



TWELFTH AIR NAVIGATION CONFERENCE

Montréal, 19 to 30 November 2012

Agenda Item 4: Optimum capacity and efficiency – through global collaborative ATM

4.1: Efficient management of airspace and improved flow performance through collaborative decision-making (CDM)

VOLCANIC ASH – NEW ZEALAND’S RISK-BASED RESPONSE

(Presented by New Zealand)

SUMMARY

Volcanic ash from the Puyehue Cordon Caulle volcano eruption in Chile extended over wide areas of Australia, the Tasman Sea, New Zealand and South Pacific and Southern Oceans in June 2011. New Zealand’s response was to implement a risk-based operating approach that provided for safe airline operations proximal to the volcanic ash contaminated airspace. This allowed for more flights and less disruption to travellers during this time.

1. INTRODUCTION

1.1 Volcanic ash from the Puyehue Cordon Caulle volcano eruption in Chile extended over wide areas of Australia, the Tasman Sea, New Zealand and South Pacific and Southern Oceans in June 2011. The eruption started on 4 June 2011, began affecting New Zealand airspace around 13 June and remained in the Wellington Volcanic Ash Advisory Centre region until 4 July 2011.

1.2 The Civil Aviation Authority’s (CAA) past response to the presence of volcanic ash cloud in New Zealand airspace (Mt Ruapehu eruption events of 1995 and 1996) was to impose moving restrictions on airspace use. These responses were similar to those imposed in Europe with the Icelandic eruptions of 2010 and 2011. While effective from a safety point of view, these restrictions were a blunt tool for addressing the safety risk posed by the ash cloud, imposing a high cost on airlines and the public. The restrictions had to be constantly revised given the changing dispersion paths and dimensions of the ash cloud. This significantly (and perhaps unnecessarily) disrupted air travel.

1.3 Volcanic ash clouds pose significant potential safety risks. After the Mt Ruapehu events 15 years ago, the CAA developed a risk-based regulatory strategy for responding to any future volcanic ash situation. The strategy addresses the risks and minimises disruption to air travel. The full details of the strategy are set out the CAA document, *Living with Volcanic Ash Episodes in Civil Aviation*.¹

¹ http://www.caa.govt.nz/Meteorology/Volcanic_Ash_Advisory_System.htm.

2. BACKGROUND - THE PUYEHUE CORDON CAULLE VOLCANIC ERUPTION ASH PLUME

2.1 The Puyehue Cordon Caulle volcanic ash plume provided the CAA with an opportunity to manage the regulatory oversight of aircraft in the affected airspace using a risk-based approach.

2.2 This approach provides a more dynamic and flexible response than measures such as closing large tracts of airspace. It rests on the availability of good information on the location and dimensions of the ash plume, and on airlines taking the responsibility to determine whether flights can be safely conducted in the vicinity of the plume.

2.3 The information from the Wellington Volcanic Ash Advisory Centre (Wellington VAAC) identifies airspace as either having ash or not having ash. It sets the boundary around the ash conservatively to ensure that this can be regarded as a well-defined (ash/no ash) boundary². In accordance with ICAO standards³ airlines and other aircraft operators are required to avoid identified volcanic ash plumes completely (and they often add a further buffer to the boundaries).

2.4 New Zealand's approach contrasted with the situation in Europe after the Eyjafjallajökull and Grimsvotn eruptions in Iceland and the consequent distribution of volcanic ash through European airspace. The United Kingdom and European authorities notified "low-density" ash concentration levels through which aircraft could be permitted to operate (with specific authorization from State of Registry), medium-density areas where short duration flight was acceptable, and high-density areas that represented legally linked "no-fly" zones.

2.5 Notwithstanding considerable advances since the Icelandic eruption in 2010 to better understand and document the observation and forecasting of volcanic ash in the atmosphere, significant questions remain on the scientific validity of the density areas concept and model, measurement, and validation of the model outputs, and the density frameworks have yet to be internationally accepted. While this scientific perspective is recorded in the work of the WMO/IUGG Volcanic Ash Scientific Advisory Group and ICAO IVATF Science Sub-Groups, it is also noted that the effective and efficient use of such information in airline planning, and operations, and in the air traffic management system is similarly fraught.

2.6 Engine and aircraft manufacturers have yet to provide empirically proven specifications of acceptable ash tolerances (density levels) for their products. In the absence of this information and the scientific and modelling development for density frameworks, New Zealand will maintain and continue to monitor its current strategy. It is satisfied that the Wellington VAAC volcanic ash plume forecast information is accurate, that airlines are making appropriate operating decisions based on that information, and that safe operations can be carried out.

