AAIB Bulletin No: 6/93 **Ref: EW/C93/1/1** **Category: 1a**

Aircraft Type and Registration:	Embraer Bandeirante, G-ZAPE
No & Type of Engines:	2 PT6A turboprop engines
Year of Manufacture:	1981
Date & Time (UTC):	13 January 1993 at 0820 hrs
Location:	Ponsonby Fell, Cumbria
Type of Flight:	Public Transport (Freight)
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - Fatal Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	35 years
Commander's Flying Experience:	2,063 hours (of which 271 were on type) Last 90 days - 104 hours Last 28 days - 46 hours
Information Source:	AAIB Field Investigation

History of the flight

The purpose of the flight was to transport freight from Southend to Glasgow as part of a contract with a major parcels company. The crew comprised two pilots, who both held an Airline Transport Pilot's Licence and were qualified to act as pilot in command of the Bandeirante. Both pilots were well rested and reported for duty at Stansted, the company operating base, at about 0530 hrs to ferry the aircraft to Southend for freight collection. They arrived at 0610 hrs and the freight was loaded while the crew reported to the flight briefing office where they were given a standard pack of weather briefing material which covered the whole of the UK. In accordance with its normal policy the company had filed an IFR flight plan the previous evening for a standard route from Southend to Glasgow. This route was for a transit outside controlled airspace at FL65 to a point 120 nm south east of Glasgow after which the flight was to be completed in controlled airspace. The last pilot to fly G-ZAPE before the accident flight stated that all aircraft systems were functioning normally.

Having studied the meteorological forecast (see Meteorological information), the commander cancelled the IFR flight plan and stated his intention of flying to Glasgow under VFR. Company policy allowed commanders to cancel IFR flight plans at their discretion. The Air Traffic Control Assistant on duty in the flight briefing office stated that both pilots appeared to be in good spirits and that, having cancelled the IFR flight plan, they appeared to be discussing a route on the western side of the country. They then booked out stating their intention of flying to Glasgow VFR but did not specify a routing or intended altitude.

The designated aircraft commander was qualified as captain in the left-hand seat only but the co-pilot was qualified to operate as captain from both the left and right-hand seats. On entering the aircraft, the pilot who had been rostered by the company as the commander was seen to occupy the right-hand seat and the co-pilot the left. These positions were maintained during engine start and taxi. The aircraft departed Southend at 0659 hrs, about one hour before sunrise, on a Special VFR clearance. By reference to RTF recordings it was established that the aircraft flew to Wallasey via Daventry, Whitegate and the Liverpool Special Rules Zone at 2,400 feet on the local QNH. It could not be determined why the commander chose to fly this route however, some two weeks before the accident he had spent a short holiday at Haverigg which is close to the direct track from Wallasey to Glasgow. On leaving Wallasey, the aircraft tracked north towards Glasgow and, at 0801 hrs, the crew called Warton aerodrome stating that they were descending to 1,000 feet and requesting a 'Radar Service'. At 0810 hrs, an aircraft that had just taken off from Blackpool reported a cloud base of between 2,500 and 3,000 feet and a visibility greater than 20 km. At this time the radar transponder on the aircraft was operating but the height encoding facility had not been selected. Recordings of the Great Dunn Fell and the St Anne's ATC radar heads indicated that the aircraft had left Wallasey on a track of 007°M (Figure 1) which was maintained until radar contact was lost at 0813 hrs at a position one mile to the south west of Walney Island airfield near Barrow in Furness. Consideration of the obscuration due to terrain between the radar heads and the aircraft indicated that, at the time of loss of radar contact, the aircraft would have been no higher than 350 feet amsl and possibly lower.

At 0809 hrs, the time of local sunrise, the crew had called Walney Island stating that they were nine miles south of the airfield at 1,000 feet and requesting overflight of the airfield. At 0812 hrs, the controller at Walney Island sighted the aircraft abeam the airfield at an estimated height of 800 feet and asked the crew to report at Millom which is about eight miles north of Walney Island. At about the same time, a witness on the beach near the airfield saw the aircraft heading north in and out of cloud at a height estimated to be not above 400 feet. The aircraft did not make the requested position report at Millom and, at 0816 hrs, the controller advised the crew to call London Information for further service. There was no reply to this call and so the controller contacted the Warton radar controller to whom she believed the pilot may have reverted following contact with Walney Island. Upon being

advised that Warton ATC were not in contact with the aircraft, the controller assumed that it had entered an area of poor RTF coverage and decided to take no further action.

