability and severity)?

The analysis of the risks is focused on the risks that the new rule is supposed to address and mitigate with the introduction of new requirements for the manufacturers.

Another interesting analysis would have been to assess if the new requirements can introduce new risks compared to the current situation. In particular, if the requirement dealing with recommendations regarding the actual levels of ash concentrations levels and the time period that can be tolerated is kept, EASA should analyse if there are cases where the availability of such a threshold would reduce the safety margins compared to the current situation where the lack of threshold leads the operator to perform their SRA or to build their decision making process with greater margins to avoid hazardous areas.

response Noted

Actual levels and time periods have been deleted under the revised ICAO concept (see also the Executive Summary).

In making fly/no fly decisions, the operator will be required to ensure an acceptable level of safety through their risk assessment and management system.

comment 45 comment by: *FAA*

The NPA states, *"This NPA is specifically addressed to type-certificate holders, restricted type-certificate holders, supplemental type-certificate holders and ETSO authorization holders who are engaged in the manufacture, change or repair to any of the following:*

- *Turbine engine aircraft;*
- *Turbine engines;*
- *Variable pitch propellers;*
- *Essential (Category 1) Auxiliary power units (APU)".*

The bullet should read "*Turbine engine powered aircraft*"

Recommended Action

The bullet should read *"Turbine engine **powered** aircraft"*

response Noted

Both terms are in common usage. There is also no intent to republish this section of the NPA.

comment	*46* comment by: *FAA* The NPA states, "*The severity of the safety risk from encounters with volcanic clouds due to the lack of available manufacturer's data in the preparation of an operator's SRA can therefore be accepted as Minor."* This statement appears incorrect as written. Performing a valid Safety Risk Assessment requires a valid data set that shows the impact on airplane, systems, powerplant and occupant health in a volcanic ash contaminated environment. The absence of data offers no assurance that operation in a contaminated environment represents a "Minor" impact on safety. FAA believes that further research is needed to determine the impact to aviation safety from flight into volcanic ash. Meanwhile visible ash should be avoided. Recommended Action EASA should withdraw this NPA until the necessary research on the impact to aviation safety from volcanic ash has been completed.
response	Not Accepted The text is taken out of context. If manufacturers' data is not available, then the operator will need to assume the product has no tolerance to volcanic ash and take this into account as part of their risk assessment. The lack of data will therefore not lead to reduced safety margins but potentially to restricted flight operations.

comment	*47* comment by: *FAA* The NPA states, "*The adoption of a new approach based on an accepted operator's SRA, will enable flight operations into, or avoiding, areas of known or forecast volcanic ash*." Without universal standards for developing ash contaminated operational data, the Operator won't know or possibly understand what data they are getting from the manufacturer. This could result in a false sense of security for operating in ash contaminated airspace, which could negatively impact safety. Recommended Action EASA should withdraw this NPA until the necessary standards for assessing flight in a volcanic ash contaminated atmosphere have been developed.
response	Not Accepted AMC states that information supplied by manufacturers should be readily usable by operators in preparing their safety risk assessments. Furthermore, it is a clear obligation on Operators as part of their management system to identify, evaluate and manage any potential risks.

comment	*48* comment by: *FAA* The NPA states, "*As part of the SRA, operators will establish a level of volcanic cloud contamination deemed tolerable from an airworthiness standpoint based on manufacturers' supplied information*."

This statement leaves many unanswered questions. What volcanic source constituents should the manufacturer assume?

How much atmospheric dilution and ash dissipation should the manufacturer assume? Should a pure SO2 cloud be assumed separately from a particulate ash cloud, or a mixed ash and SO2 cloud, or both? What level of particulate electrical charge should be assumed? What is the assumed flight operations assumed in terms of power level, airspeed, altitude and altitude changes? What time duration should be assumed? Should the manufacturer's stated limits be a recommendation or an airworthiness limitation?

As EASA is currently proposing, the manufacturers are likely to provide data based on a wide range of non-standardized variables that the Operators will need to somehow combine with other manufacturers assumptions. This will result in confusion to flight crew who will then be faced with widely varying operating requirements for different combinations of aircraft, equipment and engines.

Recommended Action

EASA should withdraw this NPA until the necessary standards for assessing flight in a volcanic ash contaminated atmosphere has been completed.

response

Noted

Reference to the establishment of a tolerable level of VA has now been removed under the new ICAO cooperating concept (see Executive summary).

The primary intent of the NPA is simply to ensure that manufacturers' data for new or changed products is made available earlier than may otherwise be the case (i.e. at type-certification as opposed to post-volcanic event in operation), with similar levels of investigation/analysis required in both cases. In the future, operators will only be able to avoid or minimise flight disruptions if they already have in place the necessary approvals at the onset of any volcanic event. Future EASA rulemaking activities, particularly in relation to engine volcanic ash ingestion limits, will be the subject of future proposals.

comment

66 comment by: *IACA International Air Carrier Association*

Table 1: Risk index matrix on page 9

While IACA can agree with the suggested severity of occurrence as **minor** (operational limitations), given the current operational procedures, the probability of occurrence seems over-estimated. The probability of a real encounter with volcanic ash is rather **improbable** than occasional: due to the current avoidance policy, the number of volcanic ash incidents is extremely low compared to the number of flight hours accumulated by commercial air transport, and had negligible impact on air safety.

response

Partially accepted

The risk index was derived based on the then new approach which would permit flights into low levels of known volcanic ash contamination. This approach has since been amended by ICAO (also see Executive summary).

comment 73 comment by: *ICCAIA*

Page 8

1.3 What are the risks (probability and severity)?

The paragraph reads:

"The adoption of a new approach based on an accepted operator's SRA, will enable flight operations into, or avoiding, areas of known or forecast volcanic ash. As part of the SRA, operators will establish a level of volcanic cloud contamination deemed tolerable from an airworthiness standpoint based on manufacturers' supplied information."

The following wording is suggested:

"The adoption of a new approach based on an accepted operator's SRA, will enable flight operations in airspace or aerodromes when a volcanic ash contamination hazard may exist. As part of the SRA, operators will have in place an identifiable safety risk assessment within its SMS. [...]"

This paragraph introduces an ambiguity that should be corrected. As written, it gives the perception that flight into volcanic ash is allowed, which should not be insinuated. The very last versions of the document "Flight Safety and Volcanic Ash - Risk Management of flight operations with known or forecast volcanic ash contamination" include wording that is preferred. The proposed wording is consistent with the latest version of the "Flight Safety and Volcanic Ash - Risk Management of flight operations with known or forecast volcanic ash contamination" document.

response Partially Accepted

The concept has been amended to align with the latest IVATF recommendations (also see Executive Summary).

comment 87 comment by: *European Cockpit Association*

The „Issue Analysis" mentions that „Application by States of the ICAO procedures led to widespread and prolonged closure of airspace …". It should be recognised that this refers mainly to the European Volcanic Ash (ATM) Contingency Plan, which had been developed from an ATM-centric perspective without due consideration of ICAO SARPs for flight operations and best practices in this area. Although there is considerable room for improvement of the ICAO SARPs, PANS and Guidance Material, the root cause of the 2010 crisis was the problematic European interpretation of these provisions. This was aggravated by inadequate models of volcanic ash dispersion, lack of knowledge about the details of Volcanic Ash Advisories (and similar information products) and the absence of a lower threshold of residual ash below that it could be assumed extremely unlikely that harmful effects would exist.

The Issue Analysis continues to say that „a new approach has been proposed to ICAO that will allow flight operations in areas of known or forecast low concentrations of volcanic ash." It needs to be recognised that this concept is currently not supported by the IVATF. In the absence of an agreement on any concentration levels, there is consensus that operation IN contaminated airspace has to be avoided. The latest version of the draft ICAO document is very clear about that. The SRA approach is never the less considered useful in

dealing with operations near or avoiding volcanic contamination.

response

Noted

The revised proposals in this CRD are aligned with the ICAO recommendations not to operate in airspace known to be contaminated with volcanic ash clouds.

comment

90 comment by: *UK CAA*

Page No: 8

Paragraph No: 1.3

Comment: The first sentence **"...** high concentrations of volcanic ash and/or for prolonged periods of time" is not clear.

Justification: Clarity

Proposed Text: Should read "high concentrations of volcanic ash or lower concentrations for prolonged periods"

response

Accepted

The text of the NPA is not reproduced in the final text.

comment

101 comment by: *Snecma*

Page 7 - A.V.1.1 - What is the Issue [last paragraph on page 7] NPA text : "It mandates manufacturers to supply information on the susceptibility of new or modified products or parts & appliances…"

Snecma comment :

Does not apply to the current fleet. For legacy fleets the ICAO proposed recommendations will be applied without any rulemaking effort ; the safety is covered thanks to the SRA approach accepted by the NAAs and supported by OEMs published recommendations : what is the additional benefit of new rules that would be applicable in many years from now to future fleets?

response

Noted

The primary intent of the NPA was simply to ensure that manufacturers' data for new or changed products is made available earlier than may otherwise be the case (i.e. at type-certification as opposed to post-volcanic event in operation), with similar levels of investigation/analysis required in both cases. In the future, operators will only be able to avoid or minimise flight disruptions if they already have in place the necessary approvals at the onset of any volcanic event.

comment

114 comment by: *Deutsche Lufthansa AG*

Risk Matrix: Lufthansa supports the AEA comment (below)

AEA comment:

We question the risk matrix which seems to overestimate the probability and severity of occurrences.

We believe that based on the current procedures which have much improved compared to those procedures which were in place a few decades ago, the probability of a real occurrence is improbable (not occasional as suggested by EASA) and the severity of those occurrences is negligible (not minor as suggested by EASA).

Our view is based on the actual number of flight hours conducted and the very limited number of volcanic ash related occurrences, which had negligible impact from a safety point of view. This is also due to the fact that aviation has improved its safety in planning and avoidance procedures to deal with volcanic ash hazards during the last decades. Therefore those more serious encounters from a few decades ago are not relevant anymore for today's situation.

response

Partially Accepted

In the event of encountering volcanic ash, some action by the flight crew may be required, including use of additional procedures, which is not considered negligible.

