French Republic

PARLIAMENTARY OFFICE FOR SCIENTIFIC AND TECHNOLOGICAL ASSESSMENT

LESSONS TO BE LEARNT FROM THE ERUPTION OF THE VOLCANO EYJAFJÖLL

Public hearing of 8 July 2010

On 8 July 2010, Mr Christian Kert, a deputy, organised a public hearing on the lessons to be learnt from the eruption of the Icelandic volcano Eyjafjöll.
As part of the work undertaken by the Parliamentary Office for Scientific and Technological Assessment (OPECST) since 1999 in the field of natural disasters increasingly related to the technological and social vulnerabilities of globalised society, this public hearing grouped all the players concerned: scientists (vulcanologists, geologists, meteorologists, specialists of the atmosphere; aviation industry manufacturers; air transport regulator (Civil Aviation Directorate-General – DGAC); air transport professionals (Association of European Airlines – AEA), Paris airports (Aéroports de Paris), National Union of Airline Pilots (SNPL), National Union of Travel Agencies); and qualified personalities. The State Secretary for Transport opened the public hearing which comprised two round-tables:

- *the first took stock of the events and the various players related the manner in which they analysed the risk;*
- *the second examined the ways and means which would help improve the management of the aftermath of eruptions of this type which will happen sooner or later.*

I. HOW THE EVENT UNFOLDED AND ASSESSMENT OF THE RISK

An eruption among others

Entirely made up of basalt, crossed by faults and shaken by earthquakes, Iceland often experiences volcanic eruptions, the average periodicity being one eruption every ten years.

The eruption of Eyjafjöll in spring this year was preceded by volcanic crises and an increase in seismicity for several weeks before the first phase of the eruption from 20 March to 12 April 2010, which was characterised by the emission of fluid basaltic magma that more than 25,000 people were able to watch without running any risk. During the second phase, from mid-April until May, which motivated the warning, the lava was explosive and interacting with ice. This led to the formation of a plume more than 9 km high, which then spread over vast distances above the Atlantic and Europe.

This eruption is modest, compared with that of the volcano Laki, also in Iceland, in 1783. The lava spewed by the volcano then exceeded ten or so cubic kilometres, in other words 10,000 times more than the volcano Eyjafjöll, while it can be estimated that there were roughly 100,000 deaths in Europe due to the indirect aftermath of this eruption.

Calipso: the vertical position of the plume photographed by the lidar

Nevertheless, Europe had to face a first-time experience this spring, marked by the closure of its airspace for nearly a week, a period longer than that imposed in the United States following the 11 September 2001 attacks.

A difficult to manage crisis

The manner in which the closure of the airspace was decided has been the subject of fierce debates between the various players.

These did not reach an agreement either on the appreciation of the phenomenon – especially when determining the size and concentration of the ash particles – or on the consequences for aviation safety.

On the one hand, the London VAAC[1] (*Volcanic Ash Advisory Centre)*, in charge of monitoring this matter for Europe, made an extensive application of the International Civil Aviation Organization rule according to which any crossing of a cloud of ash is banned, and laid down from 19 April 2010 a concentration threshold of 2 milligrammes per cubic metre.

Challenging this approach, Airbus recalled that it made two flights on 16 April 2010 at a time when the French airspace was practically closed, whereas the clearness of the sky in all southern France allowed 300 kilometre visibility.

This company also put forward that the results of the concentrations calculation model have never been validated for want of measurement in the ash cloud.