At about 0800 hrs, a low flying aircraft was heard but not seen overflying an equestrian establishment one mile to the west of Haverigg near Millom. The ear witness stated that the aircraft sounded so low that she thought it was going to crash. G-ZAPE was next seen by several witnesses at times variously reported as between about 0810 hrs and 0825 hrs. All these witnesses agreed that the aircraft was flying north at low altitude below the cloud base and most of them estimated the height of the aircraft at 200 feet agl. There was general agreement that its speed was low. The flight path was reported as steady with no significant change in height or heading and the note of the engines was constant. Most witnesses observed that, in the poor light conditions that prevailed at the time, both the external flashing lights and the internal cabin lights of the aircraft were quite obvious. The observed track of the aircraft was from Bootle Station, some three miles south of the Eskmeals gunnery range, to Holmrook, about five miles south of the crash site which was a total track distance of 11 miles. The last person to see the aircraft reported that it was flying steadily north towards Ponsonby Fell and that the cloud in the area of the Fell was covering the ground at 500 feet above sea level.

At about 0815 hrs a farmer, who was some 600 metres from the crash site, heard a bang from the direction of Ponsonby Fell which he assumed to be caused by a falling tree. He stated that at the time that he heard the bang the weather was very bad with a strong wind, rain and mist covering the fell.

Search and Rescue

G-ZAPE should have arrived at Glasgow at about 0900 hrs but Glasgow ATC was unaware of this because the commander had cancelled the flight plan submitted by the company and consequently overdue action was not initiated. When they had not heard from the commander by about 1030 hrs, the Company telephoned Glasgow ATC for news of the aircraft. It then became apparent that the aircraft was overdue and Search and Rescue operations were started at 1038 hrs. The initial search datum was based on the last known radar position to the south west of Walney Island. An RAF Nimrod, three RAF Search and Rescue helicopters, two Police helicopters and several Mountain Rescue Teams were deployed on the search. The search was hampered by poor weather, but the wreckage was eventually located at 1500 hrs by a police helicopter at an altitude of 950 feet amsl on Ponsonby Fell some 23 miles from the search datum.

Meteorological information

The forecast for the flight plan route gave a general visibility of 20 km with no cloud at the planned cruising altitude. However, it indicated broken cloud for the initial climb out of Southend and for the arrival at Glasgow together with the possibility of occasional extensive cumulus cloud at the planned cruising level and a freezing level of 3,000 feet. The forecast for the route from Southend to Liverpool gave a general visibility of 10 km in rain, variable cloud base of 1,500 feet with tops at 6,000 feet and a freezing level of between 3,000 and 4,000 feet. A meteorological observation made at the Eskmeals range at 0850 hrs on the day of the accident gave a surface wind of 200°/17 kt gusting to 29 kt, a visibility of 7 km in continuous moderate rain and a lowest cloud base of 600 feet above mean sea level. The 1,000 feet wind measured at 0700 hrs was 220°/39 kt.

Examination of the wreckage

The aircraft had flown into ground about 15 metres below the top of Ponsonby Fell. The ground marks at the first impact point gave a heading of 340°M and showed that the aircraft's velocity vector was almost parallel with the ground surface, which sloped upwards at 15°. The comparative lack of penetration of the earth by the aircraft and the absence of a definitive imprint suggested that the aircraft's attitude was also aligned with the ground. Three propeller slash marks from the right-hand engine indicated a ground speed of 217 kt (at a cruise power of 83%); with a tail wind of 20 kt this would have given an air speed of 197 kt. A further indication of airspeed came from an air speed indicator dial which was found with a pointer imprint on the dial indicating 183 kt. Such an imprint could have occurred during the first impact, which could have produced retardation forces estimated to have been between 10g and 25g.