The risk index was derived based on the then new approach which would permit flights into low levels of known volcanic ash contamination. This approach has since been amended by ICAO (also see Executive summary).

comment

116 comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Embraer supports the comments submitted by the Association of European Airlines, the International Air Transport Association, and the International Coordinating Committee of Aerospace Industry Associations (including ICCAIA's separate submittal) in response to this NPA (reference letter numbers ICCAIA/AC/058 and ICCAIA/AC/059). Embraer believes that the implementation of the NPA will contribute little to the level of safety already being provided by means other than regulation, and that implementation of the NPA could create administrative and regulatory difficulties to respond in a timely manner to future volcanic eruptions.

response

Not Accepted

Information supplied by manufacturers is a key element within the operator's SRA to support the decision on whether to operate in airspace affected by volcanic clouds. However, the fact that most manufacturers are proactive and readily supply this information voluntarily is not the real concern being addressed in this NPA. In the future, operators will only be able to avoid or minimise flight disruptions if they already have in place the necessary approvals at the onset of the volcanic event. Under the existing procedures, manufacturers' supplied information may not readily be available to new/modified aircraft types that have not previously encountered volcanic cloud events. The proposal is therefore that the manufacturer establishes tolerance levels for new/modified products as part of the type-certification, based on existing experience of volcanic events. It is expected that manufacturers would continue to be proactive following individual volcanic events and support operators by providing additional supplementary information specific to that event. The involvement of the Agency will remain as one of oversight during volcanic events.

comment	*128* comment by: *AEA* Page 9 Risk Matrix **AEA comment:** We question the risk matrix which seems to overestimate the probability and severity of occurrences. We believe that based on the current procedures which have much improved compared to those procedures which were in place a few decades ago, the probability of a real occurrence is improbable (not occasional as suggested by EASA) and the severity of those occurrences is negligible (not minor as suggested by EASA). Our view is based on the actual number of flight hours conducted and the very limited number of volcanic ash related occurrences, which had negligible impact from a safety point of view. This is also due to the fact that aviation has improved its safety in planning and avoidance procedures to deal with volcanic ash hazards during the last decades. Therefore those more serious encounters from a few decades ago are not relevant anymore for today's situation.
response	Partially Accepted In the event of encountering volcanic ash, some action by the flight crew may be required, including use of additional procedures, which is not considered negligible. The risk index was derived based on the then new approach which would permit flights into low levels of known volcanic ash contamination. This approach has since been amended by ICAO (also see Executive summary).

A. Explanatory Note - V. Regulatory Impact Assessment - 3. Options identified p. 9-10

comment	*112* comment by: *Deutsche Lufthansa AG* Lufthansa prefers option 2 because the use of the enhanced procedure zone with ash concentrations above the visibility limit that have not been disproved by other common established and accepted methods can only be enabled when all relevant parts are certified by the manufacturers.
response	Not Accepted It should be made clear that none of the options proposed address certification of products in the established sense. Information supplied by manufacturers will be an assessment of their product's susceptibility to volcanic ash based on limited available data and is just one source of information that can be used by operators in their safety risk assessments. Option 2 simply extends the proposals to the existing fleet. However, this will not bring any significant safety benefit, as most manufacturers already comply and those that do not will be pursued by the Agency outside of this rulemaking

activity.

comment *129* comment by: *AEA*

3 Options identified

AEA comment

We prefer option '0' – Rely on voluntary info supplied by manufacturers

We believe the other options do not provide any added value in the absence of clear certification criteria (see general comments). We do not need CSs to allow continued safe operations since aircraft operators are now responsible to conduct safe operations under the SRA approach. Whether an OEM wants to provide further info is on a purely commercial basis, but should not be subject to regulatory action. Information published by OEMs (where available) will be taken into account in the SRA. In cases where there is no information from the OEM, the aircraft operator will deal with it through expert judgement within its SRA/SMS processes. There is therefore no need for Authorities to restrict operations in these circumstances.

response Not Accepted

Information supplied by manufacturers is a key element within the operator's SRA to support the decision on whether to operate in airspace forecast to be contaminated with volcanic ash. In the future, operators will only be able to avoid or minimise flight disruptions if they already have in place the necessary approvals at the onset of a volcanic event. Under the existing procedures, manufacturers' supplied information may not readily be available to new/modified aircraft types that have not previously encountered volcanic cloud events.

A TCH already has an obligation under European law to ensure that limitations and information necessary for safe operation, including environmental limitations, together with instructions for continued airworthiness, are established and made available to operators. These proposals build on this existing obligation to provide a Certification Specification and associated means of compliance to specifically meet the intent for operations in volcanic clouds.

A. Explanatory Note - V. Regulatory Impact Assessment - 4. Analysis of impacts p. 10-11

comment *14* comment by: *Air Berlin*

4.6. Impact on regulatory coordination and harmonisation

Air Berlin regrets that the proposed rule is not (yet) harmonised with the FAA and TCCA. Nevertheless, this NPA is an essential part of the workable alternative being developed to prevent future closure of European airspace during volcanic eruption. Air Berlin shares EASA's view that if adopted by ICAO, more authorities may adopt the European approach. Regardless the outcome, this NPA supports the SRA approach requested by most aircraft operators.

response | Noted

The revised proposals in this CRD are fully aligned with the latest recommendations of the IVATF, as published in Doc No 9974.

comment | *21* comment by: *AIRBUS*

Page 10

4.1 Safety impact

The second sentence reads:

"Aircraft (including engines) have been shown to tolerate moderate levels of volcanic ash concentrations and any long-term effects (e.g. increased corrosion, erosion, wear, loss of performance) would become evident long before it became a safety of flight concern."

Airbus takes note of this but reminds that no demonstration was made and the characterization of "*moderate levels of volcanic ash*" does not exist. What kind of ash was involved for this observation?

A more appropriate wording would have been:

"Aircraft (including engines) have been shown to tolerate moderate concentration levels of some kinds of volcanic ash ~~concentrations~~ and any long-term effects (e.g. increased corrosion, erosion, wear, loss of performance) would become evident long before it became a safety of flight concern."

response | Noted

This does not form part of the substantive proposals and will not be further developed.

comment | *22* comment by: *AIRBUS*

Page 11

4.6 Impact on regulatory coordination and harmonization

The paragraph reads:

"If the SRA approach is adopted by ICAO, then it could be expected that other authorities may adopt this approach. Furthermore, and irrespective of the direction ICAO takes, an operator is responsible for identifying all hazards associated with their operations as part of their existing SMS."

It should be noted that, while being planned, the SMS for Part 121 operations is not yet implemented in the US (Final rule to be published on 27 July 2012 according to the December 2011 report on DOT Significant Rulemakings). It may therefore be inappropriate to make reference to the SMS in that way.

response | Noted

This does not form part of the substantive proposals and will not be further developed.

comment	*49* comment by: *FAA* The NPA states, *"The move towards a SRA approach will have no impact on safety. Aircraft (including engines) have been shown to tolerate moderate levels of volcanic ash concentrations and any long-term effects (e.g. increased corrosion, erosion, wear, loss of performance) would become evident long before it became a safety of flight concern. …"* The FAA does not agree with this statement. Maintenance inspections of airplanes after brief inadvertent excursions into volcanic ash have shown extensive wear to some engine components, some abrasion to windshield, etc; dependent upon the severity of the exposure. Furthermore, no long term testing for continuous operation in moderate levels of volcanic ash to evaluate the impact to engines, airplane systems (e.g., environmental control systems, avionics, fuel systems, etc) or occupant health (i.e., inhalation of volcanic ash) have been completed; nor have any associations or governments provided funding to conduct such testing. Recommended Action EASA should withdraw this NPA until the necessary research on the impact to aviation safety from volcanic ash has been completed.
response	Not Accepted The intent of the proposals is to allow operational utility while still maintaining an adequate level of safety. While the Agency accepts that there is a need for further research and understanding of the long-term effects of volcanic cloud constituents on aircraft parts and systems, a conservative approach that maintains an adequate level of safety can still be taken in the short term through enhanced inspections and risk assessments.

comment	*50* comment by: *FAA* The NPA states, *"The SRA approach will negate the need to close airspace during a volcanic cloud event enabling operators to continue flying within the bounds of their accepted SRA. The new approach will therefore have a positive benefit by reducing the impact on the travelling public and allow social and business needs to be better met."* FAA would also add that there are adverse affects associated to the traveling public from inhalation of volcanic ash. While definitive studies specifically addressing all aspects of inhalation of volcanic ash are very limited, FAA believes that the results of a study, *"Particulate air pollution and respiratory disease in Anchorage, Alaska.", by Gordian ME., Ozkaynak H., Xue J., Morris SS., Spengler JD, published in Environmental Health Perspectives. 104(3):290-7, 1996 Mar. [Comparative Study. Journal Article],* shows a direct health impact from inhalation of volcanic ash. The results show that an increase of 10 micrograms/m3 in PM10 [particulate material having a size less than or equal to 10 microns] resulted in a 3-6% increase in visits for asthma and a 1-3% increase in visits for upper respiratory diseases. FAA recommends that this adverse physiological risk must be properly evaluated before this rulemaking is completed. Recommended Action EASA should withdraw this NPA until the necessary research on the adverse

physiological risk is completed. FAA recommends that human health inhalation studies be completed to provide a valid safety risk assessment associated with continuous flight into regions of concentrations of volcanic ash

response

Not Accepted

Proposed AMC already includes noxious fumes in the cabin as one aspect that needs to be assessed by manufacturers and necessary information provided to operators.

comment

51 comment by: *FAA*

The NPA states, *"The economic impact to airlines due to the closure of European airspace following eruption of the Eyjafjallajokull volcano in May 2010 has been estimated at $1.8 billion of revenue loss, with some 10 million passengers and 100,000 flights being affected during the six-day period. The new approach is expected to greatly reduce this impact."*

FAA would also add that there are adverse affects associated to the traveling public from inhalation of volcanic ash. While definitive studies specifically addressing all aspects of inhalation of volcanic ash are very limited, FAA believes that the results of a study, *"Particulate air pollution and respiratory disease in Anchorage, Alaska.", by Gordian ME., Ozkaynak H., Xue J., Morris SS., Spengler JD, published in Environmental Health Perspectives. 104(3):290-7, 1996 Mar. [Comparative Study. Journal Article],* shows a direct health impact from inhalation of volcanic ash. The results show that an increase of 10 micrograms/m^3 in PM10 [particulate material having a size less than or equal to 10 microns] resulted in a 3-6% increase in visits for asthma and a 1-3% increase in visits for upper respiratory diseases. FAA recommends that this adverse physiological risk must be properly evaluated before this rulemaking is completed.

Recommended Action

EASA should withdraw this NPA until the necessary research on the adverse physiological risk is completed. FAA recommends that human health inhalation studies be completed to provide a valid safety risk assessment associated with continuous flight into regions of concentrations of volcanic ash.

response

Not Accepted

Proposed AMC already includes noxious fumes in the cabin as one aspect that needs to be assessed by manufacturers and necessary information provided to operators.

comment

67 comment by: *IACA International Air Carrier Association*

4.6. Impact on regulatory coordination and harmonisation on page 11

IACA regrets that the proposed rule is not (yet) harmonised with the FAA and TCCA. Nevertheless, this NPA is an essential part of the workable alternative being developed to prevent future closure of European airspace during volcanic eruption. IACA shares EASA's view that if adopted by ICAO, more authorities may adopt the European approach. Regardless the outcome, this NPA supports the SRA approach requested by aircraft operators.

response

Noted

The revised proposals in this CRD are fully aligned with the latest recommendations of the IVATF, as published in Doc No 9974.

comment

74 comment by: *ICCAIA*

Page 10

4.1 Safety impact

The second sentence reads:

"Aircraft (including engines) have been shown to tolerate moderate levels of volcanic ash concentrations and any long-term effects (e.g. increased corrosion, erosion, wear, loss of performance) would become evident long before it became a safety of flight concern."

