

# Boeing 737-200, EI-CJE and BAe 146-100, G-UKJF, 30 September 1997

## AAIB Bulletin No: 4/98 Ref: EW/C97/9/5 Category: 1.1

<b>Aircraft Type and Registration:</b>	i) Boeing 737-200, EI-CJE ii) BAe 146-100, G-UKJF
<b>No &amp; Type of Engines:</b>	i) 2 Pratt & Whitney JT8D-15 turbofan engines ii) 4 Lycoming ALF 502-R5 turbofan engines
<b>Year of Manufacture:</b>	i) 1982 ii) 1983
<b>Date &amp; Time (UTC):</b>	30 September 1997 at 1353 hrs
<b>Location:</b>	9 nm south west of London (Stansted) Airport
<b>Type of Flight:</b>	i) Public Transport ii) Public Transport
<b>Persons on Board:</b>	i) Crew - 7 - Passengers - 103 ii) Crew - 5 - Passengers - 17
<b>Injuries:</b>	None
<b>Nature of Damage:</b>	None
<b>Commander's Licence:</b>	i) Airline Transport Pilot's Licence ii) Airline Transport Pilot's Licence
<b>Commander's Age:</b>	i) 38 years ii) 33 years
<b>Commander's Flying Experience:</b>	i) 7,390 hours (of which 3,747 were on this type) Last 90 days - 70 hours Last 28 days - 29 hours ii) 6,975 hours (of which 2,627 were on this type)

Last 90 days -134 hours

Last 28 days - 50 hours

**Information Source:**

AAIB Field Investigation

## **Synopsis**

The incident involved a loss of separation between a Boeing 737, departing from London (Stansted), and a BAe 146, inbound to London City Airport. The incident occurred some 5.4 miles north east of the Brookmans Park (BPK) VOR.

## **History of the flight**

The B737 was planned to operate a scheduled passenger service from London (Stansted) to Dublin. As part of the pre-flight procedure the crew had obtained the latest ATIS information which included a surface wind of 250°/06 kt, a visibility of 6,000 metres, the surface temperature was 19°C, the QNH 1023 mb and the cloud was reported as 'few' at 900 feet, broken at 2,600 feet; Runway 23 was the runway in use. At 1312 hrs the crew contacted the Stansted ground control frequency to acknowledge receipt of the relevant ATIS and requested ATC clearance. A BUZAD FOUR ROMEO Standard Instrument Departure (SID) was allocated, as expected, and a transponder setting was also given.

The BUZAD FOUR ROMEO SID (see Jeppesen Guide extract, part 1 and part 2) requires that, after take off, the aircraft should climb straight ahead and, at 11.5 DME from Brookmans Park (BPK), which is coincident with the 160° radial from Barkway (BKY), the aircraft should turn right to intercept the BKY 175° radial inbound to BKY by 8 DME from BKY. The aircraft is then required to proceed inbound towards BKY. Separate routing instructions then apply for the remainder of the SID. The initial altitude constraint for this SID is to cross the 5 DME point from BKY at 3,000 feet.

The commander was to be the handling pilot for this leg. He therefore set the navigation aids as follows: BKY VOR on navigation box 1, BPK VOR on navigation box 2, 355° was set on both omni-bearing selectors (OBSs) and both remote magnetic indicators (RMIs) were set to dual VOR. These navigation aids were then checked by both pilots for the correct aural identification.

The crew requested clearance to push back and start engines at 1337 hrs after which clearance was given to taxi to the holding point for Runway 23. Whilst taxiing the flight was transferred to the frequency for the aerodrome control tower who cleared it for take off at 1349 hrs. During this period there were no amendments to the original departure clearance.

Meanwhile control of the BAe 146, on a scheduled passenger service from Edinburgh to London City Airport, had been passed to the North East sector of the London Terminal Control Area (LTCA) at 1350 hrs at which time the aircraft was descending to FL70 on a radar heading of 120°M; this heading would take it about 4 nm to the north east of BPK. This same controller was also responsible for the Stansted departures at that time.