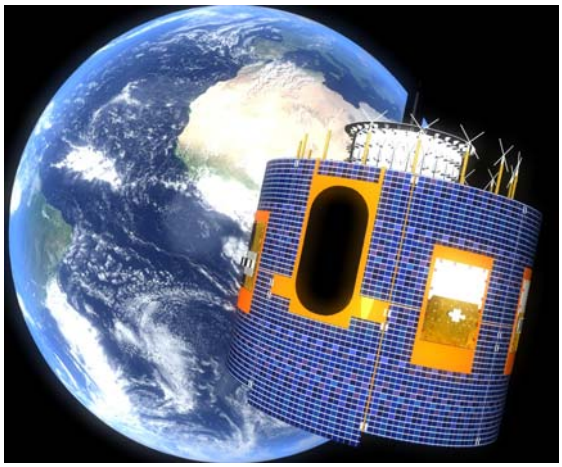
Taking up Airbus' objections, the AEA (Association of European Airlines) remarked that at the instigation of several airlines (Air France-KLM, Lufthansa and British Airways), observation flights had allowed it to be noted that parts of the airspace had been wrongly declared dangerous.

For its part, the DGAC, while insisting on the pragmatic approach to its decisions – especially thanks to the assessment flights – considered that the initial decision to close the airspace was justified, given the uncertainties and the presence of ashes shown by the maps of the meteorological models. The DGAC put forward that its regulatory mission had been made difficult by it being impossible to obtain sufficient information from engine manufacturers on the dangers of a low concentration of volcanic ashes. Furthermore, concentration alone is not significant; the length of exposure, nature of ashes, model of engines, etc. must also be taken into account. The DGAC therefore proceeded to open the airspace in stages following the adoption on 19 April of the 2 mg per cubic metre threshold.

As for the National Union of Airline Pilots, it lamented the fact that the profession had been excluded from the debates and from the measures taken throughout the crisis and also found it deplorable that pilots had not received any theoretical training when flights resumed

II. HOW CAN THE MANAGEMENT OF THE RISK BE IMPROVED?

Faced with the plausible eruption, in the months ahead, of the volcano Hekla – close to the volcano Eyjafjöll – and the existence of volcanoes that are more dangerous in other respects in Italy and Greece, the hearing put forward three series of recommendations.



Seviri/MSG, permanent monitoring thanks to the geostationary satellite

[1] The International Civil Aviation Organization (ICAO) has divided responsibilities regarding the monitoring of volcanic ashes. These centres have an advisory role supporting aviation authorities in their management of crises.

Need to improve the descriptive models and decisional aids

Various models have been used to describe the phenomena in question, from eruption till the effects on aviation safety and the resulting human and economic consequences. It is essential that the models be validated using studies and observations so as to form a continuous and coherent chain, understood by all the players, operational rather than academic, descriptive and not prematurely prescriptive. Some commentators have emphasised that wind tunnel tests are necessary for this validation. Research based on observations and simulations, and which is the subject of exchanges, should lead to the development of shared cultures regarding technical, operational and political decision-making in an uncertain situation...

Of course the work on models and decisions must be made internationally: passengers like clouds of ash do not stop at borders

Need for strong crisis coordination

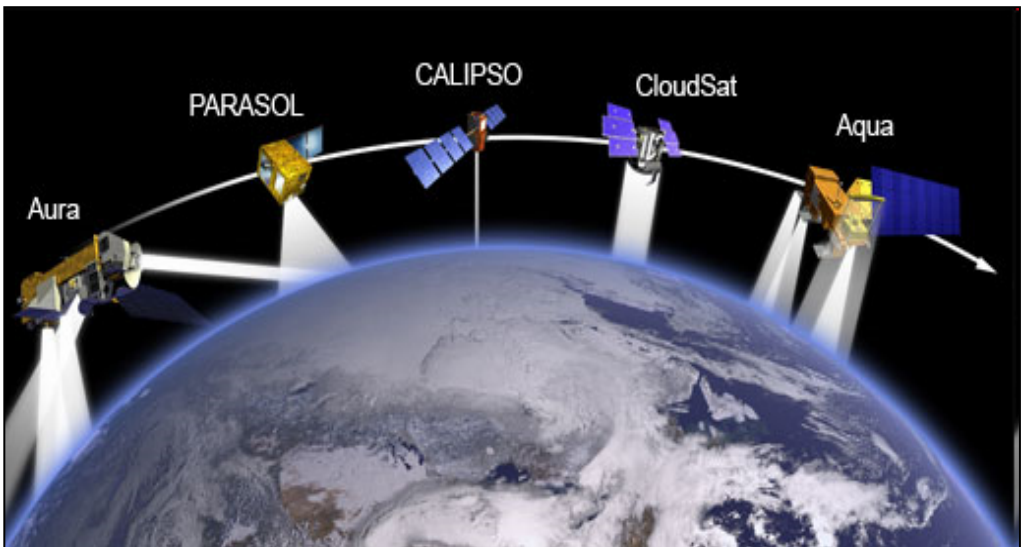
The participants were unanimous in recommending overall coordination, going beyond the existing national coordinations at a sectoral level. Some therefore spoke in favour of joint work between vulcanologists, atmospheric scientists and engine manufacturers to determine vigilance and warning thresholds and the related instructions.