A more appropriate wording would have been:

"Aircraft (including engines) have been shown to tolerate ~~moderate~~ relatively low, but unquantified, levels of some kinds of volcanic ash ~~concentrations~~ and any long-term effects (e.g. increased corrosion, erosion, wear, loss of performance) have typically ~~would~~ become evident long before it became a safety of flight concern."

There has been no quantified demonstration of tolerance to ash and there is no universal characterization of "*moderate levels of volcanic ash*".

response

Noted

This does not form part of the substantive proposals and will not be further developed.

comment

75 comment by: *ICCAIA*

Page: 10

4.4 Economic impact

ICCAIA recommends the proposed text be revised as follows:

"The economic impact to airlines due to the closure of European airspace following eruption of the Eyjafjallajökull volcano in May 2010 has been estimated at $1.8 billion of revenue loss, with some 10 million passengers and 100,000 flights being affected during the six-day period. The new ~~approach~~ ~~is~~ CSs are expected to ~~greatly reduce this~~ have minimal impact."

While it is recognized that the impact was indeed significant, there have been a number of changes already being implemented that should prevent such a economic catastrophe and since OEMs have already provided relevant information to support operator SRAs, the benefit from implementing a rule is minimal (and likely to be overcome by other consequences). Additionally, there are other issues that far overshadow the impact that the NPA would have, such as the Single European Sky.

response

Noted

The figures quoted are related to the financial loss based on the procedures existing at the time. Acknowledgment is made in the NPA that the new approach introduced since spring 2010 would greatly reduce this impact. The specific cost impacts associated with the proposed rule change are considered to be small.

comment *76* comment by: *ICCAIA*

Page 11

4.6 Impact on regulatory coordination and harmonization

The paragraph reads:

"If the SRA approach is adopted by ICAO, then it could be expected that other authorities may adopt this approach. Furthermore, and irrespective of the direction ICAO takes, an operator is responsible for identifying all hazards associated with their operations as part of their existing SMS."

The following wording is suggested:

"*… as part of their existing safety management system.*"

It should be noted that, while being planned, the SMS for Part 121 operations is not yet implemented in the US (Final rule to be published on 27 July 2012 according to the December 2011 report on DOT Significant Rulemakings). It is therefore inappropriate to make reference to the SMS in that way. The proposed wording is consistent with the way this issue was addressed in the latest version of the "Flight Safety and Volcanic Ash - Risk Management of flight operations with known or forecast volcanic ash contamination" document.

response Noted

This does not form part of the substantive proposals and will not be further developed.

comment *89* comment by: *European Cockpit Association*

ECA believes that only Option 2 provides adequate protection of the European Union's safety targets. Volcanic events like those in 2010 and 2011 can occur at any time. All in-service aircraft are to a certain extent vulnerable to volcanic contamination. Therefore it is imperative that the proposed measures also apply to existing models.

ECA believes that the Economic Impact of Option 2 is justified by the „one level of safety" principle that it would uphold.

ECA agrees with the Draft Decisions as proposed if they are implemented using Option 2.

response Noted

Option 2 simply extends the proposals to the existing fleet. However, this will not bring any significant safety benefit, as most manufacturers already comply and those that do not will be pursued by the Agency outside of this rulemaking activity (see also the Executive Summary).

comment 91 comment by: *UK CAA*

Page No: 10

Paragraph No: 4.1

Comment: The first sentence "The move towards a SRA approach will have no impact on safety" should be amended as it is hoped that safety would improve.

Justification: Clarity

Proposed Text: Should read "The move towards a SRA will have no adverse impact on safety".

response Noted

This does not form part of the substantive proposals and will not be further developed.

comment 115 comment by: *Deutsche Lufthansa AG*

Para 4.6 - Impact on regulatory coordination and harmonisation:

Lufthansa supports the AEA comment (below)

AEA comment:

It is not acceptable to have a European rule on this issue if it is not harmonized with FAA and other major partners. Moreover, it should be avoided to publish a European rule in the absence of finalized ICAO guidance material.

response Not Accepted

As volcanic clouds are a hazard to aviation, it is incumbent on the Agency to investigate and mitigate potential risks that could impact aviation safety within Europe. Furthermore, the European Council and Parliament have called for action which necessitates that the Agency move forward on this issue.

The revised proposals in this CRD are fully aligned with the latest recommendations of the IVATF, as published in Doc No 9974.

comment 118 comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Embraer is pleased to offer the following detailed comments on the NPA:

Section 4.1:

Embraer believes that there is no evidence that shows the necessity to assess the airworthiness effects of other cloud constituents, such as sulfuric acid. Embraer is unaware of any service history, testing, or analysis that indicates that aircraft components have experienced failure, damage, or unacceptable wear from other than the direct effects of volcanic ash, and we believe that inspections necessary to monitor volcanic ash effects will be sufficient to prevent undetected detrimental effects of other cloud constituents. If EASA decides to go forward with this NPA, Embraer believes that EASA should choose Option 3 and revise the applicable requirements to read ". . . volcanic ~~cloud~~ ash

contamination . . .".

response | Not Accepted

This comment is at variance with other comments and opinions received. There is a widespread belief that gases and other volcanic constituents can be a hazard to aircraft and that their long-term effects are not well understood. While the intent of the NPA is not for manufacturers to have an extensive programme of research and assessment of volcanic constituents, some assessment, based on available data, should be undertaken and information provided to operators on all volcanic cloud associated hazards so that they can manage risk based on informed judgement.

comment | *119* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Embraer is pleased to offer the following detailed comments on the NPA:

Section 4.4:

Embraer also does not understand the relevance of EASA's determination that the additional effort required to establish the effects of volcanic cloud contamination is ". . . deemed to be small in relation to what is required for certification of a new/changed product or APU." The economic evaluation should consider the costs and benefits of the proposed action(s). To compare the incremental cost of the additional requirements to the total cost of the existing requirements does little to justify for the proposed rule. There would be significant cost in engine testing and equipment qualification to justify an acceptable time period to operate in the presence of ash contamination. Before EASA implements a requirement for justification of acceptable ash contamination levels, these analyses should be updated to more robustly determine the costs and the benefits of the proposal in comparison to the existing system.

response | Not Accepted

A full cost/benefit study was considered unnecessary in this case. The primary intent of the NPA is simply to ensure that manufacturers' data for new or changed products is made available earlier than may otherwise be the case (i.e. at type-certification as opposed to post-volcanic event in operation), with similar levels of investigation/analysis required in both cases.

comment | *120* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Embraer is pleased to offer the following detailed comments on the NPA:

Section 4.6:

The NPA requirement to provide recommendations for actual ash contamination levels and their respective acceptable exposure limits is neither harmonized with other airworthiness authorities nor with the existing or proposed standards from ICAO. The implementation of this standard would induce a significant lack of harmonization with ICAO and other airworthiness standards.

response | Partially Accepted

As ICAO has now moved away from the principle of operations in airspace known to be contaminated with volcanic ash, the need for limits is no longer necessary and the text is deleted (see also the Executive Summary).

comment *130* comment by: *AEA*

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4.6 Impact on regulatory coordination and harmonization

The proposed text is not harmonized with FAA and TCCA

AEA comment:

It is not acceptable to have a European rule on this issue if it is not harmonized with FAA and other major partners. Moreover, it should be avoided to publish a European rule in the absence of finalized ICAO guidance material.

response Not Accepted

As volcanic clouds are a hazard to aviation, it is incumbent on the Agency to investigate and mitigate potential risks that could impact aviation safety within Europe. Furthermore, the European Council and Parliament have called for action which necessitates that the Agency move forward on this issue.

The revised proposals in this CRD are fully aligned with the latest recommendations of the IVATF, as published in Doc No 9974.

A. Explanatory Note - V. Regulatory Impact Assessment - 5. Conclusion and preferred option p. 11

comment *15* comment by: *Air Berlin*

5. Conclusion and preferred options

Air Berlin does not agree with EASA on the preferred option. EASA prefers Option 1 amending CSs to require new or changed products, parts and appliances, to be assessed for their susceptibility to volcanic cloud effects, and to provide information to operators. Option 1 does not ensure that operators' SRA can be completed when operating aircraft of current design and certification.

In order to meet the objectives set – "*minimise any disruption in flight operations due to volcanic cloud contamination and inconvenience to the travelling public*" - **Option 2** shall be the preferred option, i.e. Option 1 extended to in-service aircraft. Aircraft operators need today the relevant information for the aircraft currently in-service, should another volcano erupt tomorrow.

response Not Accepted

Option 2 simply extends the proposals to the existing fleet. However, this will not bring any significant safety benefit, as most manufacturers already comply and those that do not will be pursued by the Agency outside of this rulemaking

activity (see also the Executive Summary).

comment *52* comment by: *FAA*

The NPA states,

"Option 1: Establishing the effects of volcanic cloud contamination on aircraft/engines/ propellers and APUs will require additional work to be performed by the manufacturer. This additional work is deemed to be small in relation to what is required for certification of a new/changed product or APU."

FAA disagrees with the statement that *"This additional work is deemed to be small in relation to what is required for certification of a new/changed product or APU."* FAA believes that long term testing of components and systems to determine the impact from exposure to continuous flight in a volcanic ash contaminated environment will be a multi-year program. This program will consist of testing and analysis to ensure adequate data is obtained to assess the safety impact on airplane safety. Any assessment of the impact to airplane safety must include airplane structure, airplane systems, powerplant and occupant safety. Abrasion studies for structure, ingestion studies for engines, APU, avionics, environmental control systems (e.g., ozone converters, air cycle machines, etc) and human health inhalation studies to evaluate the health threat to passengers – all need to be accomplished to provide a valid safety risk assessment.