3. PRINCIPLES OF THE RISK-BASED RESPONSE

3.1 New Zealand has for some time had a mature volcanic ash advisory system with inputs from the MetService, the Institute of Geological and Nuclear Sciences, the Airways Corporation and airline operators. The existence of this system has provided a good base for adoption of a risk-based approach.

² The Wellington VAAC and MWO are operated by Meteorological Service of New Zealand (MetService) under contract to the CAA, <http://vaac.metservice.com/>.

³ the International Civil Aviation Organization's (ICAO) standards and recommended practices for volcanic ash are in Annex 3 – Meteorological Service for International Air Navigation and associated ICAO guidance covering the International Airways Volcano Watch system (IAVW)

3.2 The approach has three key premises:

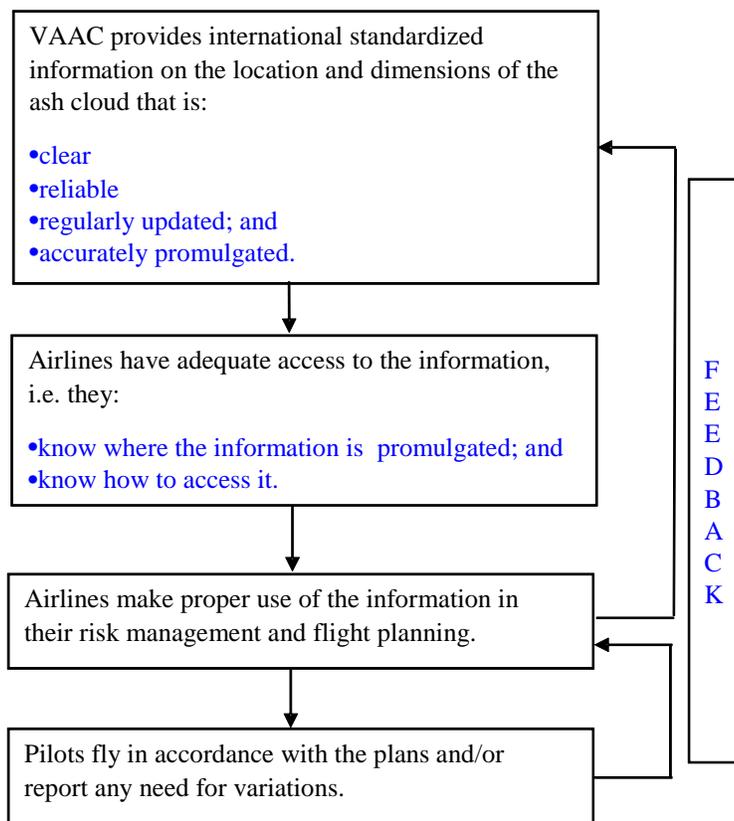
- a) accurate observation and remote sensing information of volcanic ash plume location and dimensions;
- b) accurate forecasts based on predictive models on the future location of the ash cloud(s) and its vertical and horizontal limits; and
- c) airlines making use of this information to appropriately identify and manage the associated operational risks in the planning and conduct their flights to avoid ash cloud, or to cancel flights where this cannot be done.

3.3 The approach has the following advantages, as it:

- a) enables a quick response to continuous change in the location and dimensions of the ash cloud;
- b) poses minimal disruption to air travel; and
- c) places the responsibility for operational judgements with the airline operator(s) to ensure they remain focused on effectively identifying and managing risks in order to maintain safe operations.

3.4 The approach reinforces active airline risk identification and management. It is consistent with the New Zealand civil aviation regulatory outcome approach, set out in New Zealand civil aviation rules and empowering legislation.

3.5 The diagram below summarizes the approach:



3.6 The CAA carefully verifies that all elements of the approach are in place before permitting operations. This can be a relatively intensive process. With each element of the 'approach' there are associated risks. The regulator seeks assurance and evidence that those risks are being properly identified and managed. The CAA's checks include the:

- a) Wellington (VAAC) and the Meteorological Watch Office (MWO) check the accuracy of the information provided. Feedback is sought from the airlines and oversight is provided by the CAA;
- b) airlines ensure that their risk management and planning processes provide for the latest volcanic ash advisory material (VAA/G), SIGMET and route information to be available and used by pilots;
- c) pilots assist in verifying the accuracy of the VAAC/MWO information by giving direct feedback (VAR – special air reports) to airline operational planning and the VAAC/MWO; and
- d) CAA monitors operations in the airlines and in the air traffic management system.

