Having enjoyed George Walker’s article in the previous Risk Frontiers quarterly newsletter, I feel compelled to add a few recollections of my own.

At the time, Christmas 1974, I was a non-proportional property underwriter for the Mercantile and General Reinsurance Co Ltd based in London, but with responsibility for business from many overseas markets. We had heard about the cyclone over our Christmas puddings, and on returning to work after the break, our manager, John Lock (who later became General Manager), said “It won’t amount to anything, there’s not much there.”

However, it wasn’t long before M&G Australia made it quite clear to us that there was quite a lot of insured property in Darwin, as the claims started to roll in.

What caught the whole market by surprise was not just the number of properties that were totally destroyed, but the way most of the losses were transferred to the reinsurance market, leaving relatively little to be retained by the local insurers. This was due to a number of factors:

a) There was no zoning scheme in place whereby accumulations of sums insured could be monitored. Such a system only existed in earthquake-prone Japan, and had not been considered necessary elsewhere.

b) There were no such things as event limits or cession limits in pro-rata treaties.

c) There were also a number of risk excess treaties that provided unlimited free reinstatements, and at the same time had deductibles pitched so low that they became known in London as the ‘bedroom excess of bathroom’ treaties with limits of maybe $15,000 in excess of $15,000 for any one risk. I remember one case where the insurer had received over 200 claims from Tracy and there were the same number of XL claims to reinsurers, who certainly hadn’t received a premium for this exposure! The late Bob Kiln, a leading Lloyd’s underwriter, gives a similar example in his book ‘Reinsurance in Practice’.

d) Then there were the Cat XL programs of the local companies that mopped up most of the residual amounts, provided they had bought enough cover.

At that time, M&G bought four layers of retrocessional XL cover to protect itself and its subsidiaries from a major event such as a Tokyo earthquake, but Tracy blew all four layers away! We too had not bought enough cover.

There was such an outflow of funds from the London market to Australia in 1975 that the Bank of England wanted to know what was going on. The whole process was co-ordinated on behalf of the market by the reinsurance brokers Greig Fester and overseen by Bob Cole, a loss adjuster from Toplis & Harding with wide international experience.

In an article published in Policy magazine in August 1977 based on an address to the Insurance Institute of London, Mr Cole stated that, from his point of view, there were two interesting aspects of Tracy: the overall loss ratio for domestic properties was 90%, and the adjusting problems that arose from the devastation. In his opinion, as the domestic policies were not subject to average (i.e. adjustment for under-insurance), 20% of the loss ratio was attributable to under-insurance, with inadequate construction accounting for another 25%. Interestingly, his estimate of the total cost to the insurance industry was about US$250m, of which domestic losses accounted for $160m. This compares with the ICA figure of A$200m and the 1975 estimated total Australian annual premium income for fire insurance of A$340m.

With regard to the adjustment of the losses, the biggest single problem related to the interpretation of the rent extension clause under domestic policies in the face of delays caused by the government formulating a building code as well as the absence of repair facilities. There
was a heavy escalation in building costs due to the need to fly in tradesmen and materials from all over Australia – the post-disaster inflation referred to by George.

A different situation arose over commercial policies subject to reinstatement conditions, which meant that insurers were liable for the additional costs arising from the post-cyclone building code. The other interesting feature highlighted by Mr Cole was that, due to the mass evacuation of Darwin, shopkeepers whose premises survived Tracy faced a severe loss of turnover, but this was not covered under loss of profits policies that required the loss to arise directly from damage caused by an insured peril.

The market always reacts to major losses and so what lessons did the market learn?

Some of the actions taken at the next renewal season (30th June 1975) included the introduction by leading Lloyd’s and company reinsurance underwriters of a multi-page questionnaire asking insurers to provide details of their exposures for different sections of the Australian coastline, as well as the original rates charged. No answers – no cover.

It became a sacking offence to write a risk XL without either limited reinstatements or an event limit!

Some small insurers folded, while those that remained bought a lot more Cat cover, as did many reinsurers. Reinsurance brokers reaped their rewards.

At around the same time, Dr Gerhard Berz of Munich Re came to Australia and initiated what became the ICA zoning scheme referred to by George, for the better reporting of aggregate sums insured. Elsewhere, Munich Re, Swiss Re and others founded the Cresta organisation to do the same thing in many other territories.

Tracy was therefore instrumental in changing a number of poorly thought-through practices that had been prevalent in the market until 1974 so that, apart from in Japan, some of the earliest building blocks that had to be put in place for reinsurers to better assess their clients’ Cat exposures (and therefore their own) were to be found in Australia. And underwriters started to talk about Cat PMLs, but not always with a return period in mind!