Recommended Action

EASA should withdraw this NPA until: (1) they have completed an assessment of the resources necessary to conduct research on the impact to aviation safety from volcanic ash and, (2) they have completed testing and analysis to determine the impact to airplane safety (i.e., airplane structure, airplane systems, powerplant and occupant safety).

response Not Accepted

The primary intent of the NPA is simply to ensure that manufacturers' data for new or changed products is made available earlier than may otherwise be the case (i.e. at type-certification as opposed to post-volcanic event in operation), with similar levels of investigation/analysis required in both cases.

comment *53* comment by: *FAA*

The NPA states, *"Option 2: In addition to Option 1, most manufacturers have voluntarily assessed their existing products for the effects of volcanic cloud contamination. No significant increase in costs is therefore expected, with the possible exception of those small number of manufacturers who have not voluntarily supplied information, where there may be an adverse effect."* The FAA is not aware of any manufacturer who has completed a comprehensive validated safety assessment on their airplanes. Before EASA condones flight into known elevated levels of ash contaminated airspace, it is recommended that an assessment of the impact to airplane fleet safety must be performed that includes airplane structure, airplane systems, powerplant and occupant safety. Abrasion studies for structure, ingestion studies for engines, APU, avionics, environmental control systems (e.g., ozone converters, air cycle machines, etc) and human health inhalation studies to evaluate the health

	threat to passengers – all need to be accomplished to provide a valid safety risk assessment. Recommended Action EASA should withdraw this NPA until the necessary research on the impact to aviation safety from volcanic ash has been completed.
response	Not Accepted The intent of the proposals is to allow operational utility while still maintaining an adequate level of safety. While the Agency accepts that there is a need for further research and understanding of the long-term effects of volcanic cloud constituents on aircraft parts and systems, a conservative approach that maintains an adequate level of safety can still be taken in the short term through enhanced inspections and risk assessments.

comment	*54* comment by: *FAA* The NPA states, *"The proposed rule text is not harmonised with the FAA or TCCA."* The FAA believes that it would be to the benefit of all regulatory agencies, industry and the travelling public if regulations were harmonized. The FAA fully supports research and standards development in this area. Recommended Action EASA should withdraw this NPA until the appropriate level of research and international standards have been developed.
response	Not Accepted As volcanic clouds are a hazard to aviation, it is incumbent on the Agency to investigate and mitigate potential risks that could impact aviation safety within Europe. Furthermore, the European Council and Parliament have called for action which necessitates that the Agency move forward on this issue. The revised proposals in this CRD are fully aligned with the latest recommendations of the IVATF, as published in Doc No 9974.

comment	*55* comment by: *FAA* The NPA states, "*If the SRA approach is adopted by ICAO, then it could be expected that other authorities may adopt this approach.*" FAA has no current plan to adopt this approach. Recommended Action Suggest removing this statement since other airworthiness authorities are not likely to adopt this approach in the foreseeable future.
response	Noted This is not directly related to the NPA proposals.

comment 68 comment by: *IACA International Air Carrier Association*

5. Conclusion and preferred options on page 11

IACA does not agree with EASA on the preferred option. EASA prefers Option 1 amending CSs to require new or changed products, parts and appliances, to be assessed for their susceptibility to volcanic cloud effects, and to provide information to operators. Option 1 does not ensure that operators' SRA can be completed when operating aircraft of current design and certification.

In order to meet the objectives set – *"minimise any disruption in flight operations due to volcanic cloud contamination and inconvenience to the travelling public"* - **Option 2** shall be the preferred option, i.e. Option 1 extended to in-service aircraft. Aircraft operators need today the relevant information for the aircraft currently in-service, should another volcano erupt tomorrow. The economic burden for the industry will be limited: OEM already supplied the relevant information for the aircraft and engine combinations currently operated by (large) commercial air transport.

response Not Accepted

Option 2 simply extends the proposals to the existing fleet. However, this will not bring any significant safety benefit, as most manufacturers already comply and those that do not will be pursued by the Agency outside of this rulemaking activity (see also the Executive Summary).

comment 109 comment by: *Qantas Airways Avionics Engineering*

Comments here are mainly with respect to CS25, but the logic may be equally applied to other parts.

The proposed preferred option 1 "Amend CSs to require new or changed products, parts & appliances, to be assessed for their susceptibility to volcanic cloud effects, and to provide information to operators. " does not align with other statements made in the NPA.

If option 1 is selected then only new aircraft which have the proposed new section 25.1593 as part of their Certification basis will be covered.

It is clear that the Agency's intent is that manufacturers make information available to support operators in developing their SRAs for all in-service aircraft.

It does not make any sense to restrict the applicability of this information only to aircraft which would contain the proposed section CS 2x.1593 in their certification basis.

The discussion in section 4.4 Economic impact regarding option 2 states:

"most manufacturers have voluntarily assessed their existing products for the effects of volcanic cloud contamination. No significant increase in costs is therefore expected, with the possible exception of those small number of manufacturers who have not voluntarily supplied information, where there may be an adverse effect. "

Thus it is clear that the proposed CS and AMC should place an obligation on manufacturers to provide the required supporting information to operators for all in service aircraft.

	I recommend that Option 2 be the preferred choice with respect to Instructions for Continuing Airworthiness.
response	Not Accepted Option 2 simply extends the proposals to the existing fleet. However, this will not bring any significant safety benefit, as most manufacturers already comply and those that do not will be pursued by the Agency outside of this rulemaking activity (see also the Executive Summary).

B. Draft Decisions p. 12

comment	*92* comment by: *Chris Ellis* FCL008 Cloud Flying in Sailplanes. As a glider pilot who has been flying for 55 years I am very concerned by the restriction which would severely limit the conditions under which my club, Midland Gliding Club Ltd and my syndicate of 12 members of the Falke 2000 Group, could operate. I support the position of the BGA on the cloud flying rating but would ask that there be 'Grandfather Rights' for those of us who have been flying in and around clouds for many years and have the skills and experience to do so safely. I would also ask that the possibility of a 'restricted' rating to allow pilots to fly within 1,000 feet of clouds be re-examined. Our airfield is 1450 feet above sea level and has a west facing ridge which we soar all year round. On days when cloud base is 3000' asl we would be limited to flying at 500 feet in conditions where being higher would be safer and more enjoyable.
response	This is not relevant to this NPA.

B. Draft Decisions - I. Draft Decision CS-23 p. 12

comment	*11* comment by: *Hebridean Air Services Limited* CS 23.1593 Volcanic cloud contamination specifically refers to "For turbine engine powered aeroplanes..." while the NPA refers to all flight operations. For clarity are piston engined aircraft included or excluded from the proposed changes to EASA airworthiness code CS-23??
response	Accepted The Agency accepts that the NPA was not clear on this point and further clarification has been added (see also Executive Summary).

B. Draft Decisions - I. Draft Decision CS-23 - Book 1 SUBPART G OPERATING LIMITATIONS AND INFORMATION GENERAL - CS 23.1593 Volcanic cloud contamination p. 12

comment	*121* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* Based on the comments in the introductory paragraph above, Embraer suggests that the first paragraph for the AMC for both CS23 and CS25 be revised to say: Information necessary for safe operation should be contained in the unapproved part of the flight manual, or alternatively in other appropriate manuals such as an aircraft operating manual or crew training manual. The information should be readily usable by operators in preparing their safety risk assessments, and should include ~~recommendations regarding the actual levels of ash concentrations levels and the time period that can be tolerated, together with~~ any operational precautions that need to be taken by the operator. In addition, based on the lack of service experience that indicates that consideration for effects other than ash are no necessary, revise each reference to "volcanic cloud" to "volcanic ash" in the AMC, and delete the third paragraph ("A volcanic cloud comprises volcanic ash together with gases . . .") in its entirety.
response	Partially Accepted Text has been amended. "Volcanic cloud" is retained in order to address all volcanic hazards. "Flight manual" has been supplemented with "or other appropriate manual", so as not to limit its applicability (e.g. Maintenance manual).

B. Draft Decisions - I. Draft Decision CS-23 - Book 2 SUBPART G OPERATING LIMITATIONS AND INFORMATION - AMC 23.1593 Volcanic cloud contamination p. 12-13

comment	*2* comment by: *CRT - Gyroplanes Foundation* Under a. The malfunction or failure of **one or more engines**, leading not... etc. etc. The **bold text** should be considered to be changed to '**all engines**'. (this covers both single- and multi-engine aircraft) Rationale: vulcanic ash will have an direct impact to all engines at the same time. If vulcanic ash melts down on turbine parts, it will impact all engines at practically the same time. It is a comparable effect as 'bad fuel', coming from the same tank and feeding all engines. It is also effecting all engines - not 'one or more' engines!
response	Not Accepted

This is an unnecessary assumption and other factors may come into play such as the age of the engine and its internal parts. Experience has shown that there can be some variability in the time taken for engines to fail during severe ash encounters, which is probably due to surge margin difference between individual engines.

B. Draft Decisions - II. Draft Decision CS-25 p. 13

comment *113* comment by: *Deutsche Lufthansa AG*

OEMs should stick to current recommendations to avoid visible ash. There should be no further recommendations for flights below the accepted visibility limit. To enable flight operations above this limit they should establish clearly defined tolerances and procedures.

Lufthansa partially supports the AEA comment (below)

AEA comment:

It is important to distinguish certification criteria from operations. It does, for example, not make any sense to set a time period that can be tolerated if there are no means for flight crew to measure this during actual operations. This is even more important in light of the well known deficiencies of current VAAC charts.

response Accepted

To align with the latest development in the IVATF, all references to ash tolerance levels have been deleted.

B. Draft Decisions - II. Draft Decision CS-25 - Book 1 SUBPART G OPERATING LIMITATIONS AND INFORMATION GENERAL - CS 25.1501 General p. 13-14

comment *23* comment by: *AIRBUS*

Page 13 & 14

II. Draft Decision CS-25

The proposed paragraph CS 25.1501 is the following:

"CS 25.1501 General

(a) Each operating limitation specified in CS 25.1503 to 25.1533 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crew members as prescribed in CS 25.1541 to ~~23.1587~~CS 25.1593.

~~(c) Supplementary information must be made available to the operator of each aeroplane as prescribed in CS 25.1591.~~

..."

With the deletion of (c) and the addition of the new paragraph CS 25.1593, the data requested under CS 25.1591 and CC 25.1593 are now presented as having to be provided to the crew members as described in (b).

Many of the information being part of the set of data required under CS 25.1593 nevertheless include instructions that are not useful for the crew members, or not only useful for the crew members. For example, the data includes maintenance instructions or, as another example, the list of aircraft components or systems susceptible to volcanic ash. This data is issued for the attention of different relevant technical services of the operator.

The wording "*available to the crew members*" should therefore be changed into "*available to the crew members and/or to the operator as appropriate*".

response Accepted

comment *78* comment by: *ICCAIA*

Page: 13
Proposed CS 25.1501(b)

<u>Note:</u> The following comment is also applicable to CS 23.1501, 27.1501 and 29.1501.

We recommend that the proposed text be revised as follows:

"CS 25.1501

(b) The operating limitations and other information necessary for safe operation must be made available to the crew members as prescribed in CS 25.1541 to 25.1587 and CS 25.1593."

As written, proposed CS 25.1501(b) would inadvertently incorporate CS 25.1591 (Performance Information for Operations with Contaminated Runway Surface Conditions) in compliance actions; however, that appears to be outside the scope of the NPA.

The NPA does not provide any justification for inclusion of CS 25.1591 into CS 25.1501(b) and should therefore be excluded from this NPA proposed regulatory change.

response Not Accepted

The distinction between information provided to the crew from that provided to the operator is somewhat tenuous. For example, CS 25.1501(c) requires information to be provided to the operator, and yet CS 25.1591 states that this information must be provided in the AFM. The text can be simplified by adopting Airbus's proposal in Comment #23, to extend the scope of the intended recipient in CS 25.1501(b). This is equally applicable to other codes.

comment *131* comment by: *AEA*

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Draft Decision on CS-25/CS-E/CS-APU/…

AEA comment:

In the absence of clear certification criteria, there should be no operating limitations. Any information provided by manufacturers should be left as supplementary information and should not become part of operating limitations for aircraft and components. Moreover, in the absence of further criteria, OEMs should stick to current recommendations to avoid visible ash.

It is important to distinguish certification criteria from operations. It does, for example, not make any sense to set a time period that can be tolerated if there are no means for flight crew to measure this during actual operations. This is even more important in light of the well known deficiencies of current VAAC charts. The certification requirements set for engines are met by the OEMs but are not visible to the operating crew. Thus, when demonstrating the ability of an engine to cope with bird ingestion the size of bird is specified. When the flight crew are presented with managing operations in areas that are affected by birds they are not required to know the size of the birds present just that they should avoid them if possible. The certification limitations of the size of the bird used are not known by the flight crew. This should be the same approach used for volcanic ash.

response Partially Accepted

There is no intent in these proposals to set hard limits. To align with the latest development in the IVATF, all references to ash tolerance levels have been deleted.

