

AAIB Bulletin No: 10/94

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Category: 3

Aircraft Type and Registration: Thunder AX3 Maxi Sky Chariot, G-BIBZ

No & Type of Engines: None (free balloon)

Year of Manufacture: 1980

Date & Time (UTC): 10 June 1994 at 2031 hrs

Location: Near Oswaldtwistle, Lancashire

Type of Flight: Private

Persons on Board: Crew - 1 Passengers - None

Injuries: Crew - Fatal Passengers - N/A

Nature of Damage: Failure of 'flying wires', damage to balloon 'chair' from free fall

Commander's Licence: Commercial Pilot's Licence (Balloons), United Kingdom and Kenya, Private Pilot's Licence (Aeroplanes), Kenya

Commander's Age: 46 years

Commander's Flying Experience: 1,067 hrs (Balloons) (of which 10 were on type)
Last 90 days - 34 hours (Balloons)
Last 28 days - 0:35 hours (Balloons)

Information Source: AAIB Field Investigation in association with the British Balloon & Airship Club

History of the flight

G-BIBZ was a single-seat hot air balloon and was scheduled to take part in a substantial and diverse fund-raising rally for charity, taking place at the British Aerospace airfield at Salmesbury over the weekend of 11 to 12 June. As part of this event, about a dozen hot air balloons were scheduled to fly, four of these balloons being present on the evening of Friday 10 June. There was an organised briefing at 1745 hrs and this included a weather briefing; at this briefing the 1600 hrs surface wind from BAe Warton was given as 310°/15 kt. The pilot of G-BIBZ, who held Commercial Pilot's Licences (CPLs) for Balloons issued both in the United Kingdom and in Kenya, was present at the briefing.

By 1815 hrs one of the balloon pilots present, an instructor, deemed that the wind had dropped sufficiently to undertake the flight he had planned with his student and he proceeded to inflate his balloon, G-BPBV, leaving the ground at close to 1900 hrs and having no further contact with G-BIBZ. By this time the pilot (and owner) of G-BIBZ had begun to lay out his balloon. Having

only recently returned from an extended period of teaching in Kenya, he was cautious about whether or not to fly on that evening, at least until he was sure that the wind had dropped. He also expressed caution to his ground crew to the effect that this would be the first occasion that G-BIBZ had flown in the United Kingdom and he did not want it to be the last. At about 1945 hrs the pilot inflated G-BIBZ assisted by two ground crew and, after performing thorough pre-takeoff checks, he left the ground between 1955 and 2000 hrs. The ground crew followed by road, driving the pilot's retrieve vehicle.

After the takeoff, which was normal, the retrieve crew established radio contact with the pilot of G-BIBZ, who stated that he was about to cross Blackburn. The flight appeared uneventful and later the pilot stated by radio that his flight path would take him across the Fishmoor Reservoir and that he would be looking to land soon after. As the retrieve crew passed to the south of the reservoir they saw G-BIBZ about a mile ahead, flying at some 200 to 300 feet agl. Shortly afterwards, while about a 1/2 mile from the path of the balloon, they observed G-BIBZ strike a set of power lines, their attention being drawn by a cascade of sparks. They then saw the 'chair' portion of the balloon, carrying the pilot, swing and detach from the envelope. The chair fell to the ground and the envelope flew away from the wires. The retrieve crew turned back to a telephone box they had just passed and dialled the emergency services.

Other witnesses to the balloon's impact with the power wires were closer and saw and heard at least two short and distinct bursts of the balloon's propane burner in the seconds before the impact; they also observed that the balloon's contact was high in the cables, with the balloon envelope above the cables. One of these witnesses was a Police Constable (PC) and, crossing the fields, he found the pilot still in the balloon 'chair'. The PC could find no pulse and commenced resuscitation. An ambulance arrived shortly afterwards but the pilot was pronounced dead at the Blackburn Royal Infirmary. The pathologist's post-mortem report later stated that the pilot had died of multiple injuries associated with a fall from a significant height and that there was no evidence of electrocution burns.