3.7 The CAA has established a monitoring group with, among others the:

- a) Director of Civil Aviation (Chair);
- b) CAA's General Manager Airlines;
- c) CAA's General Manager Aviation Infrastructure; and
- d) CAA's Chief Meteorological Officer.

3.8 The group meets as required to review the status of the ash cloud and the airline operational responses.

3.9 Should the operational response not provide an acceptable level of safety in the system then the CAA is able to implement appropriate measures. The legal measures available to the CAA are set out in Appendix A. Before selecting any of these, the CAA would need to identify the nature of the issue it is seeking to manage as this will influence the choice of regulatory intervention.

4. DISCUSSION

4.1 The Puyehue Cordon Caulle volcanic ash circumnavigated the southern Hemisphere at least twice (Appendix B refers).

4.2 On a number of occasions while the Puyehue Cordon Caulle volcanic ash was in New Zealand airspace, the CAA, in collaboration with Airways New Zealand, lowered the controlled airspace over parts of mainland New Zealand to FL090. This allowed regular regular passenger transport operations to continue down to that level if necessary in particular areas.

4.3 Similarly, the CAA, in collaboration with the Civil Aviation Safety Authority of Australia (CASA) on a number of occasions lowered the controlled airspace over the Tasman Sea to FL145 to provide controlled airspace for those airlines wishing to operate the trans-Tasman routes. CASA mirrored the New

Zealand airspace changes in the adjoining Australian airspace over the Tasman Sea. Numerous flights were operated across the Tasman at flight levels below FL200.

4.4 In their interaction with the CAA approach some airlines elected to cease operations while others implemented changes to procedures, routes and flight levels to continue operations where possible.

4.5 The CAA is confident that the risk approach for the management of aircraft operations proximal to volcanic ash is providing the level of safety confidence expected by the travelling public while providing for contingent and safe airline operations.

4.6 In 2012 the ICAO International Volcanic Ash Task Force finalised the guidance document, Flight Safety and Volcanic Ash (Doc 9974) amongst its other outputs. This co-sponsored document (ACI, CANSO, IATA, ICCAIA, IFALPA and IFATCA) has effectively supported the risk-based management of volcanic ash mitigation and underscored the importance of operational decision making remaining with the airlines.

4.7 A template developed by the ICAO International Volcanic Ash Task Force (IVATF) covers Air Traffic management, Volcanic Ash Contingency planning. This document will provide the ATM perspective to complement ICAO Doc 9974, which is aimed at airlines and aircraft operators.

4.8 Development work has now been completed in New Zealand for the provision of Volcano Observatory Notices for Aviation (VONA), originally designed for transmission only to VAACs, to be made available to airline operations centres. This will give airlines better pre-eruptive information to manage their pre-flight route planning and optimisation.

4.9 New Zealand continues to take an active role in the ICAO International Airways Volcano Watch Operations Group (IAVWOPSG) and the CAA will strongly support the further development of the International Airways Volcano Watch system on the recommendations made to it at the meeting of the IVATF in June 2012.

5. CONCLUSION

5.1 The Conference is invited to note the contents of this paper.

APPENDIX A

REGULATORY OPTIONS – WITH RESPECT TO ANY CAA SAFETY CONCERNS REGARDING VOLCANIC ASH

1 Standard Airspace Restrictions

1.1 Certain restrictions are automatically in place in the advent of volcanic eruptions in the New Zealand area:

- a) Volcanic hazard zones – designated under Civil Aviation Rules, Part 71 *Designation and Classification of Airspace*.
- b) Rule 91.137 prohibits operation by a pilot within a volcanic hazard zone in certain named conditions.

2 Contingent Airspace Restrictions and Prohibition on Use of Aircraft

2.1 Should the Director of Civil Aviation deem necessary because some element in the standard approach to the management of operations in a volcanic ash event cannot or is not functioning correctly, he/she can implement the following:

- a) Restricted and danger areas – designated under Part 71.
- b) Prohibiting operations by a pilot unless approved by the administering authority and compliant with conditions imposed for the area (Rule 91.129 *Restricted and danger areas*).
- c) Prohibition of, or imposition of conditions on, use of aircraft or all aircraft of a class under Section 21 of the Civil Aviation Act. The Director may prohibit or impose conditions on use of aircraft should there be reasonable grounds to believe that operation or use of aircraft or class of aircraft may endanger persons or property.