In many ways, Tracy marked the end of an age of innocence in reinsurance practice.

Observations of the explosive Eyjafjallajökull eruption

by Susanna Jenkins

Susanna was formerly a PhD student at Risk Frontiers and is now at Cambridge Architectural Research Ltd. She made the following observations after visiting Iceland between the 5th and 11th May, 2010

Eyjafjallajökull volcano (pronounced A-ya-fyat-la-yok-utl) lies under one of Iceland’s smaller glaciers in the south of the island (Figure 1). Since human settlement in 874, eruptions have occurred in 920, 1612 and from 1821 to 1823. The most recent event has so far exhibited four different stages: an effusive stage followed by a brief period of quiescence, an explosive stage and a further quiescent stage.

Following a sharp increase in seismic activity in late 2009 and ground deformation in February 2010, an effusive eruption began on 20 March 2010. This first stage - known locally as the ‘tourist eruption’ - lasted until 12 April and was characterised by fountaining of basaltic lava from fissures in between the Eyjafjallajökull and Mýrdalsjökull glaciers (Figure 1). Ash ejection from this stage was small (column height < 4km) with an explosive force estimated to be no more than 1 on the Volcanic Explosivity Index (VEI).1

The explosive stage began under the Eyjafjalla glacier in the early hours of 14 April with the eruption plume breaking through around 250m of ice approximately five hours later. The eruption was initially phreato-magmatic as ice melted, with a steam plume coincident with the ash plume. The eruption later became purely magmatic erupting more silicic and viscous trachy-andesite magma. Column heights in this stage reached above 9km height with an estimated VEI of 4. (A VEI 4 eruption may be expected to occur somewhere in the world every few years and is not unusually powerful.) On 23 May the Icelandic Meteorological Office reported that ash was no longer being ejected and the eruption appeared over. Seismographic data indicates that volcanic tremors had decreased almost to pre-eruption levels and GPS sensors indicated a continued horizontal displacement toward the centre of the volcano. This has been interpreted as showing that no replenishment of magma was taking place although further eruptions can not be ruled out. The last Eyjafjallajökull event in December 1821 produced heavy ash falls in the first week of the event with intermittent ash emission over the next year until January 1823.

1VEI range from 0 to 8 on a logarithmic scale so that a VEI 5 eruption is ten times more explosive than a VEI 4 eruption.
Long-duration ash emissions are common in the geological and historical record. The eruption of Soufriere Hills on Montserrat (1995-2003 and continuing) serves to highlight the devastating impact such an eruption can have on a community and economy. Today more than half of Montserrat, including the capital, remains an exclusion zone. Long-duration ash emissions from Eyjafjallajökull, including periods of quiescence, may similarly result in the abandonment of affected areas as well as the long-term disruption of aviation travel across Europe.

What made the Eyjafjallajökull volcanic activity so disruptive to air travel was the location of the volcano under the jet stream, the relative stability in wind conditions blowing ash towards Europe and the explosivity of the eruption. The glass-rich fine-grained ash was carried by the jet stream directly over northern Europe and into some of the busiest airspace in the world. Given the significant uncertainties associated with forecasting eruptions and wind conditions, reducing disruption to aviation in future ash emissions requires aircraft and engine manufacturers to better establish what level of ash their products can safely tolerate.

Our findings

From 5 to 11 May, I travelled to Iceland as part of a Cambridge team investigating impacts associated with the explosive stage of the event. Our objectives were fourfold: 1) to assist in the monitoring of respirable ash levels and advise on potential health impacts; 2) to collect water and ash samples for analysis that could not be carried out in Iceland; 3) to consider the impacts and emergency response associated with long duration continuous ash emissions and 4) to collect baseline data. Assessment of eruption impacts and recovery over time is rare and so the latter objective was one of the most important aspects of our studies. We worked in collaboration with the Nordic Volcanological Institute, the Icelandic Meteorological Office, government departments of Civil Protection and Emergency Management, Agriculture and Air Pollution in Reykjavik, as well as with local doctors, vets and farmers in the affected area. Here I provide an informal review of the eruption impacts and issues that I found interesting.

Since the start of the explosive stage, winds predominantly blew ash to the south and southeast of the volcano, directly towards Europe but away from most of Iceland and its population. The most affected strip of land is therefore relatively small, approximately 10km wide and 50km long. This area is home to around 200 farms and Vik, a town of approximately 400 people. The maximum depth of ash fall on affected farms around the volcano was a few centimetres (Figure 2).

