# Sky 220-24, G-SPEL, 31 March 1997 at 0815 UTC

## AAIB Bulletin No: 4/98 Ref: EW/K97 Category: 3

## (BBAC Incident No 02/97)

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| **Aircraft Type and Registration:** | Sky 220-24, G-SPEL |
| **No & Type of Engines:** | Sky Triple |
| **Year of Manufacture:** | 1966 |
| **Date & Time (UTC):** | 31 March 1997 at 0815 UTC |
| **Location:** | Near Addingham, N Yorks |
| **Type of Flight:** | Public Transport |
| **Persons on Board:** | Crew - 1 - Passengers - 12 |
| **Injuries:** | Crew - None - Passengers - 1 serious |
| | 11 minor |
| **Nature of Damage:** | None |
| **Commander's Licence:** | CPL Balloons, Groups A & B |
| **Commander's Age:** | 42 years |
| **Commander's Flying Experience:** | 444 hours (of which 54 were on Group B) |
| | Last 90 days - 5 hours |
| **Information Source:** | Accident Report submitted by the pilot and enquiries |
| | conducted by British Balloon and Airship Club |

### History of the flight

The early morning flight, which was to departfrom a regularly used launch site near Ribchester, Lancashire,was planned to last for approximately one hour. The pilot hadobtained an Airmet Area weather forecast for the UK Northern Regionusing the 'Metfax' service at 0540 hrs. This was issued at 0341hrs and was valid from 0500 hrs to 1300 hrs. It gave the generalsituation as an anticyclone centred to the south covering thearea with a visibility of 30 km with scattered cloud at 3,000to 4,000 feet. Included in the data was a strong wind warningwith south-westerly surface winds

gusting to 25 kt in the farnorth-west of the region. The winds at 1,000 and 3,000 feet wereforecast to be 2300/18 kt and 2400/20 kt respectively.

The Terminal Airfield Forecast (TAF) for LeedsBradford Airport, situated approximately 7 nm east of the accidentsite, issued at 0624 hrs, gave the surface wind as 2500/13 ktwith a 30% probability, between 1000 hrs and 1600 hrs, of becoming2800/15 kt gusting to 25 kt. A revised TAF, issued at 0842 hrs(after the accident), increased the probability of an increasein the surface wind to 40% and brought forward the period of validityas from 0800 hrs.

When the pilot arrived at the launch site the conditions werecalm with clear skies and a significant ground frost. He releaseda small helium balloon to check the wind speed and direction andthis was observed to travel almost vertically upward. The pilotestimated that at that time the surface wind was less than 3 kt. As the actual conditions were at variance with the forecast thepilot telephoned the Meteorological Office at Manchester at 0545hrs for clarification of the forecast. There was no record ofthe subsequent discussions but the pilot stated that the DutyMeteorologist assured him that the surface winds would not increasesignificantly for 'a good two to three hours'. The pilot thereforedecided that the flight could take place and the balloon was assembledand inflated.

The twelve passengers consisted of, ten whohad bought tickets for the flight, one who was the pilot's friendand who held a Private Pilot's Licence (Balloons) and his 6 yearold son. When the envelope was inflated the passengers boardedthe basket and the pilot carried out a standard safety briefing,emphasising to the passengers the need to face rearwards on landing,hold on to the rope handles inside the basket, bend the kneesand not to leave the basket until instructed. The passengerswere asked to practice the 'landing position', which they did,under the supervision of the pilot.

The take off and early part of the flight,flown at heights of between 700 and 1500 feet agl, was conductedwithout incident. After approximately one hour the passengerswere told to prepare for landing and assumed the landing position. By this time the balloon had travelled approximately 19 nm fromthe launch site.

During the descent and attempted landing thepilot encountered strong windshear at low level, and aborted theapproach. A second attempt was made approximately 15 minuteslater and aborted for similar reasons. The balloon was now travellingtowards rising moor land and the pilot once again told the passengersto prepare for landing, having selected a large field on the shoulderof a gentle hill. One of the passengers reported that an instrumentin the pilot's compartment indicated a 500 feet per minute rateof descent shortly before the landing.