3 Contingent Emergency Rule

3.1 Section 31 of the Act text: “alleviate or minimise the risk of death or serious injury to any person or damage to property”.

3.2 Temporary time-frame not exceeding 90 days, renewed once by Director of Civil Aviation for 30 days or Minister may renew for further 180 days. This option would allow the solution to be tailored to a dynamic situation.

4 Contingent Conditions on Aviation Documents

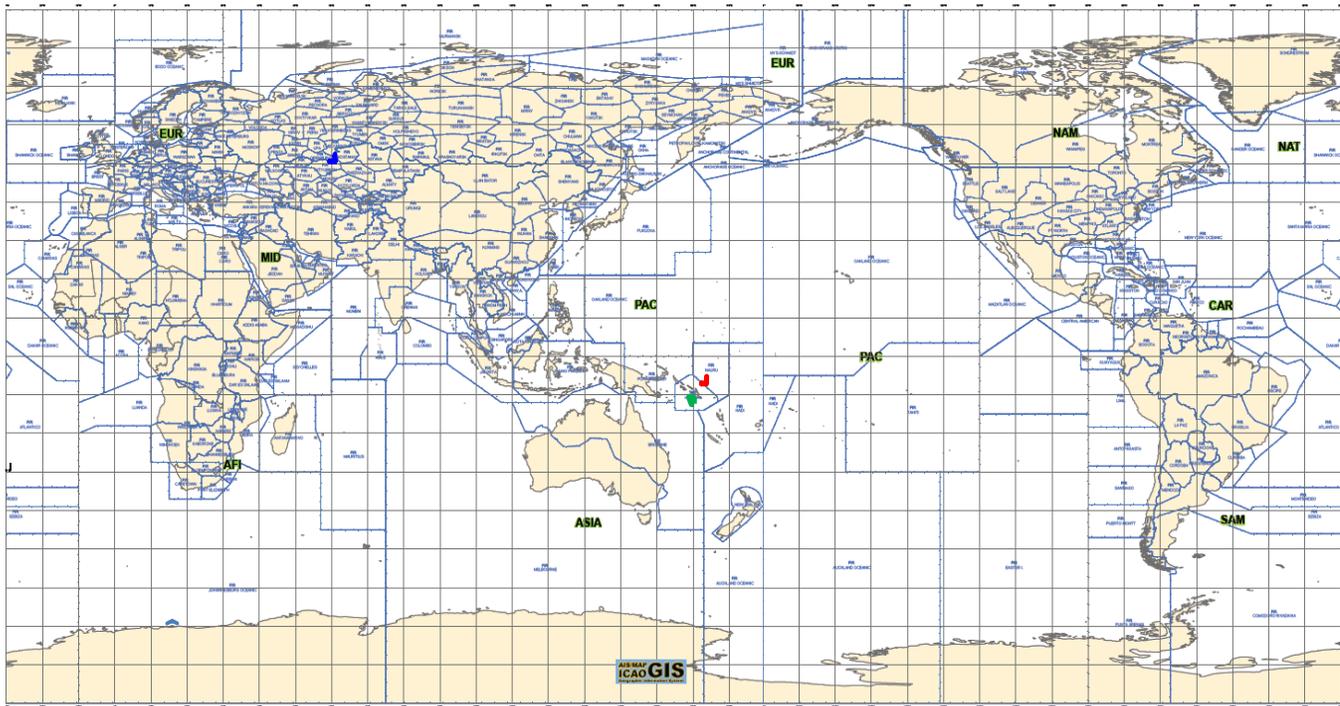
4.1 Conditions on operating certificates of operators – Need to follow section 17, 18 procedure – requires section 11 notice procedure – time consuming to do when CAA formally seeks these. Operators, however, often make voluntary changes in response to CAA concerns.

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APPENDIX B

ASH DISTRIBUTION FROM THE PUYEHUE CORDON CAULLE VOLCANO IN 2011

Volcanic ash from the Puyehue Cordon Caulle volcano 2011 eruption in Chile extended over much of the area bounded by the blue line in the map below.



ICAO ASIA/PAC Region

Auckland Oceanic FIR

Wellington VAAC

Approximate Puyehue Cordon Caulle Volcanic Ash Distribution mid - 2011

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