B. Draft Decisions - II. Draft Decision CS-25 - Book 1 SUBPART G OPERATING LIMITATIONS AND INFORMATION GENERAL - CS 25.1593 Volcanic cloud Contamination p. 14

comment *4* comment by: *Hagop Kazarian*

Comment:

Remove the word "contamination" from the requirement, and associated preambles of the AMC.

Justification:

"Contamination" is not the only failure mode or effect that is conceivably related to volcanic ash esposure. Even the proposed AMC 25.1593 text recognizes other possible failure modes and effects (e.g. "malfunction", "abrasion", "erosion") that are not necessarily literally related to "contamination". The removal of the word "contamination" will ensure that applicants evaluate all associated failure modes and effects.

response Accepted

The word “contamination” is used in multiple contexts within the rule. Text is amended where this could potentially be confusing.

comment

122 comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Based on the comments in the introductory paragraph above, Embraer suggests that the first paragraph for the AMC for both CS23 and CS25 be revised to say:

Information necessary for safe operation should be contained in the unapproved part of the flight manual, or alternatively in other appropriate manuals such as an aircraft operating manual or crew training manual.

The information should be readily usable by operators in preparing their safety risk assessments, and should include ~~recommendations regarding the actual levels of ash concentrations levels and the time period that can be tolerated, together with~~ any operational precautions that need to be taken by the operator.

In addition, based on the lack of service experience that indicates that consideration for effects other than ash are no necessary, revise each reference to "volcanic cloud" to "volcanic ash" in the AMC, and delete the third paragraph ("A volcanic cloud comprises volcanic ash together with gases . . .") in its entirety.

response

Partially Accepted

Text has been amended. "Volcanic cloud" is retained in order to address all volcanic hazards. "Flight manual" has been supplemented with "or other appropriate manual", so as not to limit its applicability (e.g. Maintenance manual).

B. Draft Decisions - II. Draft Decision CS-25 - Book 2 SUBPART G OPERATING LIMITATIONS AND INFORMATION - AMC 25.1593 Volcanic cloud contamination p. 14-15

comment

24 comment by: *AIRBUS*

Page 14

AMC 25.1593 Volcanic cloud contamination

The second paragraph reads:

"Information necessary for safe operation should be contained in the unapproved part of the flight manual. [...]"

Refer to general comments.

The selection of the Flight Manual as a repository for the set of data regarding the susceptibility of the aircraft to the effects of volcanic clouds is not a right choice to preserve the necessary flexibility associated with the expected updates of the information package.

The fact that the set of data includes information for which the flight Manual is not the right place is also recognized by EASA in sub-paragraphs (4) and (5):

"(4) 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/Despatch Deviation, or equivalents required to support the operator. *(5) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace and to/from volcanic ash contaminated aerodromes; this may take the form of Instructions for Continuing Airworthiness or other advice."*
response	Accepted The scope of manuals that can be used is broadened by adding "…or other appropriate manual".

comment	*25* comment by: *AIRBUS* **Page 14** **AMC 25.1593 Volcanic cloud contamination** The sub-paragraph (3) reads: *"(3) The effect of volcanic ash on operations to/from contaminated aerodromes. In particular, deposits of volcanic ash on a runway can lead to degraded braking performance, most significantly if the ash is wet."* The effect of volcanic ash on operations to or from contaminated aerodromes and in particular on the performance of the aircraft on contaminated runways should be addressed the same way as the effects of other contaminants. To this end, the paragraph CS 25.1591 should remain the reference for any kind of contamination and additional information covering operation on surfaces contaminated with ash should be provided at the discretion of the applicant, as requested by this paragraph, and in this case, included in the Flight Manual. The paragraph CS 25.1591 should be modified to include volcanic ash in the list of potential contaminants, OR considered appropriate without modification to the current wording of sub-paragraph (a): *"Additional information covering operation on contaminated surfaces other than the above may be provided at the discretion of the applicant."* In any case, the sub-paragraph (3) of the AMC 25.1593 should be deleted considering its redundancy with CS 25.1591.
response	Not Accepted Placing this issue in CS 25.1591 would clearly move the whole issue into the airworthiness domain. Under CS 25.1591, it would be necessary for the TCH to either prohibit operations on the contaminated surface or to establish a test procedure to define operating limitations. Due to the uncertainly of volcanic ash constituents and availability of test material, establishing operating limitations would probably be impractical. Leaving the runway contamination issue within 1593 will provide the TCH with some flexibility to use engineering judgement to advise operators, leaving the final decision to the operator and the SRA. For example, it could be envisaged that the TCH may recommend that take-off from an ash-contaminated runway is not permissible due, at least in part, to the potential for engine ash ingestion. However, landing may still be permitted, possibly with additional maintenance actions, as the worst-case breaking performance is probably still on ice-contaminated runways.

comment	*56* comment by: *FAA* The NPA states, *"CS 25.1593 Volcanic cloud Contamination* *(See AMC 25.1593) The susceptibility of aeroplane features to the effects of volcanic cloud contamination must be established."* The FAA believes that further definition/clarification should be provided to ensure that industry is aware of the depth of the assessment that would be required for an effective assessment. The AMC should also include definitions of the threat (e.g., volcanic ash and gas concentration with distance and time; makeup of the volcanic ash/particulate material; makeup of the volcanic gases present; etc) to ensure that a uniform method of evaluating the safety risk assessment can be established. Pursuant with that goal, FAA suggests the following clarification: *The susceptibility of aeroplane features to the effects of volcanic cloud contamination (particulate material and gases) should be established. The manufacturer should evaluate via test and analysis the impact to airplane safety including airplane structure, airplane systems, powerplant and occupant safety. The assessment should include the manufacturer's mitigation strategy employing design features (e.g., volcanic ash sensors) and operational means (e.g., establish a volcanic ash concentration avoidance level; increased maintenance actions to inspect, clean, or replace contaminated systems; etc) to ensure adequate airplane and occupant safety.* Recommended Action FAA does not recommend airworthiness rulemaking. If EASA does decide to impose these CS requirements and certify aircraft for flight in known ash contaminated airspace, then FAA recommends that EASA consider modifying CS 25.1593 to state – *The susceptibility of aeroplane features to the effects of volcanic cloud contamination must be established.* ***The manufacturer should evaluate the effects of volcanic cloud contamination (particulate material and gases) via test and analysis the impact to airplane safety including airplane structure, airplane systems, powerplant and occupant safety. The assessment should include the manufacturer's mitigation strategy employing design features (e.g., volcanic ash sensors) and operational means (e.g., establish a volcanic ashconcentration avoidance level; increased maintenance actions to inspect, clean, or replace contaminated systems; etc) to ensure adequate airplane and occupant safety.***
response	Not Accepted It is not possible at present to be more specific as to the type of information required due to the lack of an accepted volcanic ash/cloud specification. Manufacturers would have to demonstrate that they have gained sufficient knowledge of the risks posed by volcanic clouds through a combination of experience, studies, analysis and/or tests. The level of manufacturers' data supplied in support of existing accepted SRA may be satisfactory. While the intent of the NPA is not for manufacturers to have an extensive programme of research and assessment of volcanic constituents, some assessment, based on available data, should be undertaken and information provided to operators on all volcanic cloud associated hazards so that they can manage risk based on informed judgement. ICAO has now moved away from the principle of operating in airspace known to

	be contaminated with volcanic ash clouds.

comment	*57* comment by: *FAA* The NPA states, *"AMC 25.1593 Volcanic cloud contamination* *Acceptable means of establishing the susceptibility of aeroplane features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and/or testing of parts or sub-assemblies."* If EASA condones and certifies aircraft for flight operations in known ash contaminated airspace, then a fundamental part of the Operator's assessment process will involve obtaining test data (e.g., ingestion studies on engine/APU; ingestion studies on environmental control systems (e.g., ozone converter, HEPA filter, etc); and, inhalation studies to determine acceptable levels of volcanic ash to ensure occupant safety). This is intended to ensure that the total airplane – airplane structure, powerplant, airplane systems and occupants are considered. Therefore, the text should state, *"Acceptable means of establishing the susceptibility of aeroplane features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and testing of parts, sub-assemblies and complete airplane systems. Additional human inhalation studies should be considered to determine an acceptable exposure level for the occupants."* Recommended Action FAA does not recommend airworthiness rulemaking. If EASA does decide to impose these CS requirements and certify aircraft for flight operations in known ash contaminated airspace, then FAA recommends that EASA consider modifying AMC 25.1593 1st paragraph to state, *"Acceptable means of establishing the susceptibility of aeroplane features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and testing of parts, sub-assemblies and complete airplane systems. Additional human inhalation studies should be considered to determine an acceptable exposure level for the occupants."*
response	Not Accepted There is no intent by the Agency to formally certify information developed by manufacturers. The information is required solely to facilitate development of a safety risk assessment within operators' management system and to make decisions based on informed judgement. Information from manufacturers is expected to be conservative and to include large margins of safety to account for the many unknown factors. The information supplied will be placed in the unapproved section of the AFM or other appropriate manual.

comment	*58* comment by: *FAA* The NPA states, *"AMC 25.1593 Volcanic cloud contamination* *Information necessary for safe operation should be contained in the unapproved part of the flight manual. This information may be used to assist operators in producing operational data and instructions for their flight crews when operating in, or avoiding, airspace contaminated with volcanic clouds. The information should be readily usable by operators in preparing their safety risk assessments, and should include recommendations regarding the actual levels*

of ash concentrations levels and the time period that can be tolerated, together with any operational precautions that need to be taken by the operator." FAA believes that information which affords mitigating protection should also be included in the AMC guidance. For example, airplanes that have volcanic ash (particulate) sensors and volcanic gas sensors should be permitted greater flexibility then those airplanes without such features. In addition, operational factors such as the use of airline provided particulate respirators should be included in the AMC. Airlines which provide passengers with such devices should permit increased flexibility then those without.

Recommended Action

FAA believes that the material in the AMC should be expanded to include design and operational factors which can provide some mitigation from the effects of volcanic ash (particulate material) and volcanic gases. For example, airplanes that have volcanic ash (particulate) sensors and volcanic gas sensors should be permitted greater flexibility then those airplanes without such features. In addition, operational factors such as the use of airline provided particulate respirators should be included in the AMC. Airlines which provide passengers with such devices should permit increased flexibility then those without.

response

Partially Accepted

AMC is added which states that where any device is installed on an aircraft to detect volcanic ash threats, information on such devises should be made available by the manufacturer as part of its compliance with xx.1593. It will be up to the operator to determine what credit can be given for such devices as part of their safety risk assessment.

comment

59 comment by: *FAA*

The NPA states, *"AMC 25.1593 Volcanic cloud contamination*

A volcanic cloud comprises volcanic ash together with gases and other chemicals. Although the primary hazard is volcanic ash, other elements of the volcanic cloud may also be undesirable to operate through, and their effect on airworthiness should be assessed." FAA believes that further clarification should be included in the AMC. For example, scientists can provide information on the major constituents of volcanic gas (i.e., CO_2, SO_2, H_2S, H_2, CO, HCL, HF, and He). Other factors such as whether the material is magnetic or electrically charged should be included. The AMC should provide the information or may refer to publically available material which contains relevant data that defines the threat from a volcanic eruption.

