



## Q+A-Why is volcanic ash a threat to planes?

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April 15 (Reuters) - A cloud of volcanic ash drifting eastward from Iceland has halted flights across northern Europe, causing widespread disruption.[ID:nLDE63E0QP]

Below are some questions and answers on the aviation risk.

-- What is volcanic ash?

Plumes of dust spewed out by volcanoes usually contain tiny particles of glass, pulverised rock and silicates. The result is a cloud of potentially deadly material resembling sandpaper.

-- Why is it a hazard to aviation?

The abrasive effect of the ash can strip off vital aerodynamic surfaces and paralyse an aircraft engine.

Aircraft avionics and electronics can also be damaged.

Pitot tubes, or speed sensors -- whose sensitivity to ice or foreign objects was highlighted during a probe into the loss of an Air France jet last year -- can get bunged up and fail.

The cockpit windshield can turn opaque, scoured by ash.

Ash can bring clouds of sulphuric and hydrochloric acid.

-- What happens inside the jet engine?

The awe-inspiring speeds and temperatures inside a modern jet engine are its own downfall when invaded by larval dust.

"Volcanic ash fragments are just a few millimetres wide, very hard and very sharp. They can get inside the engine and other parts of the plane and wear away everything they come into contact with," says Jacques Renvier, technical director at French aero engine manufacturer Snecma <SAF.PA>.

First, abrasive ash can damage compressors which squeeze air ready for combustion, making them less aerodynamically stable.

From there, pressurised air is forced into the combustion chamber which is so hot -- 1,200-2,400 degrees Celsius at cruise altitude -- that the fragments melt, then meld. Then this liquid rock smashes into colder parts and solidifies like cooled glass.

Nozzles designed to shoot air towards the engine's turbines, which turn the engine's moving parts, start to thicken with larva. As a result ventilation is blocked and the nozzles burn too hot. Finally clumps of larva cut the space for air to escape and can provoke an engine stall, shooting flames from the back. "You basically strangle the engine," Renvier says.

-- Why can't aircraft simply avoid the dust clouds?

Volcanic ash is invisible to aircraft weather radar and is often not immediately noticed by pilots, says Paul Hayes, director of air safety at UK aviation consultancy Ascend. "The first warning you get is a sulphurous smell and perhaps some St Elmos fire" (a glow caused by a type of electrical discharge).

-- Have there been any accidents due to volcanic ash?

Dozens of minor cases have been reported but no crash has been blamed on ash. Yet there have been two miraculous escapes:

\* On June 24, 1982, the captain of a British Airways jumbo jet en route from Kuala Lumpur to Perth, Australia, came on the speaker system at around 37,000 feet and calmly told the 247 passengers on board that all four of its engines had failed.

In an incident that went down in aviation history, Captain Eric Moody glided the jet down more than 20,000 feet and managed to restart one engine at 13,000 feet followed by others, according to the Flight Safety Foundation (aviation-safety.net).

It was only later that investigators found the combination of engine failure, an eerie luminous glow around the plane and acrid smoke inside the cabin had been caused by flying into a cloud of volcanic ash from the eruption of Mount Galunggung.

The aircraft landed safely on three engines but the incident prompted new flight procedures and international exercises. \* On Dec. 15, 1989, all four engines failed again when a KLM jumbo jet from Amsterdam flew into a cloud that turned out to be volcanic ash while descending to Anchorage, Alaska. The engines resumed working and the plane landed safely but badly damaged.

That incident was blamed on lack of sufficient information provided to the crew, the Flight Safety Foundation says.

-- How do controllers plan for such an event?

Partly as a result of these incidents, the International Civil Aviation Organisation, a United Nations body, maintains detailed contingency plans that were activated on Thursday. But Britain says the scale of the response has been unprecedented.

The incident came just six weeks after European authorities were scheduled to do the first of two 2010 exercises for such an event, aimed at preventing a catastrophe due to volcanic dust. (Reporting by Tim Hephher, Editing by Lin Noueihed and Ralph Boulton)

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