AAIB Bulletin No: 11/93 **Ref: EW/C93/7/2** **Category: 1.3**

Aircraft Type and Registration:	Beech F33C Bonanza, G-UNST	
No & Type of Engines:	1 Continental IO-520-BA piston engine	
Year of Manufacture:	1978	
Date & Time (UTC):	20 July 1993 at 1827 hrs	
Location:	Shadoxhurst, Near Ashford, Kent	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - Fatal	Passengers - Fatal
Nature of Damage:	Aircraft disrupted by impact and destroyed by fire	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	31 years	
Commander's Flying Experience:	5,973 hours (of which 51 were on type) Last 90 days - 140 hours Last 28 days - 51 hours	
Information Source:	AAIB Field Investigation	

History of flight

The aircraft was based at Lydd Airport, Kent. The pilot booked out for a local flight and took off at 1809 hrs from Runway 04; the aircraft turned left onto a northerly heading, shortly after becoming airborne. Between 1821:48 hrs and 1822:13 hrs, secondary radar data recorded from the Pease Pottage head, south of Gatwick Airport, showed five returns from an aircraft crossing the southern edge of the town of Ashford. Two more associated returns, at 1823:02 hrs and 1823:52 hrs, were recorded in the vicinity of the accident site. Although positive identification was not possible, the balance of evidence suggested that these returns were from G-UNST. The final part of the aircraft's track to the accident site was deduced by correlating this information with the observations of eye witnesses.

The aircraft's track from Ashford was south-westerly and its radar height was 900 feet; this was based on the standard atmospheric pressure of 1013.2 mb. The radar return at 1822:13 hrs gave the height as 500 feet; there were no more returns until 1823:02 hrs. The distance and time which separated these two returns was commensurate with the aircraft having flown in a direct line between them.

At 1823:02 hrs the aircraft was at 800 feet, north of the village of Shadoxhurst. It then flew a level, left orbit to the west of the village and returned to approximately the same position at 1823:52 hrs; this was the last radar return and the height was again 800 feet. The aircraft turned left and tracked south. When it was about ½ nm west of the village, the wings were seen to rock slightly and the engine noise reduced. It then started a descending left turn back towards the village and passed over a garage workshop on the western edge at an estimated height of about 100 to 150 feet agl; the speed was described as slow and the engine sounded to be at low power. The landing gear was retracted. The left wing then dropped suddenly and the aircraft disappeared from view behind the perimeter hedge of an adjacent field. The engine noise increased shortly before impact at, or just before, 1827 hrs.

Impact parameters

The aircraft crashed into a field of mature broad beans in heavy clay soil at a height of approximately 130 feet amsl. It struck the level ground on a heading of approximately 340° M at low forward speed, probably in the region of 50 kt, whilst in a right wing low attitude but with a relatively level pitch attitude. The vertical speed at the time of impact was estimated as being high. The above assessments were consistent with the aircraft being in a stalled or semi-stalled state and possibly with it in the early stages of a spin. It could not be established if the observed direction of rotation had been reversed prior to striking the ground or if the aircraft had completed one complete revolution after being lost from sight but it would seem unlikely that sufficient height was available for it to accomplish the latter. The initial right wing contact resulted in the wing section outboard of the flap becoming detached and caused the aircraft to cartwheel heavily onto its nose and yaw rapidly to the right. The airframe suffered major failures about the centre section at this time but came to rest erect facing approximately east. A ground fire was precipitated by the relatively large quantity of fuel released from both wing tanks and this fire consumed most of the cabin area of the fuselage.

Weather

The weather in the area was fine and the visibility was good; the surface wind was northerly at about 5 kt. The temperature was 18°C and the dew point was 11°C. The Chatham regional QNH was 1009 mb, however, the area in which the final portion of the flight took place was less than 12 nm from Lydd Airport, elevation of 11 feet amsl, where the QNH/QFE was 1014 mb. It would, therefore, be reasonable to assume that, in the prevailing weather conditions, the pressure would have been the same in the Shadoxhurst area as at Lydd. The aircraft was, therefore, about 700 feet agl throughout the first orbit.

