International Civil Aviation Organization

Fifteenth Meeting of the APANPIRG ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/15)

Bangkok, Thailand, 25 – 29 July 2005

Agenda Item 4: Consider problems and make specific recommendations concerning the provision of ATM/AIS/SAR in the Asia/Pacific Region

CONTINGENCY PLANNING FOR VOLCANIC ERUPTIONS

(Presented by IATA)

SUMMARY

This working paper summarizes some of the more important points and lessons learned in contingency planning in the event of a volcanic eruption.

1. INTRODUCTION

1.1 The success of any contingency plan to mitigate aircraft encounters with volcanic ash depends on a large network of services and communications between regulators, controllers, pilots, airline operations centres, meteorologists, volcanologists and Volcanic Ash Advisory Centres (VAAC's). Many State ATS Providers wrongly assume that volcanic ash does not concern them because there are no volcanoes in their territory. However, volcanic ash travels for thousands of miles and the ash cloud itself can be in excess of 2000 miles long (see attachment A). For example a B747 over Chicago, Illinois was damaged by ash from the Philippines. Another example is when a DC9 on descent into El Paso, Texas was damaged by volcanic ash from Alaska.

2. DISCUSSION

The following elements should be considered in the development of contingency plans to avoid aircraft encounters with volcanic ash.

2.1 Monitoring

2.1.1 Precursor information supplied by volcanologist is critical to a successful volcano program for ATS. In particular, real time seismic monitoring is essential for precursory activities as well as detection of explosive events. This is of paramount importance for active volcanoes that are near busy air routes and for any volcanoes that have a history of explosive projections of ash into the upper flight levels. These volcanoes should have seismic monitoring.

2.2 Detection

2.2.1 Determining whether a volcano has actually erupted is the most urgent and critical exercise to air safety, and can be very difficult to determine, even when a pilot observes a "plume". Volcanoes have been known to vent steam 25 thousand feet high giving costly false alarms of an explosive volcanic event. For this reason a special Volcanic Activity (VAR) Form (see

Attachment B) was developed and included in PANS-ATM that equips both controllers and pilots to ask and answer the questions that experts need to know in order to determine if a volcanic eruption actually took place. This VAR form should be readily available to controllers as part of that facility's Volcano Contingency Plan.

2.2.2 Placing seismic instruments at the volcano is many times the only way that an actual eruption can be verified, especially during times of low visibility. However, it cannot be overemphasised that the verification of an actual eruption is paramount to safety. What happens during the first 30 minutes after an eruption is vital to flight safety.

2.2.3 Essential detection includes more than just the starting of an event. Also essential is the ending of event, and all movement in-between. Radar, satellite imagery, computer modelling and pilot reports all play an important role in detecting and defining the ash cloud. It must be remembered that the cloud itself is a 3-dimensional mass and determining its coverage can be a very challenging and misleading exercise. As example, during the 1990 eruption of Mount Readout in Alaska ash reports indicated ash movement in many different directions. Depending on the altitude, ash was drifting south, southeast, east, east & then southwesterly, and northeasterly (see Attachment C).

2.3 Communication

2.3.1 Communication is critical to a successful contingency plan. This includes rapid communication between adjacent State ATS providers, to pilots in the air, airline operations, Volcano Ash Advisory Centres (VAACs), Meteorological Watch Offices, military and other civil authorities. Everything is time critical and must be in place as part of the contingency plan.

2.3.2 For Air Traffic Services a central point of contact that is known to all stakeholders is critical and needs to be clearly defined and known by all participants.

2.3.3 Communications needs to be clear, concise and relevant. State ATS Providers should use the Green, Yellow, Orange and Red colour codes (see Attachment D) contained in the Handbook on the International Airways Volcano Watch (Doc 9766). These colour codes are extremely valuable and quickly provide an easy to understand relevance to a volcano or an event. This will also require the assistance of a VAAC or Volcano Observatory in order to determine the proper colour code.

2.3.4 ASHTAM's, NOTAM's, Volcanic Ash Advisories and other flight information must be quickly and concisely promulgated. Volcano contingency plans at ACC's should already have in place generic examples of ASHTAM's, NOTAM's already drafted so that the actual promulgation is only a fill in the blank exercise and not an exercise of trying to determine what to write. These are very time critical exercises!

