AAIB Bulletin No: 2/94 **Ref: EW/C93/12/1** **Category: 2.3**

Aircraft Type and Registration:	Montgomerie-Bensen B8M, G-BOYK
No & Type of Engines:	1 Rotax 532 piston engine
Year of Manufacture:	1988
Date & Time (UTC):	11 December 1993 at 1230 hrs
Location:	Sturminster Marshall, Dorset
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - Fatal Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Airline Transport Pilot's Licence (Aeroplanes) Private Pilot's Licence (Gyroplanes)
Commander's Age:	57 years
Commander's Flying Experience:	Over 10,000 hours (of which 20 were on type) Last 90 days - 133 hours Last 28 days - 44 hours
Information Source:	AAIB Field Investigation

The pilot

The pilot had flown a wide range of aircraft types during his Royal Air Force career and had been a Qualified Flying Instructor. Since leaving the Royal Air Force he had been employed as a commercial pilot for the five years preceding the accident. He was in the process of constructing his own gyrocopter and had used G-BOYK, which belonged to a friend, for the training required to gain his gyrocopter licence. Because of his previous flying experience, which included some gyroglider training, the CAA required that he complete only 20 hours flying for the grant of a licence as opposed to the 40 hours required of an *ab initio* candidate. The majority of this training was conducted by an experienced gyrocopter instructor between 9 and 13 August 1993 and was completed on 27/28 August 1993 when he successfully completed a qualifying cross-country flight and the General Flying Test. He was rated by his instructor as an above average student. All flying was conducted on G-BOYK, which was a single seat machine, and the CAA awarded the pilot a licence on 28 October 1993. No record could be found of the pilot having flown a gyrocopter between 28 August and the day of the accident.

History of the flight

On the morning of the accident the owner of G-BOYK took it by trailer to a grass strip where he was met by the pilot. The weather was fair with good visibility and the owner estimated the surface wind to be from the north west at 20 to 25 kt and gusting. At about 1030 hrs the owner flew the aircraft for about ten minutes. He stated that the aircraft behaved normally and there were no defects and that he flew for only ten minutes because 'it was rather bumpy'. It was decided to delay further flying until the afternoon when it was expected that the weather would have improved. Over lunch, the pilots listened to a weather forecast and, on returning to the strip, the owner considered that the weather had improved and, in particular, the wind was less gusty. A meteorological aftercast compiled by the Meteorological Office at Bracknell indicated that, at the time of the accident, the surface wind was 280°/20 kt gusting to 35 to 40 kt.

It was decided that the newly qualified pilot, who was subsequently involved in the accident, should fly the aircraft and it was agreed that he should climb to 1,000 feet after take off and conduct some general flying to the north of the strip before returning to land. The take off into the westerly wind was observed by the owner and appeared to be quite normal with the pilot in good control of the aircraft. The engine note was normal but after take off the aircraft did not appear to achieve the expected rate of climb. On reaching the end of the strip, after a flight of about 600 metres, the aircraft had reached a height of only about 200 feet. It was then seen to enter a steady and mainly level left turn which continued through 360°. On completing this turn the aircraft was seen to straighten onto a westerly heading for about two seconds before entering a further stable turn to the left. As the aircraft approached a southerly heading the rotor speed was seen by a witness close to the impact point to reduce as the aircraft pitched nose down while rotating through one to one and a half revolutions. After stabilising for a short time with the rotor still at low speed, the aircraft pitched nose down and fell to earth. During this fall the rotor was seen to complete only two or three revolutions. The final manoeuvre of the aircraft was seen by the owner, who was some 600 metres away, as a bunt followed by the aircraft tumbling to earth. The pilot sustained fatal injuries on impact. A post mortem examination did not reveal any pre-existing medical condition that could have caused or contributed to the accident

Gyrocopter disc loading

It is a characteristic of gyrocopter flight that the rotor is maintained in rotation by an upflow of air through the rotor disk which is presented to the airflow at a suitable angle. This airflow results from the aircraft's forward motion caused by engine thrust or, with reduced or no thrust, by the aircraft's descent under the effect of gravity. In either case positive disk loading is essential and it is apparent

that any reduction in normal acceleration (g) can result in a rapid decay of rotor RPM to a value below that at which autorotation is sustained. Normal acceleration may be reduced as a result of a flight manoeuvre (pushover/bunt) or unstable airflow which may be encountered in turbulence. Experienced fixed wing pilots tend instinctively to move the control column forward when encountering unusual or unexplained aircraft motions.

Engineering Investigation

Examination of the wreckage showed that the aircraft had come to rest on a magnetic heading of about 020° but it had travelled several feet across the ground on a track of about 360°. From the nature of the damage the speed was assessed as very low, less than 30 kt, and the aircraft had been descending fairly rapidly. At impact it was rolled fully to the right side and the nose was down, probably by about 20°. There was little evidence of rotation of the rotor blades and no evidence at all of the rotor striking the ground before the main impact. The engine had been running at speed and many fragments of the wooden propeller were found a considerable distance from the wreckage. Closer examination showed that the aircraft had been complete at impact with all the flying controls connected. The vertical stabiliser had not been struck by the rotor and no part of the aircraft, in particular the pre-rotator mechanism or starter handle, had come into contact with the rotor.

The tachometer was damaged in the impact but as found the pointer was indicating about 4,000 RPM, with no marks on the instrument face and the needle position alone was not considered reliable evidence. The throttle mechanism was examined to try to determine the throttle setting at impact. One carburettor slide was found jammed in the fully open position but it is possible that this was caused by pulling of the throttle cables during the impact sequence. No other evidence of throttle position could be found.

The airspeed indicator and its venturi system were examined. No pre-impact blockage or leaks were found although the venturi itself had broken off and was filled with mud from the accident site. The static vent was unobstructed and the instrument itself was found to function normally.