The selected site was a grass field whichwas very wet and muddy. Approximately 20 metres from the edgeof the field, lying at right angles to the path of the balloon,was a raised stone track approximately 10 cm above the surroundingsurface. Apart from the stone track, the field surface was virtuallyfree from stones or other hard objects.

Having committed to the landing, the pilotstarted to pull the 'rip' line, releasing hot air from the crownof the balloon envelope. This is normal practice when landingin strong winds and ensures that the balloon will no longer remainbuoyant. It also reduces the chance of a bounce and the lengthof the subsequent drag. An eye witness located approximately800 metres from the touchdown point saw the final descent andlanding. She reported that shortly before touchdown the upwindside of the balloon envelope had taken on a concave shape.

During the touchdown the left hand leadingcorner of the basket impacted the field immediately adjacent toand up against the raised track. This resulted in the balloonbasket immediately and rapidly rotating about it's leading edgeonto its side. As this happened, 6 of the 7 passengers locatedat the rear of the balloon lost their grip on the internal baskethandles and were thrown forward out of the basket.

Two of the passengers (passengers No 1 andNo 2 in Figure 1) were thrown clear of the basket. The pilot'sfriend (passenger No 3) and his son (passenger No 4) slid alongthe surface until eventually being pushed clear. On the otherside of the basket, passengers No 5 and No 7 were both ejectedon impact and thrown clear of the balloon. Passenger No 6 wasthrown forwards, became entangled in the balloon control linesand was dragged behind the balloon for approximately 160 metresbefore becoming disentangled. The balloon continued to drag fora further 10 metres before coming to rest. (A diagram of thelanding site showing the distribution of passengers and balloonis shown in Figure 2.)

Approximately 5 minutes after the landing,the pilot's friend, realising the extent of the injuries sustained,called the emergency services using his mobile telephone. Hewas later able to pass the exact map grid reference of their positionon information supplied by the balloon 'retrieve crew who arrivedon scene minutes later. They attempted to make the injured personscomfortable, but did not use the first aid kit that was carriedin the balloon and thrown from the basket during the impact. Furthermore there did not appear to be a contingency plan, availableto the retrieve crew, that could have been implemented to dealwith the occurrence.

Two ambulances arrived approximately 15 minuteslater. The vehicles attempted to drive across the field to theinjured but one became stuck. The four-wheel drive balloon retrievevehicle was not able to pull the ambulance free. Eventually alocal farmer was able to do so with the use of a four-wheel drivetractor.

**Video evidence**

Two video recordings had been taken of theevent. One had been taken from the ground and one, showing thefinal 62 seconds of the flight, had been taken from within thebasket. The audio portion of this recording revealed details ofburner activity. The recording commenced with the burner alreadyin operation and recorded the sound of the burner for a further7 seconds. The burner was then operated again after a 19 secondspause. On this occasion the burner was noticeably quieter possiblyindicating the operation of the less powerful 'quiet' burner,used when flying near livestock. This burn lasted for 16 seconds,with one short interruption, after which no further burn tookplace. Impact occurred 26 seconds after the end of the lastburn.

The video images also showed ground featuresreadily identifiable on an Ordnance Survey map of the area. Timeversus distance calculations from the video data showed that atthat time the balloon was travelling at an estimated ground speedof between 23 and 30 kt.

**Pilot details**

The pilot held an unrestricted CommercialPilot's Licence (CPL) for Balloons with a valid Class II medicalcertificate. He held type ratings to fly balloons in Group A(not exceeding 105,600 cu ft) and Group B (105,600 to 316,800cu ft). He obtained his CPL(B) in July 1994, adding the GroupB type rating in July 1996.40 hours of his group B experiencehad been gained on balloons with a 140,000 cu ft capacity. Hehad had the required period free from duty prior to the flight. In July

1996 he successfully completed a combined base/line checkfor Group B balloons, valid for 13 months. He had also completeda fire fighting and first aid course during 1994.