Recommended Action

FAA believes that the material in the AMC is not complete and should include consideration of at least the major constituents of volcanic gas (i.e., CO_2, SO_2, H_2S, H_2, CO, HCL, HF, and He); whether the material is magnetic or electrically charged; etc, and/or refer to publically available material which contains the relevant data.

response

Partially Accepted

The AMC is not intended as a comprehensive treatise on the subject. As the FAA rightly point out, further research is required on many aspects of volcanic ash hazards.

comment	*60* comment by: *FAA* The NPA states, *"AMC 25.1593 Volcanic cloud contamination* *(1) Identify the features of the aeroplane that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:* *….* *e. Volcanic ash and/or toxic chemical contamination of cabin air-conditioning packs, possibly leading to loss of cabin pressurisation or noxious fumes in the cabin;"* If EASA condones and certifies aircraft for flight operations in known ash contaminated airspace, then the FAA believes that the entire airplane environmental control system (i.e., ventilation, pressurization, engine bleed ports, precooler, ozone converter, air cycle machines, air distribution system, ducting, pressure controller, outflow valves, etc) could be susceptible to the threat of volcanic ash and toxic chemicals, which could place the passengers and flight crew at risk in atmospheres of elevated levels of contaminants. In addition, we believe that the affect on the occupants (i.e., passengers and crew) should also be noted here. Therefore, we recommend the AMC subpart (e) include: e. Volcanic ash and/or toxic chemical contamination of the cabin **environmental control system (i.e., ventilation, pressurization, engine bleed ports, precooler, ozone converter, air cycle machines, air distribution system, ducting, pressure controller, outflow valves, etc),** possibly leading to loss of cabin pressurisation or noxious fumes in the cabin; **the impact to crew performance and health of occupants (i.e., crew and passengers) should be evaluated in the presence of volcanic ash and associated chemical contamination."** Recommended Action FAA does not recommend airworthiness rulemaking. If EASA does decide to impose these CS requirements and certify aircraft for flight operations in known ash contaminated airspace, then FAA believes that the material in the AMC should be expanded to include the impact on the entire environmental control system as well as crew performance and health of the occupants. We recommend EASA add the following (bold) text: *e. Volcanic ash and/or toxic chemical contamination of the cabin* ***environmental control system (i.e., ventilation, pressurization, engine bleed ports, precooler, ozone converter, air cycle machines, air distribution system, ducting, pressure controller, outflow valves, etc),*** *possibly leading to loss of cabin pressurisation or noxious fumes in the cabin;* ***the impact to crew performance and health of occupants (i.e., crew and passengers) should be evaluated in the presence of volcanic ash and associated chemical contamination."***
response	Partially Accepted The AMC is not intended as a comprehensive treatise on the subject. As the FAA rightly point out, further research is required on many aspects of volcanic ash hazards.

comment	*79* comment by: *ICCAIA*
	Page: 14 **AMC 25.1593 Volcanic cloud contamination** **Note: The following comment is also applicable to AMC 23.1593, 27.1593 and 29.1593.** ICCAIA recommends the proposed text be revised as follows: "Acceptable means of establishing the susceptibility of aeroplane features to the effects of volcanic clouds ~~should~~ may include ~~a combination of~~ experience, studies, analysis, and/or testing of parts or sub-assemblies." The phrase *"should include a combination of"* indicates that an acceptable means must include a combination of experience, studies, analysis, and/or testing of parts or sub-assemblies, and if any one element is not included, it would be a non-compliance with the CS. Our recommended change allows an acceptable means of compliance to include experience, studies, analysis, and/or testing of parts or sub-assemblies, but would not mandate each one for compliance.
response	Not Accepted It is important when performing an assessment that a range of data sources are utilised. The existing wording is therefore believed to better reflect the intent. The AMC and the word "should" are non-mandatory.

comment	*81* comment by: *ICCAIA*
	Page: 14 **AMC 25.1593 Volcanic cloud contamination** **Note: The following comment is also applicable to AMC 23.1593, 27.1593 and 29.1593** ICCAIA recommends the proposed text be revised a follows: "In determining the susceptibility of aeroplane features to the effects of volcanic clouds and the necessary information to operators, the following points should be considered: (1) Identify the features of the aeroplane that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following: a. The malfunction or failure of one or more engines, leading not only to reduction or complete loss of thrust but also to failures of electrical, pneumatic and hydraulic systems; b. Blockage of pitot and static sensors, resulting in unreliable airspeed indications and erroneous warnings; c. Windscreen abrasion, resulting in windscreens being rendered partially or completely opaque; d. Fuel contamination; e. Volcanic ash and/or toxic chemical contamination of cabin air-conditioning packs, possibly leading to loss of cabin pressurisation or noxious fumes in

the cabin;

f. Erosion of external and internal aeroplane components;

g. Volcanic cloud static discharge, leading to prolonged loss of communications; and

h. Reduced electronic cooling efficiency, leading to a wide range of aeroplane system failures.

(2) The nature and severity of effects.

~~(3) The effect of volcanic ash on operations to/from contaminated aerodromes. In particular, deposits of volcanic ash on a runway can lead to degraded braking performance, most significantly if the ash is wet.~~

(4) 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/Despatch Deviation, or equivalents required to support the operator.

~~(5) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace and to/from volcanic ash contaminated aerodromes; this may take the form of Instructions for Continuing Airworthiness or other advice~~."

General comment for items (1) and (2) - The information required by this portion of the AMC has already been provided to ICAO in working paper IVATF/2-WP/17 for inclusion in ICAO Doc 9691 AN/954 "*Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds*". As such, and assuming EASA finds the material acceptable, including this section in AMC would create a potential disconnect from globally acceptable guidance should ICAO Doc 9691 be revised in the future.

Suggest deleting item (3) as it introduces a requirement for landing performance which is contained in CS 25.1591, suggested for deletion in Comment 7 as it would introduce new requirements outside the scope of the NPA.

Suggest deleting item (5) as it introduces a requirement for Instructions for Continued Airworthiness, which are not part of the proposed CS 25.1593. Requirements for ICA are defined in CS 25.1529.

response

Not Accepted

Item (1)&(2): The AMC is based on ICAO Doc 9974. Consideration will be given to amending or expanding the AMC if the ICAO guidance is significantly amended.

Item (3): See response to Airbus (Comment #25).

Item (5): This is not a new requirement. Changes/additions to the ICA are likely to be an output from the manufacturers' assessments and form part of the information supplied to operators. For completeness, the bullet is retained.

comment *86* comment by: *ICCAIA*

Page: 14
AMC 25.1593 Volcanic cloud contamination

Note: The following comment is also applicable to AMC 23.1593,

27.1593, 29.1593, E 1050, P-80 and APU 550.

ICCAIA recommends the proposed text be revised a follows:

"Information necessary for safe operation should be contained in the unapproved part of the flight manual. This information may be used to assist operators in producing operational data and instructions for their flight crews when operating in~~, or avoiding,~~ airspace ~~contaminated with~~ affected by volcanic ~~ash~~ clouds. The information should be readily usable by operators in preparing their safety risk assessments~~, and should include recommendations regarding the actual levels of ash concentrations levels and the time period that can be tolerated~~, together with any operational precautions that need to be taken by the operator."

The AMC statements suggest that it is acceptable to fly into a volcanic ash cloud; however, no aircraft or engine OEM has ever indicated it is acceptable to fly into an ash cloud. There should not be any language that suggests it is acceptable to fly into a volcanic ash cloud. The AMC also requires recommendations for the actual levels of ash concentrations levels and the time period that can be tolerated. Previously, EASA has indicated that the intent of this NPA was to ensure existing information from the manufacturers was made available to operators and determination of whether actual ash tolerance levels were needed would be the subject of a future A-NPA. (See EASA's Volcanic Ash Work Plan for 2012 Action No. XYZ.3.)

response

Partially Accepted

The proposed text has been modified to align with developments in the IVATF. Actual levels and time periods have been deleted under the revised ICAO concept (see also the Executive Summary).

B. Draft Decisions - III. Draft Decision CS-27 - Book 2 SUBPART G OPERATING LIMITATIONS AND INFORMATION - AMC 27.1593 Volcanic cloud contamination p. 15-16

comment *63* comment by: *EUROCOPTER*

Comment on proposed AMC 27.1593 § (1): it is proposed to modify as follows (bold characters): *'f. Erosion, **blockage or malfunction** of external and internal rotorcraft components*'. Reason: risks related to external and internal rotorcraft components are not limited to erosion.

response

Accepted

The text is also added to aeroplane CSs to cover possible effects on flight control systems and any other systems.

B. Draft Decisions - IV. Draft Decision CS-29 - Book 2 SUBPART G OPERATING LIMITATIONS AND INFORMATION - AMC 29.1593 Volcanic cloud contamination p. 17-18

comment	*62* comment by: *EUROCOPTER* Comment on proposed AMC 29.1593 § (1): it is proposed to modify as follows (bold characters): *'f. Erosion, **blockage or malfunction** of external and internal rotorcraft components*'. Reason: risks related to external and internal rotorcraft components are not limited to erosion.
response	Accepted The text is also added to aeroplane CSs to cover possible effects on flight control systems and any other systems.

B. Draft Decisions - V. Draft Decision CS-E - Book 1 SUBPART F TURBINE ENGINES - ENVIRONMENTAL AND OPERATIONAL DESIGN REQUIREMENTS - CS-E 1050 Volcanic Cloud Contamination p. 18

comment	*103* comment by: *Snecma* Page 18 - B.V - Draft Decision CS-E - NPA text CS-E 1050 Volcanic Cloud Contamination (See AMC E.1050) (b) Information necessary for safe operation must be provided in the relevant documentation. Snecma comment Approved documentation must not prevent, due to approval process constraints, from making short term adjustment in case of specific request from operators
response	Noted Information provided by the engine TCH may or may not be approved information. The term "relevant documentation" is specifically used in the text of the rule to allow flexibility as to where information is placed. Where data is included in the instructions for installing and operating the engine, in accordance with CS-E 20, this would be approved data. However, some manufactures operate a technical variance system under their DOA to allow flexibility from the approved data.

