



International Civil Aviation Organization

**FIFTEENTH MEETING OF THE
COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND
METEOROLOGY SUB-GROUP (CNS/MET SG/15) OF APANPIRG**

Bangkok, Thailand, 25 – 29 July 2011

Agenda Item 9: Regional Implementation of International Airways Volcano Watch (IAVW)

VOLCANIC ASH – NEW ZEALAND CAA RISK BASED RESPONSE

(Presented by New Zealand)

SUMMARY

The volcanic ash plume recently over New Zealand had significant implications for aviation operations in the region. This information paper outlines the risk based operating strategy the Civil Aviation Authority of New Zealand has implemented to provide for safe airline operations proximal to volcanic ash contaminated airspace.

Strategic Objectives:

- A: Safety
- C: Sustainability

Global Plan Initiatives:

- GPI-18 Aeronautical information
- GPI-19 Meteorological Systems

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 recent weeks (refer to Appendix 2). The eruption started on 4 June 2011 and is on-going but at a low level at the date of providing this paper. Volcanic ash cloud remained in New Zealand airspace and the Wellington VAAC region for some time.

1.2 The Civil Aviation Authority's (CAA) past responses to the presence of volcanic ash cloud in New Zealand airspace (Mt Ruapehu eruption events of 1995 and 1996) were to impose moving restrictions on airspace use. Such restrictions, while relatively effective from a safety point of view were seen to be a blunt tool for addressing the problem. These moving restrictions (similar to what has been imposed in Europe with the Icelandic eruptions of 2010 and 2011) resulted in high costs for the airlines and the public, in comparison with the safety risk. Restrictions had to be constantly revised given the constant shifts in location and dimensions of the ash cloud and the blanket nature of the restrictions significantly (and perhaps unnecessarily) disrupted air travel.

1.3 The presence of the volcanic ash cloud poses significant potential safety risks. In preparation for such volcanic events, the CAA developed a risk-based regulatory strategy after the Mt Ruapehu events 15 years ago, for responding to any future volcanic ash situation. The strategy seeks to address the risks and minimises disruption to air travel. The full details of this are set out the CAA document, *Living with Volcanic Ash Episodes in Civil Aviation*.¹

1.4 This Information Paper outlines the features of the strategy as they are being applied to the volcanic ash plumes from the Puyehue Cordon Caulle volcanic eruption in Chile.

2. Discussion

2.1 The CAA is managing this current Puyehue Cordon Caulle volcanic ash situation using a risk based regulatory approach.

2.2 This strategy provides a more dynamic and flexible response than measures such as closing large tracts of airspace. It is made possible by the availability of good information regarding the location and dimensions of the ash plume. It properly places the responsibility on airlines to determine whether flights can be safely conducted in the vicinity of the plume.

2.3 At present the information on the ash plume identifies airspace as either having ash or not having ash. The Wellington Volcanic Ash Advisory Centre (VAAC) sets the boundary around the ash conservatively to ensure that this can be regarded as a well defined (ash/no ash) boundary². Airlines and other aircraft operators are required to avoid identified volcanic ash plumes completely (and they often add a further buffer to the boundaries). This is in accordance with the International Civil Aviation Organization's (ICAO) standards and recommended practices for volcanic ash in Annex 3 – Meteorological Service for International Aviation and associated ICAO guidance covering the International Airways Volcano Watch system (IAVW).

2.4 The CAA's approach contrasts with the situation in Europe after the Eyjafjallajökull and Grimsvotn eruptions in Iceland that involved distribution of volcanic ash over European airspace. This resulted in the UK and European authorities developing and notifying "low density" ash concentration levels through which aircraft could fly (with specific authorisation 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 The concept of density levels was implemented in Europe as a way to provide ostensibly usable airspace having previously implemented blanket closures of airspace. However, these density frameworks have not yet been internationally accepted. This is because there remain questions of the scientific validity of the density areas and model, measurement, validation of the model outputs, the effective and efficient use of the information in airline planning and operations and in the air traffic management system itself.

Another important consideration is that the engine and aircraft manufacturers have not yet been able to provide empirically proven specifications of acceptable ash tolerances (density levels) for their products.

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

² The Wellington VAAC and MWO are operated by Meteorological Service of New Zealand (MetService) under contract to the CAA.

2.6 In the absence of the satisfactory completion of all the empirical engineering, scientific and modelling development for such density frameworks, the New Zealand CAA will maintain the pragmatic approach it has taken in the region for some time.

2.7 Nevertheless, the CAA is actively monitoring the implementation of this current strategy. It is presently satisfied that volcanic ash plume forecast information is accurate, that airlines are making appropriate operating decisions based on that information, and that safe operations are being carried out as a result.

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 MetService, the Institute of Geological and Nuclear Sciences, the Airways Corporation and airline operators. The existence of this system provides a good basis for adopting a more dynamic risk-based approach to the problem.

