

# Agusta Bell Jetranger 206B, G-BAKS

**AAIB Bulletin No: 6/98 Ref: EW/C97/11/3**      **Category: 2.3**

**Aircraft Type and Registration:** Agusta Bell Jetranger 206B, G-BAKS

**No & Type of Engines:** 1 Allison 250-C20 turboshaft engine

**Year of Manufacture:** 1972

**Date & Time (UTC):** 14 November 1997 at 1813 hrs

**Location:** Cocking Hill, near Chichester, West Sussex

**Type of Flight:** Private

**Persons on Board:** Crew - 1 - Passengers - None

**Injuries:** Crew - Fatal - Passengers - N/A

**Nature of Damage:** Helicopter destroyed

**Commander's Licence:** Airline Transport Pilot's Licence (Helicopters)

**Commander's Age:** 47 years

**Commander's Flying Experience:** 4,042 hours (of which 1,830 hours were on type)  
Last 90 days - 106 hours  
Last 28 days - 22 hours

**Information Source:** AAIB Field Investigation

## History of the flight

The helicopter operator was the holder of an Air Operator's Certificate (AOC) and the helicopter was generally operated in the Public Transport category. The pilot had planned to fly from Goodwood Airfield to a nearby hotel where he was to collect two passengers, he then intended to fly them to another hotel before returning, on his own, to Goodwood. The final sector (the accident flight) was a positioning flight and as such operated in the private category.

The pilot left Goodwood at 1551 hrs and arrived at the first hotel at approximately 1600 hrs. He collected his passengers and flew them to their destination, near Basingstoke in Hampshire, where he arrived at 1632 hrs. The weather on arrival was described by an eyewitness as dark and gloomy with a low cloudbase and some light drizzle. The pilot departed from this hotel at 1642 hrs intending to return to Goodwood and was then in radio contact with Farnborough ATC (Lower Airspace Radar Service) who saw him on radar pass to the north of their airfield. When he reported approaching the town of Godalming he was transferred to Dunsfold ATC at 1657 hrs. Once in contact with Dunsfold ATC the pilot requested an update on the weather conditions at Goodwood which the Dunsfold controller obtained; the Goodwood weather was described as misty with a cloud base estimated to be just above 700 feet and it was dark. When he received these details the pilot decided to divert to a nearby private landing strip at Tongham which he knew well; he was seen by Farnborough radar approaching Tongham at 1707 hrs. Whilst on the ground the pilot made a number of telephone calls one of which was to the ATC tower at Goodwood. He was told that the weather conditions had not changed. He gave the controller in the tower at Goodwood the impression that he probably intended to remain at Tongham overnight and that he would return to Goodwood the next day.

At 1739 hrs a primary radar contact was noted by Farnborough ATC appearing in the Tongham area and initially this contact headed east although there were no radio communications which might have originated from the contact. At about 1810 hrs a number of witnesses heard a helicopter flying south over the village of Cocking. This village is 11 km to the north of Goodwood Airfield. All of these witnesses, who were familiar with helicopter flight over the village, describe the helicopter as being unusually low and slow. A professional pilot, who had a clear view of the helicopter, estimated it to be between 50 to 100 feet above the ground and flying at a speed of about 10 kt. The helicopter appeared to be following the A286 road south out of the village towards Chichester, the road was reasonably busy at the time with a steady stream of traffic in both directions and the helicopter was displaced about 50 metres to the west of the road which rises steeply to the south of the village. The weather conditions in the village at the time were described as murky and dark with some light drizzle.

At about 1815 hrs a farmer heard a helicopter fly very low over his cottage which is situated on a crest of the South Downs one kilometre to the south of the village of Cocking. He ran outside and shone a hand-held torch at the helicopter which was directly above him. The helicopter was low enough for the underside to be clearly illuminated by the beam. The helicopter engine sounded normal although it was unusually loud since it was so low. The noise of the helicopter appeared to commence a right turn back to the north; very shortly afterwards there was a loud thump and then silence. A neighbour, who had also come outside having heard the low flying helicopter, saw the helicopter for the first time in the instant that it struck the ground about 150 metres away; she then contacted the emergency services and this call was logged at 1816 hrs. The emergency services arrived at 1830 hrs but the pilot had already died from multiple injuries.