2.4 Air Traffic Management

2.4.1 Proper Air Traffic Management is critical to flight safety as any aircraft encounter with ash can be very damaging and potentially fatal. Once again time is one of the more critical factors. Once an event is known or suspected, controllers should immediately start soliciting pilot reports to determine airspace conditions. All information of relevance to a volcanic eruption must be immediately provided to the ATS Provider to help determine what airspace to sterilize and how to route air traffic around volcanic ash clouds. When the position and speed of ash clouds is unknown, untimely, or vague, then huge sections of airspace must be sterilized from air traffic. While this can be a gross inefficient use of airspace, this sometimes extreme caution is necessary to ensure safety of flight. Once again the role of the VAAC cannot be underemphasized in helping to determine ash drift by using computer modelling to help define potential size and direction of ash clouds.

2.4.2 After a volcanic eruption, aircraft in the vicinity must be immediately informed of all relevant information and controllers need to assist and clear aircraft from airspace affected or potentially affected with volcanic ash. When a course of action is uncertain, controllers should work with the pilot and suggest headings or reroutes around known ash or possible ash areas.

3. ACTION BY MEETING

3.1 The meeting should note that volcanic eruptions pose as one of the more serious threats to flight safety. The meeting should also note that a coordinated team effort must occur AS SOON AS POSSIBLE after a volcanic eruption that emits ash into airspace shared with aircraft. The only way to ensure potential success is to have contingency plans already developed, in place and understood by all parties.

3.2 The meeting is asked to consider the following as a meeting Conclusion:

Conclusion XX – Volcano Contingency Planning

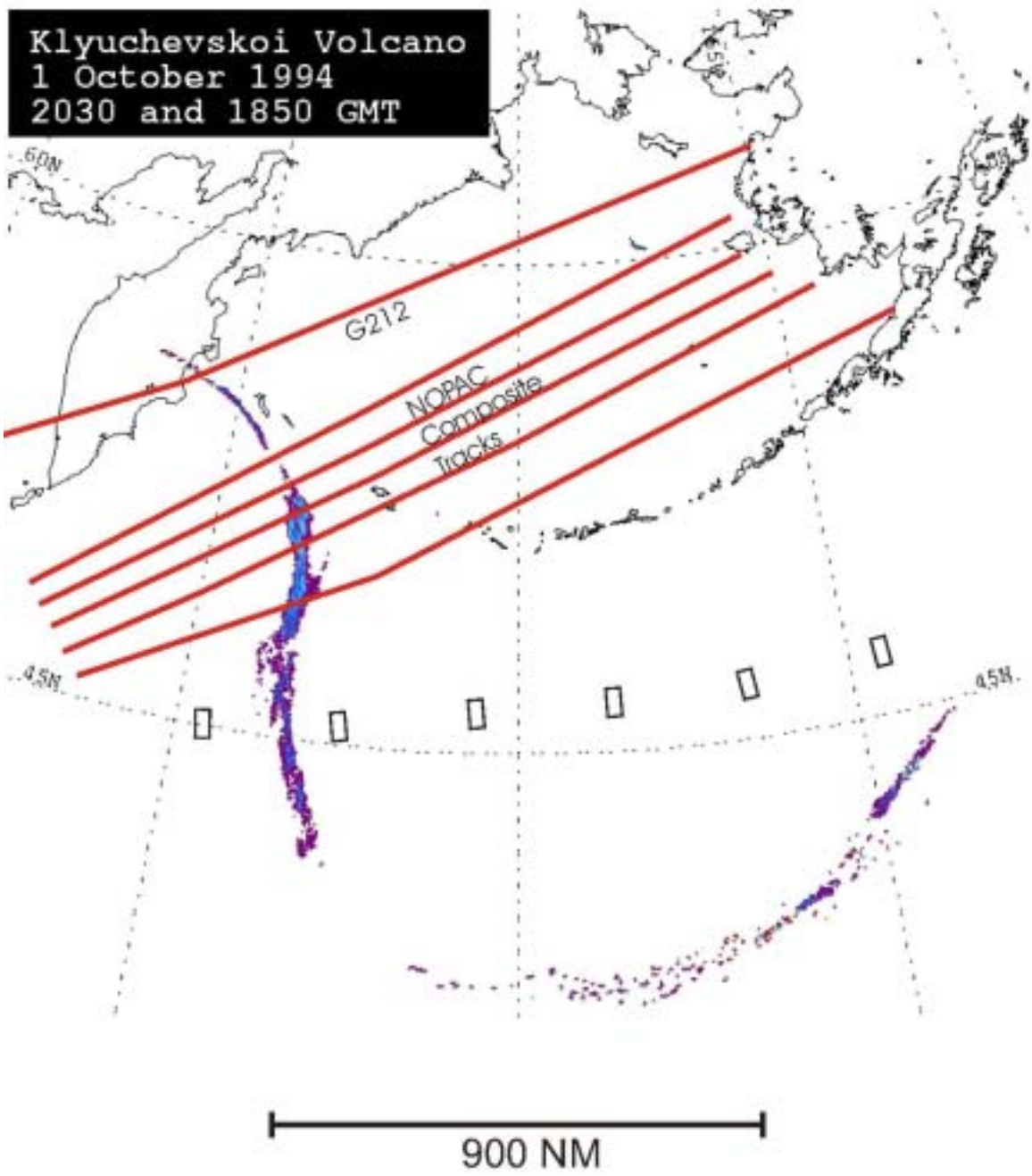
That, States review, amend or develop contingency plans that will:

a. Promulgate the status of active volcanoes via the colour code system as defined in the Handbook on the International Airways Volcano Watch (Doc 9766).

b. Provide templates and a rapid means of disseminating ASHTAM's, NOTAM's, Volcanic Ash Advisories and other flight information, and

c. Provide Air Traffic Management policy and coordination procedures that provide a safe and orderly flow of air traffic around areas of volcanic ash.

Attachment A



Attachment B

2. Special air-report of volcanic activity form (Model VAR)

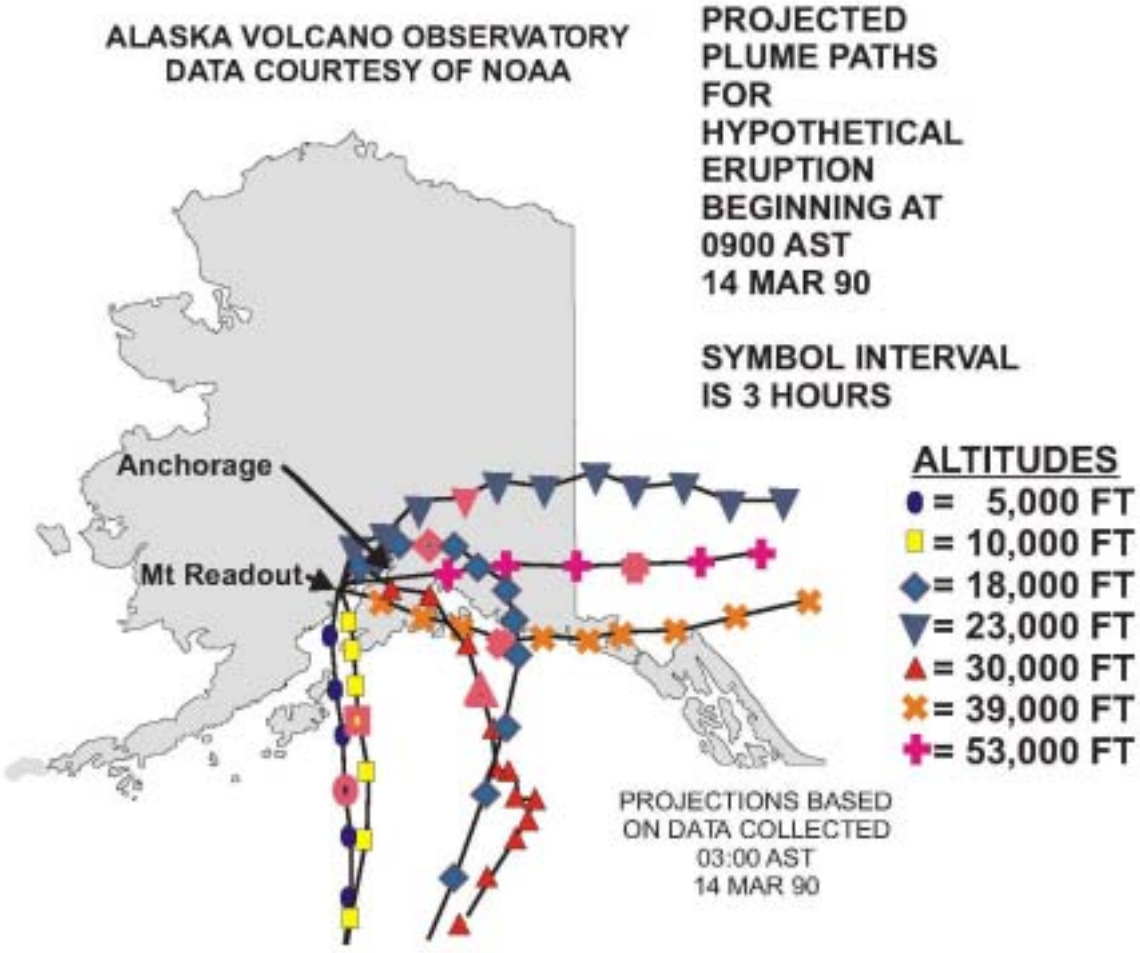
MODEL VAR: to be used for post-flight reporting