B. Draft Decisions - V. Draft Decision CS-E - Book 2 SUBPART F TURBINE ENGINES - ENVIRONMENTAL AND OPERATIONAL DESIGN - AMC E 1050 Volcanic Cloud Contamination p. 18-19

comment	*61* comment by: *EUROCOPTER* Comment on proposed AMC E 1050 § (1): **a new item 'g. Fuel circuit**

contamination' should be added. As a matter of fact some hydro mechanical engines governors are piloted by fuel. Moreover even numerical governors are also concerned as in some cases the bleed valves are fuel piloted.

response

Partially Accepted

Fuel is added to point e.

comment

83 comment by: *ICCAIA*

Page 19
AMC E 1050 Volcanic Cloud Contamination

ICCAIA recommends the proposed text be revised a follows:

"In determining the susceptibility of turbine engine features to the effects of volcanic clouds and the necessary information to operators to allow safe engine operation, the following points should be considered:

(1) Identify the features of the turbine engine that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:

a. Erosion of compressor blades and other internal parts;

b. Glassy deposits on hot section parts, which can result in loss of surge margins, engine stall, flame out, and inability to restart engines;

c. Clogging of turbine blade cooling channels;

d. Corrosion of metallic parts;

e. Oil circuit contamination; and

f. Electrical, hydraulic and pneumatic systems.

(2) The nature and severity of effects.

(3) The related pre-flight, in-flight and post-flight precautions to be observed by the operator including any necessary amendments to Engine Manuals, Despatch Deviation, or equivalents, required to support the operator.

~~(4) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace; this may take the form of Instructions for Continuing Airworthiness or other advice~~."

General comment for items (1) and (2) - The information required by this portion of the AMC has already been provided to ICAO in working paper IVATF/2-WP/17 for inclusion in ICAO Doc 9691 AN/954 "*Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds*". As such, and assuming EASA finds the material acceptable, including this section in AMC would create a potential disconnect from globally acceptable guidance should ICAO Doc 9691 be revised in the future.

Suggest deleting item (4) as it introduces a requirement for Instructions for Continued Airworthiness, which are not part of the proposed CS-E 1050.

response

Not Accepted

Item (1)&(2): The AMC is based on ICAO Doc 9974. Consideration will be given to amending or expanding the AMC if the ICAO guidance is significantly amended.

Item (4): This is not a new requirement. Changes/additions to the ICA are likely to be an output from the manufacturers' assessments and form part of the information supplied to operators. For completeness, the bullet is retained.

B. Draft Decisions - VI. Draft Decision CS-P p. 19

comment *84* comment by: *ICCAIA*

Page 19
CS-P 80 Volcanic Cloud Contamination

"*For variable pitch propellers*": As fixed pitch propellers would also be subject to erosion of propeller blades and corrosion of metallic parts, it is unclear why EASA has chosen to limit the application to only variable pitch propellers.

response Noted

The primary concern here is the inability to feather the propeller caused by contamination of the propeller control system. Such a malfunction could lead to a hazardous propeller effect resulting in excessive drag. Erosion of propeller blades and corrosion of metallic parts are known effects from exposure to volcanic clouds and are included here for completeness. These effects, however, are not safety-of-flight issues and would be readily identifiable during normal maintenance activities.

B. Draft Decisions - VI. Draft Decision CS-P - Book 2 SUBPART A GENERAL - AMC P 80 Volcanic Cloud Contamination p. 20

comment *85* comment by: *ICCAIA*

Page 20
AMC P 80 Volcanic Cloud Contamination

ICCAIA recommends the proposed text be revised a follows:

"In determining the susceptibility of variable pitch propeller features to the effects of volcanic clouds and the necessary information to operators to allow safe propeller operation, the following points should be considered:

(1) The features of the propeller system that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:

a. Erosion of propeller blades and other propeller system components;

b. Corrosion of metallic parts;

c. Oil circuit contamination; and

d. Electrical, hydraulic and pneumatic systems;

(2) The nature and severity of effects.

	(3) The related pre-flight, in-flight and post-flight precautions to be observed by the operator including any necessary amendments to Propeller Manuals, Despatch Deviation, or equivalents required to support the operator. ~~(4) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace; this may take the form of Instructions for Continuing Airworthiness or other advice~~." Suggest deleting item (4) as it introduces a requirement for Instructions for Continued Airworthiness, which are not part of the proposed CS-P 80.
response	Not Accepted Item (4): This is not a new requirement. Changes/additions to the ICA are likely to be an output from the manufacturers' assessments and form part of the information supplied to operators. For completeness, the bullet is retained.

I. Draft Decision CS-23

Book 1

SUBPART G OPERATING LIMITATIONS AND INFORMATION

GENERAL

CS 23.1501 General

(a) Each operating limitation specified in CS 23.1505 to 23.1527 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crew members and/or to the operator as appropriate, as prescribed in CS 23.1541 to ~~23.1589~~CS 23.1593.

…

CS 23.1593 Exposure to volcanic cloud hazards

(See AMC 23.1593)

If required by an operating rule, the susceptibility of aeroplane features to the effects of volcanic cloud hazards must be established.

Book 2

SUBPART G OPERATING LIMITATIONS AND INFORMATION

AMC 23.1593 Exposure to volcanic cloud hazards

The aim of CS 23.1593 is to support commercial operators and non-commercial operators operating complex motor-powered aircraft by identifying and assessing airworthiness hazards associated with operations in contaminated airspace. Providing such data to operators will enable those hazards to be properly managed as part of an established management system.

Acceptable means of establishing the susceptibility of aeroplane features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and/or testing of parts or sub-assemblies.

Information necessary for safe operation should be contained in the unapproved part of the flight manual, or other appropriate manual, and should be readily usable by operators in preparing a safety risk assessment as part of their overall management system.

A volcanic cloud comprises volcanic ash together with gases and other chemicals. Although the primary hazard is volcanic ash, other elements of the volcanic cloud may also be undesirable to operate through, and their effect on airworthiness should be assessed.

In determining the susceptibility of aeroplane features to the effects of volcanic clouds and the necessary information to operators, the following points should be considered:

(1) Identify the features of the aeroplane that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:

a. The malfunction or failure of one or more engines, leading not only to reduction or complete loss of thrust but also to failures of electrical, pneumatic and hydraulic systems;

b. Blockage of pitot and static sensors, resulting in unreliable airspeed indications and erroneous warnings;

c. Windscreen abrasion, resulting in windscreens being rendered partially or completely opaque;

d. Fuel contamination;

e. Volcanic ash and/or toxic chemical contamination of cabin air-conditioning packs, possibly leading to loss of cabin pressurisation or noxious fumes in the cockpit and/or cabin;

f. Erosion, blockage or malfunction of external and internal aeroplane components;

g. Volcanic cloud static discharge, leading to prolonged loss of communications; and

h. Reduced electronic cooling efficiency, leading to a wide range of aeroplane system failures.

(2) The nature and severity of effects.

(3) Details of any device or system installed on the aeroplane that can detect the presence of volcanic cloud hazards (e.g. volcanic ash (particulate) sensors or volcanic gas sensors).

(4) The effect of volcanic ash on operations to/from contaminated aerodromes. In particular, deposits of volcanic ash on a runway can lead to degraded braking performance, most significantly if the ash is wet.

(5) 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/Despatch Deviation, or equivalents required to support the operator.

(6) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace and to/from volcanic ash-contaminated aerodromes; this may take the form of Instructions for Continuing Airworthiness or other advice.

II. Draft Decision CS-25

Book 1

SUBPART G OPERATING LIMITATIONS AND INFORMATION

GENERAL

CS 25.1501 General

(a) Each operating limitation specified in CS 25.1503 to 25.1533 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crew members and/or to the operator as appropriate, as prescribed in CS 25.1541 to ~~25.1587~~CS 25.1593.

~~(c) Supplementary information must be made available to the operator of each aeroplane as prescribed in CS 25.1591.~~

…

CS 25.1593 Exposure to volcanic cloud hazards

(See AMC 25.1593)

The susceptibility of aeroplane features to the effects of volcanic cloud hazards must be established.

Book 2

SUBPART G OPERATING LIMITATIONS AND INFORMATION

AMC 25.1593 Exposure to volcanic cloud hazards

The aim of CS 25.1593 is to support operators by identifying and assessing airworthiness hazards associated with operations in contaminated airspace. Providing such data to operators will enable those hazards to be properly managed as part of an established management system.

Acceptable means of establishing the susceptibility of aeroplane features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and/or testing of parts or sub-assemblies.

Information necessary for safe operation should be contained in the unapproved part of the flight manual, or other appropriate manual, and should be readily usable by operators in preparing a safety risk assessment as part of their overall management system.

A volcanic cloud comprises volcanic ash together with gases and other chemicals. Although the primary hazard is volcanic ash, other elements of the volcanic cloud may also be undesirable to operate through, and their effect on airworthiness should be assessed.

In determining the susceptibility of aeroplane features to the effects of volcanic clouds and the necessary information to operators, the following points should be considered:

(1) Identify the features of the aeroplane that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:

a. The malfunction or failure of one or more engines, leading not only to reduction or complete loss of thrust but also to failures of electrical, pneumatic and hydraulic systems;

b. Blockage of pitot and static sensors, resulting in unreliable airspeed indications and erroneous warnings;

c. Windscreen abrasion, resulting in windscreens being rendered partially or completely opaque;

d. Fuel contamination;

e. Volcanic ash and/or toxic chemical contamination of cabin air-conditioning packs, possibly leading to loss of cabin pressurisation or noxious fumes in the cockpit and/or cabin;

f. Erosion, blockage or malfunction of external and internal aeroplane components;

g. Volcanic cloud static discharge, leading to prolonged loss of communications; and

h. Reduced electronic cooling efficiency, leading to a wide range of aeroplane system failures.

(2) The nature and severity of effects.

(3) Details of any device or system installed on the aeroplane that can detect the presence of volcanic cloud hazards (e.g. volcanic ash (particulate) sensors or volcanic gas sensors).

(4) The effect of volcanic ash on operations to/from contaminated aerodromes. In particular, deposits of volcanic ash on a runway can lead to degraded braking performance, most significantly if the ash is wet.

(5) 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/Despatch Deviation, or equivalents required to support the operator.

(6) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace and to/from volcanic ash-contaminated aerodromes; this may take the form of Instructions for Continuing Airworthiness or other advice.

III. Draft Decision CS-27

Book 1

SUBPART G OPERATING LIMITATIONS AND INFORMATION

GENERAL

CS 27.1501 General

(a) Each operating limitation specified in CS 27.1503 to 27.1525 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crew members and/or to the operator as appropriate, as prescribed in CS 27.1541 to ~~27.1589~~CS 27.1593.

…

CS 27.1593 Exposure to volcanic cloud hazards

(See AMC 27.1593)

If required by an operating rule, the susceptibility of rotorcraft features to the effects of volcanic cloud hazards must be established.

Book 2

SUBPART G OPERATING LIMITATIONS AND INFORMATION

AMC 27.1593 Exposure to volcanic cloud hazards

The aim of CS 27.1593 is to support commercial operators and non-commercial operators operating complex motor-powered aircraft by identifying and assessing airworthiness hazards associated with operations in contaminated airspace. Providing such data to operators will enable those hazards to be properly managed as part of an established management system.

Acceptable means of establishing the susceptibility of rotorcraft features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and/or testing of parts or sub-assemblies.

Information necessary for safe operation should be contained in the unapproved part of the flight manual, or other appropriate manual, and should be readily usable by operators in preparing a safety risk assessment as part of their overall management system.