Aircraft performance

The aircraft weight at the time of the accident was estimated to have been about 3,000 lb and the centre of gravity was within the limit for normal flight. The flaps up stalling speed under these conditions, with wings level, would have been about 61 kt (70 mph).

Wreckage analysis

Examination of the wreckage both on site and subsequently at AAIB Farnborough showed the aircraft to have been complete and structurally intact prior to impact and that it was configured with both the landing gear and flaps retracted. As a result of the fire it was not possible to establish complete integrity of the flying control systems but no evidence was discovered of any pre-impact jam or disconnection in the wreckage available for examination. For the same reason little of the airframe mounted fuel system could be examined. There was evidence of engine rotation from damage to the propeller blades and this suggested that some power was being developed at the time of impact. A strip examination of the propeller assembly revealed all internal damage to be consistent with impact forces. The engine itself had survived the impact and fire in a relatively good condition, a detailed examination of which showed it to be mechanically sound. Although the sump had shattered in the impact, oil was present throughout the engine and its ancillary equipment. The oil filter was free of metallic debris and the oil pump and its drive were in a serviceable state. The fuel injection system was strip examined and found to contain, in places, wet fuel. No pre-existing defects were identified in the fuel pump, its drive, or the distribution system, and all filters were clear. Both magnetos had remained with the engine although the left unit had broken free from the crankcase. The right unit was firmly secured to its mounting with no sign that it had slipped and, on test, produced sparks down to approximately 200 RPM. The left unit, which had been affected by the fire, could be turned but failed to generate sparks. A strip examination showed it to be intact but that it had suffered corrosion subsequent to the fire. All the spark plugs were clear of pre-impact deposits and were capable of normal operation. The exhaust system was examined for evidence of pre-existing cracks or leakage but none was found.

Examination of the few instruments to have survived the fire revealed the following information, all of which was judged to be valid:

1 Altimeters set to 1009 mb and 1013 mb
2 Fuel flow needle witness mark at 13 gal/hr. (This represents approximately 60% max power. The F33C model of the Bonanza is aerobatic and as such the engine and fuel system are unlikely to be affected by 'unusual' attitudes or loading).
3 VSI needle witness mark at 3400 fpm down
4 Artificial horizon jammed at 60° right wing low, pitch attitude mechanism free to rotate.

With the limitation that significant parts of the wreckage had been consumed by the post-impact fire and were therefore not available for examination, no pre-impact defects were identified in the aircraft which might have contributed to this accident.

The aircraft occupants

The passenger, who occupied the front right seat, held a current private pilot's licence. He had flown with the pilot on previous occasions and it was their normal practice for one to fly the aircraft while the other performed in the manner of a co-pilot. On this occasion, the initial radio transmissions were made by the passenger which implied that the pilot was handling the aircraft during the first part of the flight. It was not possible to determine who was handling the aircraft during the final part of the flight.

Post mortem examination

Post mortem examination of the pilot revealed no pre-existing medical condition which would have contributed to the accident. The cause of his death was multiple injuries consistent with an aircraft accident.

Post mortem examination of the passenger revealed evidence of very severe natural disease which involved all three major coronary arteries. Detailed examination of the heart and its associated blood vessels led to the conclusion that, at some point prior to the impact, this might have produced symptoms which could have varied from chest pain, through collapse, to sudden death. As far as could be determined, the passenger had not previously experienced any clinical symptoms of heart disease and none had been evident during routine examination by his CAA Authorised Medical Examiner. However, the balance of evidence suggested that the eventual cause of his death was multiple injuries consistent with an aircraft accident.

The passenger had a carboxyhaemoglobin level of 11%; this was slightly higher than would normally be attributed to smoking alone, however, the pilot had a level of less than 1%, so it is unlikely that there was a significant level of carbon monoxide present in the cockpit.

Both occupants had similar and distinctive injuries to the left hand; a major laceration between the thumb and index finger. This type of injury can be suffered by the hand which is holding the control wheel at impact, however, a similar injury could result from gripping the coaming.