## **Meteorological conditions**

An aftercast, obtained from the Meteorological Office, indicated that there was a moist south-westerly airstream established over Southern England producing occasional rain and drizzle at the time of the flight. The visibility was generally around 6 km but this probably reduced to 2,000 to 3,000 metres over the South Downs. There was some cloud with a base of 500 feet above sea level (amsl) but the main base was between 800 and 1,000 feet amsl, the surface wind was 200 /12 kt with a temperature of 12\_C and the mean sea level pressure was 1010 mb. These conditions accurately reflected the meteorological forecast obtained by the pilot. Sunset had been at 1612 hrs that evening and, for regulation purposes, night flying commences at sunset plus 30 minutes ie 1642 hrs.

Estimates of the visibility at ground level at the accident site vary from 50 metres to about one mile. However, whilst the two witnesses closest to the accident could not see the helicopter during its turn behind the farm cottages one of them did see the impact about 150 metres away from where she was standing. No estimates were available of the cloud base but it was probably low enough to have forced the helicopter to fly at less than 100 feet.

The minimum weather conditions for normal company operations published in the Operations Manual are: "cloud base of 600 feet above ground level and a horizontal visibility of 1,000 metres."

The Agusta Bell 206B also has an operating limitation published in the Flight Manual that restricts night flying operations to visual contact flight conditions. This means that at night orientation should be maintained through visual reference to ground objects solely as a result of lights on the ground or adequate celestial illumination: ie starlight or moonlight. With the prevailing cloud cover there was no such celestial illumination available to this pilot who would therefore have been relying totally on cultural lighting.

## **Pilot experience**

The pilot's flying experience had been gained exclusively in helicopters and his various licences related solely to this type of aircraft. He had gained his Private Pilot's Licence in 1984 and had then progressed to a Commercial Pilot's Licence in 1989 and an Airline Transport Pilot's Licence in December of 1990. His initial flying as a professional pilot had been from Shoreham, near Worthing, and he subsequently moved to Goodwood in 1995; he was therefore thoroughly familiar with the area where the accident occurred. He had recorded in his flying log book a total of 45 hours of night flying with 2 hours entered since April 1997. He had never trained for or passed an Instrument Rating; this would have demonstrated a proven ability to fly an appropriately approved helicopter by sole reference to the aircraft instruments.

Post-mortem examination of the pilot revealed that there was no evidence of any alcohol, drugs or medical condition which may have caused or contributed to the cause of the accident.

## **Instrument flying in helicopters**

The Agusta Bell 206B Flight Manual Operating Limitations (Section 1) states:

### "TYPE OF OPERATION

The basic helicopter is approved as a five place aircraft and is certified for land operations under day or night VFR non-icing conditions."

Single engine helicopter registered in the UK are not permitted to be operated solely by reference to flight instruments ie visual reference is required at all times and this means that the helicopter must be flown clear of cloud and in sight of the surface. Pilots who are type rated only on such helicopters therefore rarely possess an Instrument Rating. In considering instrument flight by IFR approved twin engine helicopters it is noteworthy that their limitations include a minimum speed below which flight by sole reference to the flight instruments is prohibited; this speed is typically about 45 kt. Below this speed the inherent instability of a helicopter is increased as a direct consequence of the decreased airflow over the aerodynamic surfaces and the tail rotor. Furthermore, as the speed reduces the pilot's attention moves more and more to the cues provided outside of the helicopter until, when at the hover, he relies completely on external cues. These combined factors of increased instability and an increased reliance on external visual cues make the task of flying any helicopter by sole reference to the flight instruments extremely difficult at a low speed, and this problem is compounded during the transition between visual flight and flight on instruments.

## **Site details**

The helicopter had struck the ground in a ploughed field at an altitude of 357 ft amsl, some 300 metres to the west of the A286 road which it had apparently been following. The crash site was compact, with only a small amount of forward throw of items such as windscreen perspex and the left main cabin door - the nature of this throw suggested that the aircraft was travelling at slow speed in a northerly direction. The field was fairly open with no adjacent high obstacles which the helicopter might possibly have struck before impact with the ground. Inspection of the closest buildings, trees and low-tension power cables did not reveal any evidence of such contact.