Operator: Aircraft identification (as per item 7 of flight plan): Flight number: Dep. from ..... Date ..... Time ..... UTC

.... Arr. at ..... Date ..... Time ..... UTC

	Addressee	
		AIREP SPECIAL
Section 1	1 Aircraft identification	
	2 Position	
	3 Time	
	4 Flight level or altitude	
	5 VOLCANIC ACTIVITY OBSERVED AT	(position or bearing and distance from aircraft)
	6 Air temperature	
	7 Spot wind	
	8 Supplementary information (Brief description of activity including vertical and lateral extent of ash cloud, horizontal movement, rate of growth, etc. as available)	
Section 2	The following information is not for transmission by RTF	
		TICK ✓ THE APPROPRIATE BOX
	9 Density of ash cloud	(a) wispy ☐ (b) moderate dense ☐ (c) very dense ☐
	10 Colour of ash cloud	(a) white ☐ (b) light grey ☐ (c) dark grey ☐ (d) black ☐
	11 Eruption	(a) continuous ☐ (b) intermittent ☐ (c) not visible ☐
	12 Position of activity	(a) summit ☐ (b) side ☐ (c) single ☐ (d) multiple ☐ (e) not observed ☐
	13 Other observed features of eruption	(a) lightning ☐ (b) glow ☐ (c) large rocks ☐ (d) ash fall out ☐ (e) mushrooming cloud ☐ (f) nil ☐
	14 Effect on aircraft	(a) communications ☐ (b) nav. systems ☐ (c) engines ☐ (d) pitot static ☐ (e) windscreen ☐ (f) windows ☐ (g) nil ☐
	15 Other effects	(a) turbulence ☐ (b) St. Elmo's Fire ☐ (c) fumes ☐ (d) ash deposits ☐
	16 Other information	(Add any information considered useful.)

Attachment C



Attachment D

Note 3. A volcano level of alert colour code has been developed for aviation which may be used by some vulcanological agencies to report volcanic activity information to aviation. In those States where the colour code has been introduced by the vulcanological agency, it is useful to include the reported colour code in ASHTAMs or NOTAMs issued for volcanic activity. The aviation volcano level of alert colour code is:

Level of alert colour code	Status of activity of volcano
RED ALERT	VOLCANIC ERUPTION IN PROGRESS. ASH PLUME/CLOUD REPORTED ABOVE FL 250. OR VOLCANO DANGEROUS, ERUPTION LIKELY, WITH ASH PLUME/CLOUD EXPECTED TO RISE ABOVE FL 250.
ORANGE ALERT	VOLCANIC ERUPTION IN PROGRESS BUT ASH PLUME/CLOUD NOT REACHING NOR EXPECTED TO REACH FL 250. OR VOLCANO DANGEROUS, ERUPTION LIKELY BUT ASH PLUME/CLOUD NOT EXPECTED TO REACH FL 250.
YELLOW ALERT*	VOLCANO KNOWN TO BE ACTIVE FROM TIME TO TIME AND VOLCANIC ACTIVITY HAS RECENTLY INCREASED SIGNIFICANTLY, VOLCANO NOT CURRENTLY CONSIDERED DANGEROUS BUT CAUTION SHOULD BE EXERCISED. OR (AFTER AN ERUPTION, I.E. CHANGE IN ALERT TO YELLOW FROM RED OR ORANGE.) VOLCANIC ACTIVITY HAS DECREASED SIGNIFICANTLY, VOLCANO NOT CURRENTLY CONSIDERED DANGEROUS BUT CAUTION SHOULD BE EXERCISED. * The code "yellow" may be used in cases of "regular" or "quasi-permanent" volcanic eruptions that do not normally reach FL 250 and do not necessarily involve a "significant increase in volcanic activity".
GREEN ALERT	VOLCANIC ACTIVITY CONSIDERED TO HAVE CEASED AND VOLCANO REVERTED TO ITS NORMAL STATE.

The colour code for the level of alert indicating the status of activity of the