

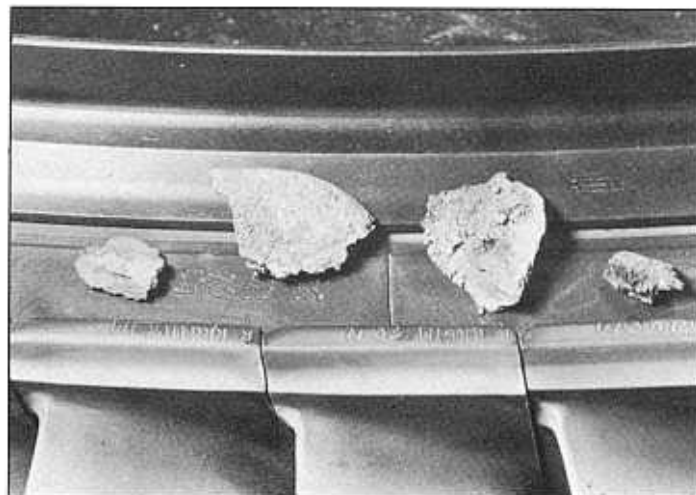
encounter with volcanic ash when he found his hands and clothes covered in a fine black dust as they waited for steps to be brought to the aircraft. When they got outside they found all the leading edges, engine nacelles and nose cone stripped of paint as if the aircraft had been sandblasted, as indeed in one sense it had. They had flown into the dust cloud from a volcanic eruption from Mount Galunggung which is positioned about 110 miles south east of Jakarta. The plume of ash started to become visible on satellite weather photographs, after the event.

The engines were the worst affected parts of the aircraft with the turbine blades having the most damage. The tips of the blades were ground away where they were blasted by the ash at high speed. The material of the ash was mostly silicate particles with a mean diameter of .075 mm. Apart from wearing away the high speed parts of the engine the 'silicacious refractory material sintered in contact with the hot metal fusing itself to the blades'. This is what happens inside steel furnaces. The changes in blade shape and size had serious effects on the efficiency of the engines with the number 4 engine (significantly the engine which ran down first) being the least damaged. Ash was also found in the pitot tubes which had caused the differing airspeed readings. In October 1984 ICAO issued a special report on the dangers of volcanic ash to aircraft, where it was pointed out that the incident on the 24th June 1982 was the ninth eruption of Mount Galunggung that year. The report found that prevention was better than cure, but suggested that any pilot who encountered such a problem should, altitude permitting, reduce thrust to zero, descend and leave the area as soon as possible. Consideration should be given to turning off engines and restarting them when clear of the ash and inside the relight envelope of the aircraft.

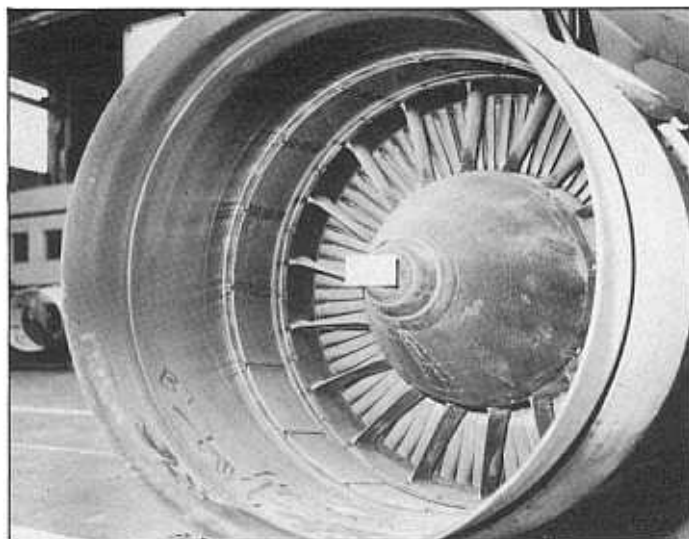
What Can be Learnt from the Behaviour of the Crew?

It would be comforting to think that this was an average crew and that a similar outcome would have emerged had others been flying the aircraft. If this be the case then British Aviation is indeed blessed with the standards of their pilots and flight engineers. If they were unexceptional crew members then it is obvious that they behaved in an exceptional way. They exhibited a quality which is described, best, by a word which is much loved by football managers, and the word is 'bottle'. This describes a sort of courage which is not of the gung-ho variety but the sort which causes someone to persist in an enthusiastic and inspiring manner when the odds for success look slim. Barry said that, had the aircraft landed in the sea, he would have still been trying to start engines as the fuselage touched the water. This is the sort of professionalism which passengers deserve to get from their flight crew.

Barry felt, very strongly, that check lists, which have to be used in such extreme emergencies, should contain every item of relevance to that emergency (perhaps in an expanded form in the Flying Manual) and suggests that the crew should read out, from the check-list, the items which are meant to be 'memory items'. When there are three concurrent drills to be carried out while one is "thinking through treacle", close adherence to a comprehensive checklist is the only way to guard against error.



The material which adhered to the blades



The engine intake after the event

Their efforts were successful because:

- i) One pilot ensured that while check-lists were being completed, the aircraft attitude and speed were always monitored (somebody minded the shop),
- ii) the emergency was managed in a rational and safe manner,
- (iii) the emergency checklists were fully utilised.
- iv) they continued to try to start the engines even though for 13 minutes there was no visible reward for their efforts, they used the auto-pilot to reduce work load so that, at least, one member of the crew could detach himself from the check-list and try and reason his way to a solution,
- v) where necessary they made bold decisions: trying to start No.4 engine and refusing to climb back into the cloud of ash, and
- vi) they made full use of each crew member, aircraft system and landing aid, to ensure a safe landing.

This was an exercise in crisis management, the sort of thing which NATO spends much of its time studying. Any Captain finding himself in such an extreme situation must ensure that, at any particular moment, he clearly identifies the aspect of the problem which is most relevant to the safety of the aircraft and attempts to solve it. He must be able to delegate some responsibilities, and clear-minded enough to ignore those problems which are not an immediate danger to the aircraft. These priorities will change as time goes on so the pilot must guard against tunnel vision. This is an aspect of aviation which is not studied widely, although, in recent years, there have been five occasions when multi-engine aircraft lost all engine power. The most amazing aspect of these incidents is that there has been no loss of life in any of them.

Postscript

Afterwards the crew were amazed to see the way the event captured the imagination of the world. Their own reactions were mixed, some feeling a sort of delayed action euphoria, while others felt very lucky to be alive. They all felt that after similar incidents, crews should not be allowed back to their jobs until normality returns. Eric found himself both lauded and hounded by the press of the world, often being asked questions which were both silly and uninformed. Always he was being asked for quotes. "Give us a quote about what it was like to land on a dark night with no forward vision" he was once asked. "It was a bit like negotiating one's way up a badger's arse" said Eric not because of any great knowledge of brock bums (presumably the *Arctonyx Collaris*, or the Sumatran badger) but because it is how a dark night is described in his beloved Hampshire. Eric was pleased with his quote and disappointed when it was never used, even when he changed badger for possum (*Didelphis Massupialis*) in Australia. We have much pleasure in including the quote in the *LOG*, long renowned for its fearless misuse of the English language.

Jack Diamond