**Injuries**

The passenger who had been dragged behindthe balloon suffered a broken hand, concussion and minor cutsand grazing. Another passenger sustained whiplash injuries withsevere bruising to the chest, neck, shoulders and knee. One passenger,who had not adopted the correct landing position suffered severebruising to both knees. Two of the ejected passengers sufferedwhiplash and bruising injuries. The pilot, who was wearing arestraint harness, and the other passengers had remained in thebasket. They all suffered from bruising with minor cuts and grazes. Two had suffered whiplash injuries. The pilot, who had beendazed in the impact, was assisted from his safety harness by oneof the passengers.

**Balloon information**

The balloon, with a volume was 220,000 cuft, had flown a total of just over 6 hours since new and had acurrent Certificate of Airworthiness in the Public Transport Category.

The basket was of standard wicker and caneconstruction, woven around a central stainless steel framework. The main compartment contained the fuel cylinders and space forthe pilot, two smaller compartments each side of the main compartmentwere capable of carrying 3 to 4 passengers. Woven into the basketon the inside of each of the passenger compartments were six ropehandles. All compartments were fitted with a non-slip plywoodfloor.

The balloon envelope was fitted with a 'parachute're-sealable valve to deflate the balloon, which was operated bya control 'rip' line to the basket. Similar lines operated twoturning vents which released air from the envelope in order thatthe basket could be oriented for landing.

**Balloon performance**

On the day of the accident the surface temperaturewas 5°C. This gave a lift of 9 kg per 1,000 cu ft of envelopevolume. The balloon loadsheet showed the total load as being1590 kg. The calculated lift available, in the prevailing conditions,was 1980 kg thus there was 390 kg of spare lift available. Theballoon was therefore correctly loaded within prescribed limits.

**Conclusions**

The accident was caused by the execution ofa landing with a higher than normal ground speed combined witha higher than normal rate of descent.

The concave appearance of the balloon envelopejust prior to touchdown indicated that either the balloon hadbeen hit by a severe sudden gust of wind or had already begunto deflate as a result of the rip line having been pulled by thepilot. However despite the loss of 442 kg of payload (6 passengers;29% of the All-up Weight) during the initial impact, the balloondid not become airborne again, and dragged for 170 metres beforecoming to rest. This therefore suggests that partial collapseof the envelope was due to rip line activation.

The pilot was relatively inexperienced inlanding balloons of this size in strong wind conditions. He hadobtained the necessary Meteorological Information available priorto takeoff and having sought

clarification considered that theflight could be conducted safely. The balloon however encounteredincreasing windspeed conditions as it progressed north-eastwardsand an early decision by the pilot to land may have been moreprudent. Having delayed this decision the pilot was committedto land at altitude on the open moors, where wind speeds and conditionswere liable to be higher and more turbulent.

During the touchdown 6 of the passengers wereejected from the basket. These passengers suffered varying degreesof injury including concussion, whiplash injuries, cuts and bruises. The wearing of head protection may have reduced the severityof these injuries. Furthermore one passenger became entangledin the control lines and was dragged behind the basket. Althoughthe passengers had been briefed on the correct position to adoptduring a landing several suffered injury at touchdown.

After the accident there was no evidence ofany contingency plan for dealing with the aftermath, a situationexacerbated by the fact that the pilot was stunned and/or shockedand therefore effectively incapacitated.

**Safety Recommendations:**

In view of the conclusions above it is recommendedthat:

**Recommendation 98-24**

The CAA should consider mandating the wearingof suitable head protection for the use of all balloon occupants.

**Recommendation 98-25**

The CAA should ensure that balloon manufacturesdesign and supply control lines that are adequately routed andof a suitable length so as to reduce the possibility of inadvertententanglement with personnel or equipment during all phases offlight.

**Recommendation 98-26**

The CAA should encourage operators holdinga commercial balloon AOC to include, in their company operatingmanuals, an initial restriction on the windspeed limits applicableto pilots upgrading from their current type to significantly largerballoons.

**Recommendation 98-27**

The CAA consider whether commercial balloonoperators should incorporate into their operations manual, orother standing instructions, a written disaster management planand provide adequate training, in first-aid at an appropriatelevel, for their ground crew personnel accordingly.