

centre part of the fuselage detached in flight. The main spar connection remained and was later easily derigged. Most of the structure was recovered and examined at Farnborough. Four main areas of the glider had fragmented or been directly affected by internal overpressure in flight: the fuselage centre section; the right wing tip and the areas aft of the main spar at the inboard end of both ailerons. Most bonded joints in the wings, and the bonded seams in the centre of the fuselage, separated along the adhesive lines. Both canopies had remained securely closed, but all the perspex was shattered.

Damage and failures

Damage resulted from three different direct effects of the strike: Joule heating as the current passed through conductive parts of the glider; localised heat damage where lightning arc roots attached; and structural damage caused by lightning arcs and their resulting shock waves and overpressures within the enclosed volumes of the wings and fuselage.

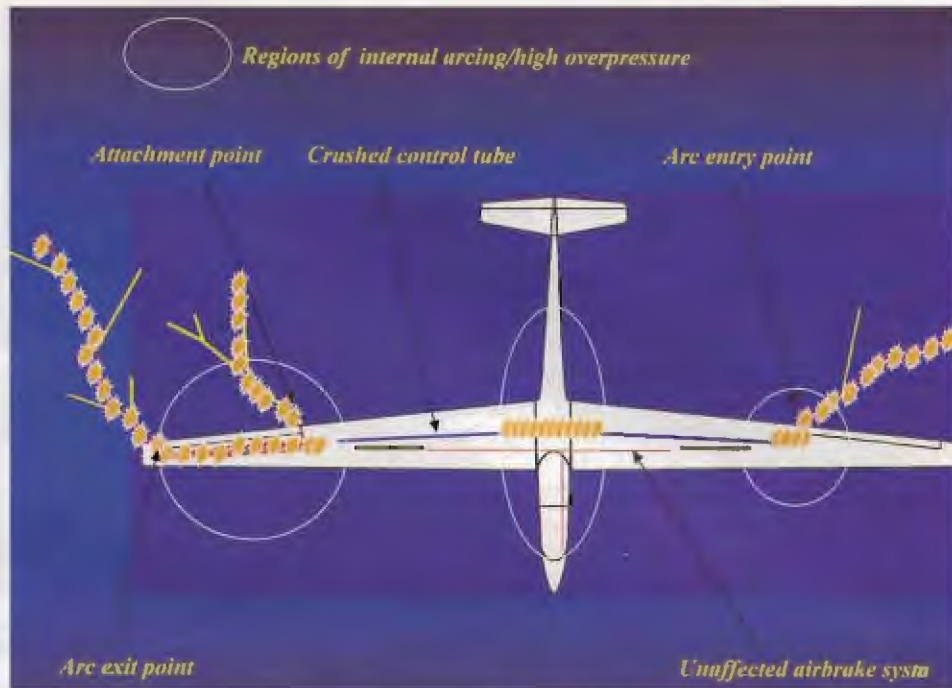
Such arcs ionise the air and almost instantaneously produce extremely high gas temperatures which may be in the region of 50,000° F. In addition, heating damage and failures are likely to occur wherever resistance is high compared to the current flowing. This happens especially at bearings and joints, with further arcs (and their consequent shocks and overpressures) forming in the opened gaps between the linkages. The large mechanical forces generated by the intense magnetic fields associated with such high currents may also make linked components separate – as happened with



A LARGE area of bad weather with heavy falls of snow and sleet was slowly approaching Dunstable airfield from the north. K-21 GBP had been on a training flight for about an hour and was soaring in 2-3kt up, in clear air, back along the frontedge of the cloud line.

At around 17:09 hrs, it turned away to return to the airfield. Shortly afterwards, at c. 2,500ft agl – 300ft above cloudbase – and an estimated 800 yards from cloud, the glider was hit by lightning. Large sections of its airframe disintegrated.

The Basic Instructor, Peter Goldstraw, heard a “very loud bang” and then the cockpit felt “very draughty”; he believes he may have briefly lost consciousness.



the linkages in GBP’s aileron system – and so induce further arcs.

The strike damaged only the aileron system – not the adjacent airbrake system or the elevator and rudder controls. The aileron system, linked by self-aligning ball or plain bearings and by Hotellier ball and socket joints, included three aluminium alloy rods in each wing. The centre rod from the right wing was burned and eroded at each end close to its jointed connections, which were missing, and had, unusually, been “crushed” because of the intense magnetic field generated by conducting the current. The end result was an

almost solid, irregularly-shaped “bar” (pictured below right). This deformed rod, which probably reached no more than 200° C, is thought to have conducted all the current.

The lowermost of three bolts attaching this system to the steel bracket which supported the aileron bellcrank had reached a temperature in the region of 1,000° C, and melted (pictured below left). From the damage to this bolt and the pushrod, the energy level of the strike was calculated as at least eight to nine times higher than specified international lightning protection standards for aircraft.



GBP’s final few minutes

He felt dazed and remembers slowly becoming aware that this was “a real emergency requiring unpleasant and decisive action”.

He shouted to the pupil, Graham Cooper, to bale out. Unable to hear him, he did so anyway. The instructor followed, but was surprised when he realised he had not needed to jettison the canopy. Both parachutes opened by an estimated 1,800ft agl. The student landed

on the roof of a disused petrol station and escaped major injury. The instructor landed in a field, breaking his ankle; and “sooting” damaged his jacket, parachute pack and hair. The hearing of both pilots was affected.

Few people saw the actual strike, but many witnessed its immediate aftermath: large items of slowly-falling debris, parachutes, the fuselage descending vertically at high speed and a ball of smoke and fine debris where the glider had been.

As the lightning flashed there was an extremely loud crack; many witnesses said it was the loudest sound they had ever heard.

Overleaf: how the strike happened and the BGA Technical Committee’s verdict. Peter Claiden will present his findings at the BGA Conference. See page 5 for more details. The full AAIB report is at: www.open.gov.uk/aaib/dec99htm/bga3705.htm