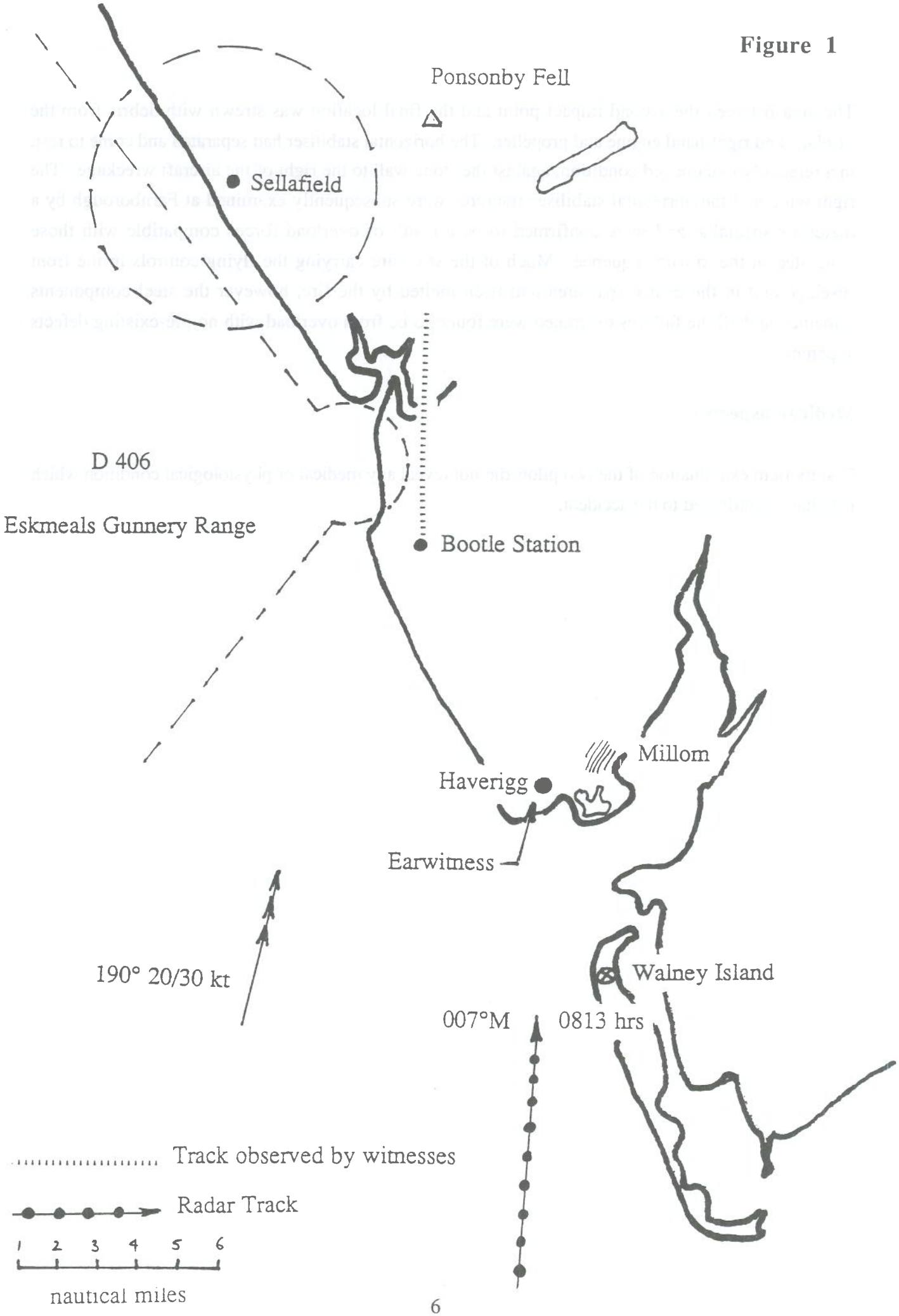
The brunt of the impact had been taken by the right-hand engine nacelle and wing and the right-hand wing had detached at a position outboard of the engine; this section came to rest 200 metres along track. The rest of the aircraft had cleared the ridge and made a second impact 340 metres from the first contact point, from whence it slid into a stone wall 90 metres further on. A fuel fire developed around the left-hand wing and melted the front fuselage, sections of the wing, and heavy aluminium alloy structure around the main spar and right-hand main gear attachment points. The left-hand engine and propeller remained attached to the wing but the propeller blades were further damaged by the ground fire. The right-hand engine had completely disintegrated and components were found at and beyond the second impact point. Both engines were examined at the manufacturer's overhaul facility and were determined to have been running in their operating regime at the time of impact.

The area between the second impact point and the final location was strewn with debris from the fuselage and right-hand engine and propeller. The horizontal stabiliser had separated and come to rest, in a relatively undamaged condition, against the stone wall to the right of the aircraft wreckage. The right wing and the horizontal stabiliser fractures were subsequently examined at Farnborough by a materials specialist and were confirmed to be a result of overload forces compatible with those generated in the impact sequence. Much of the structure carrying the flying controls in the front fuselage and in the centre spar area had been melted by the fire, however the steel components remained and all the failures examined were found to be from overload with no pre-existing defects apparent.

Medical aspects

Post mortem examination of the two pilots did not reveal any medical or physiological condition which may have contributed to the accident.

Figure 1


Ponsonby Fell
Sellafield
D 406
Eskmeals Gunnery Range
Bootle Station
Millom
Haverigg
Earwitness
190° 20/30 kt
Walney Island
007°M
0813 hrs
Track observed by witnesses
Radar Track
1 2 3 4 5 6
nautical miles