The time of the accident was recorded as 2031 hrs by the electricity company, NORWEB, and the distance covered in the 30 to 35 minute flight was 6.24 nm. G-BIBZ's average speed, therefore, of about 10 to 12 kt was consistent with that of the other balloon, G-BPBV, which had landed slightly earlier after a flight of 10.9 nm at an average speed of 13.7 kt. The instructor and student had an uneventful flight in G-BPBV, with no problems with visibility or wind curl-over, and reported the cloud cover as $\frac{4}{8}$ altostratus.

Technical examination

G-BIBZ, the single-seat balloon involved in this accident, was manufactured in 1980 as a Thunder AX3 Maxi Sky Chariot and shipped to Kenya. In this design a conventional balloon envelope of some 22,000 cubic feet supports a 'chair' constructed of welded steel tube through eight vertical load-

bearing 'flying wires', arranged around the mouth of the balloon envelope. The chair carries the gas burner, two propane fuel tanks and the pilot, who is seated on a thick foam cushion and restrained by leg and chest straps. The control lines for the balloon consist of one line for control of the parachute-type plug vent at the apex of the envelope and two lines for controlling the two side vents, designed to enable the pilot to rotate the balloon about its vertical axis. These lines lead from the envelope to the chair. Thus, immediately before landing, the pilot will rotate the balloon so that he will contact the ground backwards, with the chair protecting his torso and legs.

The balloon's collision was with a set of 132 Kv power lines, part of the NORWEB grid and running approximately perpendicular to the path of the balloon. This set of lines consists of an earth wire, running between the tops of the pylons, and three conductors supported by the pylons' cross-arms; the overall diameter of the earth wire was 13.95 mm, that of the conductors 19.53 mm. The visible damage to the lines was to the earth wire, indicating that this had contacted the balloon's stainless steel flying wires. Damage to the chair and the geometry of the wires indicated that the chair had passed over the top conductor and that, after contacting the earth wire, the electrical arcing had occurred as the chair swung back. In the area of the collision, the top conductor, the closest to the earth wire, was 23.9 metres above ground level.

Examination of the balloon after the accident showed that all eight of the 'flying wires' had failed, allowing the chair and occupant to fall to the ground. These flying wires were later subjected to detailed metallurgical examination. All eight wires showed damage from thermal effects typical of those produced by electrically induced heat. The most extensive damage was to the five wires at the front and left of the balloon (relative to the direction the pilot was facing) and this was consistent with damage to the linking carabiners and to the Nomex 'skirt' above the gas burner. It appeared, therefore, that the pilot was facing in the direction of travel at the point of impact with the power lines, that the initial electrical arcing vaporised portions of five of the eight flying wires and that a combination of electrical heating and tensile load caused the remaining three wires to fail.

The balloon's burner and propane supply were functionally tested following the accident. The system functioned properly, with no adjustment required. The balloon's envelope was later inflated in a hangar at Farnborough. The envelope's vents were still functional, the only damage being from the tensile loads caused in the control lines when the chair fell away from the balloon envelope.

The original structural design data for the flying wires were obtained and samples of the wires from G-BIBZ, and new wire, were structurally tested. The structural analysis and testing showed that, without the reduction in strength from the massive electrical heating effect, any two of the remaining wires would have supported the inertial loads of the chair.

There is no positive indication as to the intentions of the pilot of G-BIBZ during the latter stages of his flight. The field in which the pylons stood would have been unsuitable for a landing as there was only some 59 metres distance remaining before a stone wall and a low set of wires. However, the next field was 140 metres in length in the direction of the balloon's travel, with an adjacent access road, and this field would have been suitable for a landing. The time of the accident was close to official sunset so there were some 30 minutes remaining for flight. However, it was observed at the same site and under similar lighting conditions two days later, that, around sunset, linear features such as electricity pylons and power lines tended to blend into the busy background. One possibility would be that, on approach to land, the pilot saw the electrical conductors but did not spot the less visible earth wire until it was too late to take avoiding action.