The earthquake in the Indian Ocean and the resulting tsunami that took place on 26 December 2004 reminded all of us that the Earth is not always stable and firm and that the forces released by its movements are of a magnitude that are difficult to imagine.

One of the consequences of this tragedy is that the international community is considering the installation of an early warning system in the Indian Ocean. An early warning system will enable the development of tried and tested contingency plans associated with it. Volcanic eruptions are other examples of the instability of our planet. On the surface of the earth, the size of the geographical area affected by a volcanic eruption is normally much less than that affected by the tsunami in December, but an erupting volcano produces ash that is spread with the upper winds and its effects can be far reaching.

On 24 June 1982, a British Airways Boeing 747 lost power on all four engines while flying at 11,300 m (37,000 ft) from Kuala Lumpur, Malaysia to Perth, Australia. During the ensuing sixteen minutes, the aircraft descended without power from 11,300 m to 3650 m (37,000 ft to 12,000 ft) at which point the pilot was able to restart three of the engines and make a successful emergency landing at Jakarta, Indonesia. The subsequent investigation of the incident showed that the aircraft had passed through a volcanic ash cloud and that penetration of ash particles into the engines had caused them to fail. The need to establish the capability of predicting the presence of ash particles in the atmosphere and redirecfl ffolli tos as to circumnavigate ‘contaminated’ airspaces became evident.

A system called the International Airports Volcano Watch (IAWV) has been established to meet the requirements of civil aviation. The role of the IAVW is to keep aircraft in flight and volcanic ash in the atmosphere separated.

Nothint can be done to prevent volcanic ash extruding into the atmosphere and being carried by the upwind jet streams across international air routes; however, whenever this happens, the aviation community has the responsibility to ensure, as far as possible, that the ash cloud movements are predicted and monitored, that pilots concerned are advised, and that aircraft are routed safely around the ash clouds.

The effects of a volcanic eruption

Iceland has well developed ways and means of monitoring and forecasting volcanic activities, and it was no surprise when an eruption started at Grimsvøtn on 1 November 2004. The ash plume rapidly reached FL 410. The upper part of the plume entered the jet stream, which transported the ash cloud as far as the Black Sea and Turkey in a few days. In the last stages of the eruption, the ash cloud covered large parts of the European Region airspace. Figure 2 below is illustrative.

Extents of the predicted ash cloud using a combination of earth projection models

As a result, at least one airline cancelled a flight from New York to Moscow and several airlines were re-routed or cancelled. A spokesman for IATA said, "the financial damage for the airlines was considerable". Large tracts of airspace were closed as the huge ash cloud extended from Iceland to the Black Sea.

ICAO EUR/NAT Volcanic Ash Working Group (VAVG)

The ash cloud from Grimsvøtn affected large areas of the EUR Region’s airspace that had never previously been affected in such a way since the IAVW procedures were introduced. That means that several parts of IAVW procedures concerning distribution of VAAs and SIGMETs to ATM and the airlines did not work as planned. In addition, although an ATM contingency plan exists for the NAT Region, none does for the EUR Region.

Considering the very serious implications that such an event could have on air space management, in particular over the areas with very high traffic intensity like the NAT tracks and the Western part of the EUR Region, the relevant experiences had to be collected and analyzed with the goal to find out lessons to be learned and how to further improve the systems.

The implications were both safety related and financial. An ad hoc EUR/NAT Volcanic Ash Working Group (VAVG) was therefore established with the task of collecting and analyzing all relevant lessons to be learned in identifying areas for further action and the bodies to deal with them at the regional and global level.

The ad hoc EUR/NAT VAVG, including ATM and MET experts, together with airline representatives, met once at the ICAO EUR/NAT Office in Paris in January 2005. During this meeting several very important experiences were reported and discussed. A list of items was identified for follow up actions on both the global and regional levels in order to further improve the VAAs and the implementation of regional IAVW procedures. The need to develop ATM contingency procedures for the EUR Region was identified to be of high priority.

Future Work

Several items from the EUR/NAT VAAC were of a global nature and would be presented to the North Atlantic Systems Planning Group (NAT SPG) and the European Air Navigation Planning Group (EANPG) who would in turn pass them to the International Airports Volcano Watch Operations Group (IAVWOPSG), while items related to implementation deficiencies at a regional level would be addressed directly by the ICAO EUR/NAT Office.

As a first step, a special Task Force was established under the auspices of ICAO to develop ATM volcanic ash contingency procedures for the EUR Region. This work would highly benefit from the experience in the NAT Region, where such procedures had already been implemented for several years.
**Final conclusion**

It can be concluded that a volcanic eruption in Iceland can have a great effect on air travel in both the NAT and EUR Regions. The area affected by a volcanic eruption can be quite large within a short period of time. Further, there can be a significant number of aircraft airborne when the eruption starts. The vast majority of the aircraft can be affected either directly or indirectly under certain weather conditions. The ash cloud spreads rapidly and can cover large portions of airspace with the knock on safety and economic effects on international civil aviation. Although an effective early warning system is in place, the EUR Region lacks an effective and robust contingency plan that would take account of safety of flight as well as the economic penalties associated with airspace closure.

Accordingly, the EUR/NAT Office of ICAO established a Task Force to develop an ATM contingency plan. The Task Force is composed of Iceland, Italy, Norway, Russian Federation, Eurocontrol, IATA and VAACs. The contingency plan, which should take due account of the economic fall out of a major volcanic eruption, would address short term and long term actions to be taken. The contingency plan should be delivered to the European Air Navigation Planning Group at their next meeting in November 2005. When the contingency plan is developed, it will be thoroughly tested and validated. At that time, the EUR and NAT Regions will have both an effective early warning system and a robust contingency plan to mitigate to the extent possible the fall out from a major volcanic eruption.