Others considered that the coordination set in place in Alaska since 2004 is a reference. The *Interagency Operating Plan for Volcanic Ash Episodes* coordinates the activities of scientists and pilots. This continuous watch structure indeed allows operators to be informed of the position of dense clouds of ash. Using this validated information, Alaska Airline can then carry out inspection flights – in compliance with ICAO recommendations – and assure commercial flights by bypassing as widely as possible highly contaminated areas. As for Alaska Airlines pilots, they are obliged to follow regular training in the risks and practice every six months on a simulator, to cope with all the possible consequences of an unreported approaching volcano cloud.

At the same time, European coordination must be strengthened. European networks – EUFAR[2] and EARLINET[3] – do exist but swifter collection of information must be ensured so as to improve exchanges between satellite images, information supplied by the various airborne means, and models. Indeed, while all the components existed in Europe in April this year, they could not be brought together fast enough to respond to the unfolding crisis. Also Europe must be better able to exploit this data so as to provide a harmonised response. For this purpose, to meet the request by the Transport Council of Ministers, the European Commission has set up a crisis coordination cell but its creation has nevertheless led to a twin series of problems:

- first, that of how it fits in with the structures already tasked with responding to these crises, both at the national and European level;

- second, that of how the scientific and technical competencies at European level are interlinked with this crisis cell.



Means used by SAFIRE

[2] EUFAR : European Fleet of Airborne Research. France contributes to it through the SAFIRE programme, which brings together the CNRS, the National Space Studies Centre (CNES) and Meteo-France.

[3] EARLINET : European Aerosol Research Lidar Network: this network in which two French observing stations participate, aims at determining the vertical distribution of aerosols by lidar measurement.

The strengthening of cooperation must be prolonged internationally by the adoption of joint safety, maintenance and piloting standards, both at the European Aviation Safety Agency (EASA) and at the ICAO, via in particular cooperation between the EASA and the American Federal Aviation Administration.

Last, referring to the situation of passengers in limbo at airports, the Transport Council of Ministers of 4 May and 24 June 2010 decided to combine a certain flexibility with a principle of fair treatment in applying passengers' rights in order to avoid the proliferation of disputes between travellers and airlines.

In addition, at the request of France, the European Commission has announced the forthcoming revision of the European regulation on passengers' rights.

Need for more technical means

A first avenue could consist in making use of satellites and their means. For want of permanent monitoring of volcanoes by remote sensing, observations could be made more systematic as part of the European GMES programme (Global Monitoring for Environment and Security) currently limited to crisis management.

Also, the use of more effective satellites – such as the new constellation of Meteosat satellites (third generation Meteosat and post-EPS) – could lead to swifter processing of the data supplied by research satellites.

A second envisaged avenue concerns the installation of airborne instruments which would help pilots to know the characteristics of the zones they are about to cross. This arrangement would therefore be aimed at other disturbances, no doubt more frequent than volcanic ashes.

From left to right: Mr Dominique Bussereau, State Secretary for Transport; Mr Christian Kert, deputy – Bouches-du-Rhône; Mr Claude Birraux, deputy – Haute-Savoie, president of OPECST.

October 2010

The report is available at the following address: http://www.assemblee-nationale.fr/13/rap-off/2851.asp