3.2 The approach is based on three key premises:

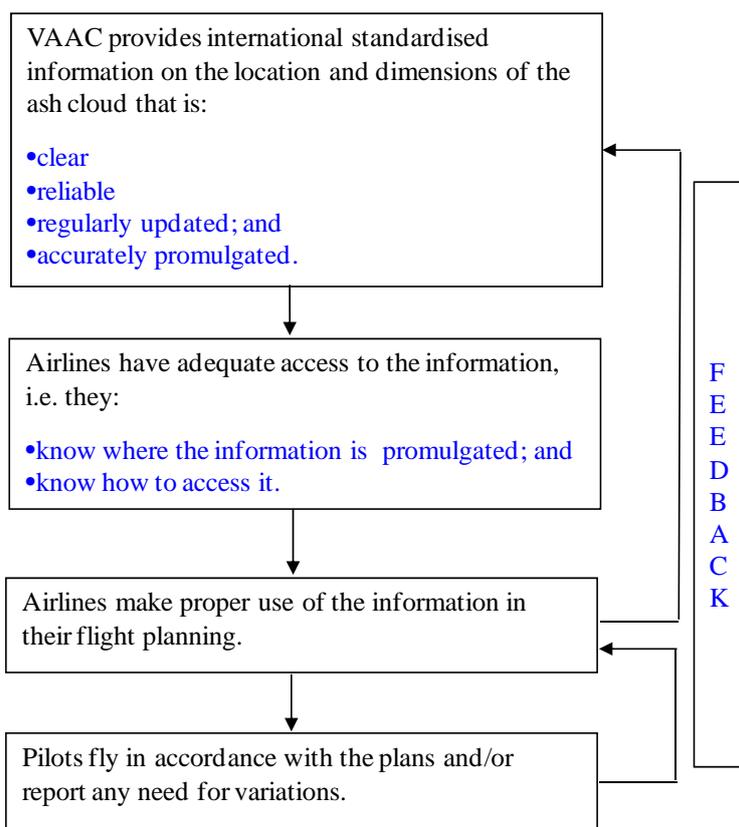
- a. accurate observation and remote sensing information of volcanic ash plume location and dimensions;
- b. accurate forecasts based on predictive models regarding the future location of the ash cloud(s) and its vertical and horizontal limits; and
- c. airlines making proper use of this information to plan and conduct their flights so as to avoid the cloud, where this can be done safely, or to cancel flights where this cannot be done.

3.3 The advantages of this risk based approach are that it:

- a) is able to quickly respond to continuous change in the location and dimensions of the ash cloud;
- b) poses minimal disruption to air travel; and
- c) puts the responsibility for making operational judgements where it properly belongs – with the airline operator(s).

3.4 Relying on the airlines, given good information on ash location and movement, to act responsibly and make appropriate operational decisions to avoid the ash plume, is consistent with the regulatory principles contained in the Civil Aviation Act and the CAA's regulatory philosophy generally.

3.5 The basic strategy can be summarised by the following diagram:



3.6 The CAA verified that all elements of the strategy were in place before permitting operations to be undertaken in accordance with the strategy.

3.7 The CAA recognised that there are risks in each element of the strategy and these risks compound from one element to the next, i.e., the total risk will be the product of the risks in each of the elements. The effectiveness of the strategy therefore depends on each step being rigorously applied, good communications between all participants and on-going checks being made to ensure that this is occurring.

3.8 Checks include:

- a) Wellington Volcanic Ash Advisory Centre (VAAC) and Meteorological Watch Office (MWO) checking the information it is providing is accurate with feedback from airlines and oversight from CAA;
- b) airlines checking their planning processes have access to the latest volcanic ash advisory material (VAA/G), SIGMET and route information and are using it appropriately, with oversight from CAA;
- c) airlines monitoring that pilots are following the requisite processes, policies and flight plans;
- d) pilots verifying the accuracy of the VAAC/MWO information through providing direct feedback (VAR – special air reports) to airline operational planning and the VAAC/MWO; and
- e) CAA monitoring operations in the air traffic management system and at airports.

3.9 To ensure adequate CAA monitoring of the process, the CAA established a monitoring group comprising critical participation from, and amongst others:

- a) Director of Civil Aviation (Chair)
- b) General Manager Airlines
- c) Manager Meteorology Authority

3.10 The group meets as required and with highest priority to review the status of the ash cloud and the airline operational responses.

3.11 The CAA intends to continue to apply this regulatory strategy unless it determines that it is not able to safely continue applying it, because one or more of the strategy elements has been degraded or is not able to be used as intended. In such a case the CAA may either adopt alternative measures; or maintain the approach, but supplement it with other measures.

3.12 The aim of any alternative or supplementary measure would be to restore an acceptable level of safety in the system. The legal measures available to the CAA are set out in Appendix 1. 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. Using general principles, the intervention should:

- a) utilise a tool (or combination of tools) aimed at ensuring an acceptable level of safety, while being proportionate to the safety risk or non-compliance involved;
- b) strike the appropriate balance between commercial imperatives and/or adverse effects on people or organisations involved, and public safety;
- c) where appropriate, provide any person or entity subject to the regulatory action a time-bound opportunity to meet the applicable standard or mitigate risk, including putting in place systems that will ensure on-going compliance with the standard can be achieved; and
- d) result in quick action to mitigate risk where there is a significant risk to public safety.

4. **Summary**

4.1 The CAA is confident that the risk approach that it is taking toward 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.

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

4.3 Similarly, the CAA, in collaboration with the Australian Civil Aviation Safety Authority (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 strategy, some airlines elected to cease operations while others implemented safety management system risk based operational changes to procedures, routes and flight levels to continue operations where possible.

5. Action by the Meeting

5.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate

APPENDIX 1

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 Rule 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 can implement the following:

- a) Restricted and danger areas – designated under Part 71, Designation and Classification of Airspace.
- b) Prohibit operations by a pilot unless approved by the administering authority and compliant with conditions imposed for the area. Rule 91.129 (General Operating and Flight Rules).
- c) Prohibition the use of aircraft 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 - Test “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.

APPENDIX 2

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