Agricultural impacts

For the farmers in the area, the timing of this explosive eruption has been particularly bad. May is one of the driest months of the year and ash resuspension by winds has been a major problem. The area needs rainfall to suppress the ash and to remove ash from grazing land, however, there are also concerns that rain may generate lahars from the steep hills above many farms (Figure 3). Recent heavy rainfall on ash covered land led to a lahar in the Svaðbælisheiði river on 19 May, which resulted in the greatest discharge at the Markarfljót river since the initial meltwater floods of 15 April.

During May, Icelandic farmers work long hours lambing, calving and preparing fields for crops to be grown for the next winter’s feed. Farmers face the dilemma of either sowing and fertilising all their seed, assuming no return of eruptive activity, or sowing less now and saving money to pay for winters feed on the assumption that eruptive activity will continue.

Under normal conditions livestock and their new offspring would be put out to graze the higher lands over summer. With the ash fall this has not been possible and so livestock are being kept indoors in increasingly crowded conditions. Due to controls on sheep movement due to disease it is not possible to relocate stock to other areas. An estimated 5% of livestock are expected to die from overcrowding if they are kept inside. The percentage that would die if they were let out onto ash-covered pastures is unknown.

By far the most important question for farmers has been when the eruption will end. Should this quiescent stage mark the end of the eruption, rain will clean ash off the vegetation and life may return to normal rather quickly. However, if the Eyjafjallajökull event were to continue intermittently for months or even years, farmers would need to slaughter livestock and...
it may quickly become economically (and psychologically) unfeasible to continue farming.

Following previous natural disasters in Iceland (avalanches in January and October 1995 that killed 34; earthquakes in June 2000 and May 2008 that injured more than 30), the Civil Protection Department has developed a protocol for help centres to be set up in affected areas. The purpose of these is to provide necessary equipment, such as facemasks, goggles and shovels in the case of eruption, and to offer advice; doctors, air pollution experts and members of Civil Protection frequent the centres. One of the most important accomplishments of the centres may be the support they offer the small, close-knit community. These help centres are considered a success, with a large daily attendance.

Health impacts

The government has advised against being outdoors during ash falls and to always wear facemasks outdoors where ash has fallen. Some of the ash produced in the explosive stage of the Eyjafjallajökull event has an unusually fine-grained component, with more than 10% of the plume comprising particulate matter less than 10 microns (PM<sub>10</sub>) and 7% of the plume less than 2.5 microns in size (PM<sub>2.5</sub>). PM<sub>10</sub> is considered an approximate size threshold for particles breathed into the thoracic (chest) area, with PM2.5 particles able to penetrate further into the respiratory system. As well as the particle size of ash, the electrical charge, presence of crystalline silica and toxic substances on the particle surfaces are important for human health impacts. Analysis of the ash is currently in progress. Finer respirable particles are likely to be the most toxic and increase the irritancy of ash in the airways and the likelihood of long-term respiratory impacts. Fortunately, facemasks had been stockpiled in Iceland in anticipation of the swine flu epidemic and these have been distributed in the affected areas. Homes in Iceland are well sealed against the cold and so infiltration of ash is low. To limit ash resuspension in the town of Vík, efforts include wetting roads and lowering speed limits. Exposure to ash over long periods, typically years to decades, may result in long-term respiratory effects. There are therefore concerns for the health of children and outdoor workers should long-duration ash emissions continue.

Infrastructure impacts

Infrastructure damage is limited. Meltwater from the glacier flowed mostly to the north of the volcano down the Markarfljót river (Figure 1). Mitigation plans were already in place for meltwater floods of up to 400,000m<sup>3</sup> in this river following an eruption from Katla. Construction machinery for quarrying aggregate in the Markarfljót area were re-assigned to prepare for the flood: levees were built to prevent flooding of local agricultural areas and roads were bulldozed to provide channels and prevent adjacent (expensive) bridges being damaged. Impacts were therefore limited, with the main road rebuilt within days. Corrosion of metal from the toxicity of ash particles was limited to the initial phase of the eruption with very minor damage to machinery (Figure 4).

The ominous neighbour

Links between eruptions at Eyjafjallajökull and its much larger neighbour, Katla, have been suggested with the Icelandic President Ólafur Grímsson saying "the time for Katla to erupt is coming close ... it is high time for European governments and airline authorities all over the world to start planning for the eventual Katla eruption". In fact, while the three most recent eruptions of Eyjafjallajökull have been closely followed (< 1 year) by an eruption from Katla, a further 16 Katla eruptions have occurred without any eruption from Eyjafjallajökull. There is currently no change in activity at Katla; however, the possibility for activity at Katla or for long-duration activity at Eyjafjallajökull and the consequences for aviation and the Icelandic population must be considered.