A volcanic cloud comprises volcanic ash together with gases and other chemicals. Although the primary hazard is volcanic ash, other elements of the volcanic cloud may also be undesirable to operate through, and their effect on airworthiness should be assessed.

In determining the susceptibility of rotorcraft features to the effects of volcanic clouds and the necessary information to operators, the following points should be considered:

(1) Identify the features of the rotorcraft that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:

a. The malfunction or failure of one or more engines, leading not only to reduction or complete loss of thrust but also to failures of electrical, pneumatic and hydraulic systems;

b. Blockage of pitot and static sensors, resulting in unreliable airspeed indications and erroneous warnings;

c. Windscreen abrasion, resulting in windscreens being rendered partially or completely opaque;

d. Fuel contamination;

e. Volcanic ash and/or toxic chemical contamination of cabin air-conditioning packs, possibly leading to loss of cabin pressurisation or noxious fumes in the cockpit and/or cabin;

f. Erosion, blockage or malfunction of external and internal rotorcraft components;

g. Volcanic cloud static discharge, leading to prolonged loss of communications; and

h. Reduced electronic cooling efficiency, leading to a wide range of rotorcraft system failures.

(2) The nature and severity of effects.

(3) Details of any device or system installed on the rotorcraft that can detect the presence of volcanic cloud hazards (e.g. volcanic ash (particulate) sensors or volcanic gas sensors)

(4) The effect of volcanic ash on operations to/from contaminated aerodromes.

(5) 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/Despatch Deviation, or equivalents required to support the operator.

(6) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace and to/from volcanic ash-contaminated aerodromes; this may take the form of Instructions for Continuing Airworthiness or other advice.

IV. Draft Decision CS-29

Book 1

SUBPART G OPERATING LIMITATIONS AND INFORMATION

GENERAL

CS 29.1501 General

(a) Each operating limitation specified in CS 29.1503 to 29.1525 and other limitations and information necessary for safe operation must be established.

(b) The operating limitations and other information necessary for safe operation must be made available to the crew members and/or to the operator as appropriate, as prescribed in CS 29.1541 to ~~29.1589~~CS 29.1593.

…

CS 29.1593 Exposure to volcanic cloud hazards

(See AMC 29.1593)

If required by an operating rule, the susceptibility of rotorcraft features to the effects of volcanic cloud hazards must be established.

Book 2

SUBPART G OPERATING LIMITATIONS AND INFORMATION

AMC 29.1593 Exposure to volcanic cloud hazards

The aim of CS 29.1593 is to support commercial operators and non-commercial operators operating complex motor-powered aircraft by identifying and assessing airworthiness hazards associated with operations in contaminated airspace. Providing such data to operators will enable those hazards to be properly managed as part of an established management system.

Acceptable means of establishing the susceptibility of rotorcraft features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and/or testing of parts or sub-assemblies.

Information necessary for safe operation should be contained in the unapproved part of the flight manual, or other appropriate manual, and should be readily usable by operators in preparing a safety risk assessment as part of their overall management system

A volcanic cloud comprises volcanic ash together with gases and other chemicals. Although the primary hazard is volcanic ash, other elements of the volcanic cloud may also be undesirable to operate through, and their effect on airworthiness should be assessed.

In determining the susceptibility of rotorcraft features to the effects of volcanic clouds and the necessary information to operators, the following points should be considered:

(1) Identify the features of the rotorcraft that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:

a. The malfunction or failure of one or more engines, leading not only to reduction or complete loss of thrust but also to failures of electrical, pneumatic and hydraulic systems;

b. Blockage of pitot and static sensors, resulting in unreliable airspeed indications and erroneous warnings;

c. Windscreen abrasion, resulting in windscreens being rendered partially or completely opaque;

d. Fuel contamination;

e. Volcanic ash and/or toxic chemical contamination of cabin air-conditioning packs, possibly leading to loss of cabin pressurisation or noxious fumes in the cockpit and/or cabin;

f. Erosion, blockage or malfunction of external and internal rotorcraft components;

g. Volcanic cloud static discharge, leading to prolonged loss of communications; and

h. Reduced electronic cooling efficiency, leading to a wide range of rotorcraft system failures.

(2) The nature and severity of effects.

(3) Details of any device or system installed on the rotorcraft that can detect the presence of volcanic cloud hazards (e.g. volcanic ash (particulate) sensors or volcanic gas sensors)

(4) The effect of volcanic ash on operations to/from contaminated aerodromes.

(5) 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/Despatch Deviation, or equivalents required to support the operator.

(6) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace and to/from volcanic ash-contaminated aerodromes; this may take the form of Instructions for Continuing Airworthiness or other advice.

V. Draft Decision CS-E

Book 1

SUBPART F TURBINE ENGINES - ENVIRONMENTAL AND OPERATIONAL DESIGN REQUIREMENTS

CS-E 1050 Exposure to volcanic cloud hazards

(See AMC E.1050)

(a) The susceptibility of turbine engine features to the effects of volcanic cloud hazards must be established.

(b) Information necessary for safe operation must be provided in the relevant documentation.

Book 2

SUBPART F TURBINE ENGINES - ENVIRONMENTAL AND OPERATIONAL DESIGN

AMC E 1050 Exposure to volcanic cloud hazards

Acceptable means of establishing the susceptibility of engine features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and/or testing of parts, sub-assemblies or engines.

Information necessary for safe operation should be contained in the relevant documentation. This information may be used to assist operators in producing operational data and instructions for their flight crews when operating in, or avoiding, airspace contaminated with volcanic clouds. The information should be readily usable by operators in preparing a safety risk assessment as part of their overall management system.

A volcanic cloud comprises volcanic ash together with gases and other chemicals. Although the primary hazard is volcanic ash, other elements of the volcanic cloud may also be undesirable to operate through, and their effect on airworthiness should be assessed.

In determining the susceptibility of turbine engine features to the effects of volcanic clouds and the necessary information to operators to allow safe engine operation, the following points should be considered:

(1) Identify the features of the turbine engine that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:

a. Erosion of compressor blades and other internal parts;

b. Glassy deposits on hot section parts, which can result in loss of surge margins, engine stall, flame out, and inability to restart engines;

c. Clogging of turbine blade cooling channels;

d. Corrosion of metallic parts;

e. Oil and fuel circuit contamination; and

f. Electrical, hydraulic and pneumatic systems.

(2) The nature and severity of effects.

(3) The related pre-flight, in-flight and post-flight precautions to be observed by the operator including any necessary amendments to Engine Manuals, Despatch Deviation, or equivalents, required to support the operator.

(4) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace; this may take the form of Instructions for Continuing Airworthiness or other advice.

VI. Draft Decision CS-P

Book 1

SUBPART A GENERAL

CS-P 80 Exposure to volcanic cloud hazards

(See AMC P.80)

For variable pitch propellers:

(a) The susceptibility of features of the propeller system to the effects of volcanic cloud hazards must be established.

(b) Information necessary for safe operation must be provided in the relevant documentation.

Book 2

SUBPART A GENERAL

AMC P 80 Exposure to volcanic cloud hazards

Acceptable means of establishing the susceptibility of propeller features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and/or testing of parts, sub-assemblies or propellers.

Information necessary for safe operation should be contained in the relevant documentation. This information may be used to assist operators in producing operational data and instructions for their flight crews when operating in, or avoiding, airspace contaminated with volcanic clouds. The information should be readily usable by operators in preparing a safety risk assessment as part of their overall management system.

A volcanic cloud comprises volcanic ash together with gases and other chemicals. Although the primary hazard is volcanic ash, other elements of the volcanic cloud may also be undesirable to operate through, and their effect on airworthiness should be assessed.

In determining the susceptibility of variable pitch propeller features to the effects of volcanic clouds and the necessary information to operators to allow safe propeller operation, the following points should be considered:

(1) The features of the propeller system that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:

a. Erosion of propeller blades and other propeller system components;

b. Corrosion of metallic parts;

c. Oil circuit contamination; and

d. Electrical, hydraulic and pneumatic systems;

(2) The nature and severity of effects.

(3) The related pre-flight, in-flight and post-flight precautions to be observed by the operator including any necessary amendments to Propeller Manuals, Despatch Deviation, or equivalents required to support the operator.

(4) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace; this may take the form of Instructions for Continuing Airworthiness or other advice.

VII. DRAFT DECISION CS-APU

Book 1

SUBPART D CATEGORY 1 APUs. ADDITIONAL SPECIFICATIONS

CS-APU 550 Exposure to volcanic cloud hazards

(See AMC APU.550)

(a) The susceptibility of features of the APU to the effects of volcanic cloud hazards must be established.

(b) Information necessary for safe operation must be provided in the relevant documentation.

Book 2

SUBPART D CATEGORY 1 APUs. ADDITIONAL SPECIFICATIONS

AMC APU 550 Exposure to volcanic cloud hazards

Acceptable means of establishing the susceptibility of APU features to the effects of volcanic clouds should include a combination of experience, studies, analysis, and/or testing of parts, sub-assemblies or APUs.

Information necessary for safe operation should be contained in the relevant documentation. This information may be used to assist operators in producing operational data and instructions for their flight crews when operating in, or avoiding, airspace contaminated with volcanic clouds. The information should be readily usable by operators in preparing a safety risk assessment as part of their overall management system.

A volcanic cloud comprises volcanic ash together with gases and other chemicals. Although the primary hazard is volcanic ash, other elements of the volcanic cloud may also be undesirable to operate through, and their effect on airworthiness should be assessed.

In determining the susceptibility of Category 1 APU features to the effects of volcanic clouds and the necessary information to operators to allow safe APU operation, the following points should be considered:

(1) The features of the APU that are susceptible to airworthiness effects from volcanic clouds. These may include, but are not limited to the following:

a. Erosion of compressor blades and other internal parts;

b. Glassy deposits on hot section parts, which can result in loss of surge margins, APU stall, flame out, and inability to restart APUs;

c. Clogging of turbine blade cooling channels;

d. Corrosion of metallic parts;

e. Oil circuit contamination; and

f. Electrical, hydraulic and pneumatic systems.

(2) The nature and severity of effects.

(3) The related pre-flight, in-flight and post-flight precautions to be observed by the operator including any necessary amendments to APU Manuals, Despatch Deviation, or equivalents required to support the operator.

(4) The recommended continuing airworthiness inspections associated with operations in volcanic cloud contaminated airspace; this may take the form of Instructions for Continuing Airworthiness or other advice.

Appendix A - Attachments

FINAL-BCAcmts-NPA-2011-17-Volcanic_Ash.pdf
Attachment #1 to comment #69

11 12 20 EASA Volcanic Ash NPA Response - ICCAIA IATA AEA - General Comments - FINAL.pdf

Attachment #2 to comment #70

11.12.20 ICCAIA Response to EASA Volcanic Ash NPA - FINAL.pdf

Attachment #3 to comment #71

A&C-11-636, GAC Response to NPA 2011-17 Volcanic Ash.pdf

Attachment #4 to comment #98

2886-RC-Snecma comments on NPA 2011-17.pdf

Attachment #5 to comment #99

1145.pdf

Attachment #6 to comment #124

EASA NPA 2011-17 (Volcanic ash).pdf

Attachment #7 to comment #134