The fuselage had impacted in an almost inverted attitude. Initial ground contact by the fuselage had been on the nose and then the cabin roof. However, one main rotor blade had already struck the ground heavily, destroying that blade and causing detachment of the hub from the mast. At the same time the rest of the helicopter impacted heavily, wiping back the mast, flying control Power Control Units (PCUs) and the main transmission. Because of the attitude at impact, the tail boom had not struck the ground but had jack-knifed forwards against the fuselage and the tail rotor was unmarked. The helicopter had come to rest very rapidly as there were no indications of any ground slide marks nor was there any evidence that the tail boom had been struck by the main rotor. Given the low airspeed, it is highly improbable that the helicopter flew or was flown into an inverted attitude before impact. It is more likely that it was in a steeply banked right turn and descending when a main rotor blade struck the ground which caused the fuselage to rotate around the mast and flipped it into the inverted attitude in which it struck the ground.

The wreckage was recovered and transported to the AAIB hangar at Farnborough for more detailed examination. It had already been established on-site that there had been considerable energy in the main rotor system and that the engine had been running, so attention was principally focused on the flying control system. The PCUs struck the ground early in the impact sequence and suffered distortion which effectively locked them in their pre-impact positions. By measuring the extension of the jack rams, it was determined that their positions corresponded to virtually full aft and right cyclic pitch control with the collective pitch lever roughly at mid-travel.

Because of the massive disruption to the forward upper fuselage and cockpit, there was corresponding heavy damage to the flying control components which are mostly situated in that area. However, each control rod was inspected to ensure that no pre-impact failures or disconnection had occurred. None was found. The helicopter was equipped with two illumination flares for emergency forced landings at night. These had not been fired. It was also equipped with three radio communication sets. One of these was tuned to 125.25 Mhz (Farnborough radar) and 120.17 Mhz ('Timber' sector of London Terminal Control). The third was tuned to 122.45 Mhz Chichester (Goodwood) Approach. It was not possible to determine which of these frequencies was selected to the pilot's transmit button.

## **Conclusions**

On the evening of the accident the weather in the general area was changing quite rapidly and from time to time it probably deteriorated below the limits for safe flight under visual conditions. It was presumably for this reason the pilot, when he learned of the weather at his original destination, Goodwood, decided to divert to the landing site at Tongham. For unknown reasons he then decided to continue the journey, after a pause of some 32 minutes on the ground, although the reported weather at Goodwood remained unchanged. It is possible that the local conditions at Tongham favoured an attempt to continue with the homeward flight. Given the pilot's local knowledge he was well placed to use the natural features along the route in order to avoid high ground and to choose a

feasible route away from the worst of the weather. Nevertheless, the absence of the necessary visual references could have contributed to the pilot's spatial disorientation.

The area forecast indicated that the main cloud base was between 800 and 1,000 feet amsl. The estimated cloud base of 700 feet at Goodwood, which is 100 feet amsl, tends to confirm this forecast. Between Tongham and Goodwood there are two areas of high ground. The South Downs run east/west some three miles to the north of Goodwood and rise to an average height of 600 feet. Further north there is high ground between Haslemere and Midhurst rising to similar heights, but it is possible, under favourable conditions of visibility, to follow lower ground along the River Arun valley to the east. Considering the location of the accident site it is likely that the pilot was attempting to find his way across the South Downs by following the A286 road which runs through the village of Cocking.

Shortly before the accident the helicopter was seen to be flying below 100 feet and at a speed estimated to be at about 10 kt, it was a dark night with a low cloud base and restricted visibility and the pilot would have been relying totally on the lights on the ground for navigation and orientation. He apparently entered a turn to the right, probably as a result of flying into deteriorating weather conditions at the crest of the hill whilst following the road. When turning to the right he would have been flying over a very dark area of rural landscape with little cultural lighting. Lacking any useful external visual cues he would have been forced to transition to flight on instruments, but, with his lack of training and experience this would have been an unusual environment for him. It is therefore likely that by now the pilot had become disorientated and lost control of the helicopter which then struck the ground and crashed in an inverted attitude.