The B737 took off from Stansted at 1350:35 hrs and climbed straight ahead as the BAe 146, descending through FL 90, was 21 nm to the west maintaining the radar heading of 120°M. Stansted handed the B737 over to the departure controller at 1350:55 hrs as the aircraft was passing through 1,500 feet, however, due to the amount of radio traffic on the new frequency, contact was not established until one minute later by which time the flaps were raised and the aircraft had levelled at 3,000 feet. From the recorded flight data it was determined that at this time the aircraft was already one nautical mile past the start point for the right turn towards BKY required by the SID. The BAe 146 had by now been cleared to descend to 4,000 feet.

When the crew of the B737 called level at 3,000 feet it was instructed to 'Squawk Ident', climb to FL 70 and the speed restriction of 250 KIAS below FL 100 was removed. Ident was selected (causing the aircraft transponder to transmit its code to the ground radar), and the aircraft recommenced the climb. However, the aircraft maintained the runway heading until 13:52:43 hrs, when at an altitude of 4300 feet and 6.8 nm from BPK, the aircraft commenced a right turn. Just as this aircraft entered the turn the ATC controller instructed the flight to 'TURN RIGHT IMMEDIATELY HEADING 360°'. The BAe 146 was then instructed to 'TURN RIGHT IMMEDIATELY HEADING 180° STOP YOUR DESCENT ALTITUDE 5500 FEET'. The B737 was then told 'AVOIDING ACTION DESCEND IMMEDIATELY ALTITUDE 4,000 FEET TRAFFIC OPPOSITE DIRECTIONS SAME LEVEL'.

The commander of the B737 then reported being visual with the BAe 146 and the two aircraft passed at the closest proximity of 0.91 nm horizontally and 200 feet vertically, calculated from the Stansted radar head. At the point of minimum separation, 5.4 nm northeast of the BPK VOR, the BAe 146 was at 5,400 feet and climbing slightly to achieve 5,500 feet whilst the B737 was at 5,200 feet and about to descend. Both aircraft were then in a right turn.

The B737 levelled at 4,300 feet QNH (FL 40) before requesting clearance to climb to FL 70. Both aircraft were subsequently given radar vectors before they left the frequency.

This reconstruction was compiled using a combination of recorded radar data, recordings of the radio transmissions and information from the Flight Data Recorder (FDR) from the B737. The FDR had been removed from the aircraft upon the completion of the twelfth sector following the incident. The Cockpit Voice Recorder had been operational throughout that time but, having only a 30 minute loop facility, it had recorded audio data subsequent to the period of the incident. Supporting evidence for the event was provided by recordings from the Stansted Airport Noise Unit and data from the Separation Monitoring Function at LATCC.

The navigation equipment on the B737 was serviceable for this flight. There is no evidence of any unserviceability of the ground navigation aids and all other aircraft allocated this SID in the same period followed it correctly.

### **Pilot experience**

The commander of the B737 had considerable experience on type and was very familiar with this route and the associated SID. His First Officer held a Commercial Pilot's Licence, had a total of 1,400 hours with 400 hours on this type and was also familiar with this departure from Stansted. Both pilots were well rested at the time of the event.

### **Air Traffic control**

The controller had started his duty at 1300 hrs and was well rested. At the time of the incident he was responsible for both the NorthEast sector of the LTCA as well as the departures from Stansted, he described his workload as moderate. He had accepted the BAe146 on a radar heading of 120° knowing that this heading would take it close to BPK and had cleared its descent to 4,000 feet in preparation for the handover to the next agency who would control the approach to London (City). The controller knew that the B737 had been allocated the BUZAD FOUR ROMEO SID and, after the initial contact during which he cleared that aircraft to climb to FL 70, he directed his attention to other traffic. He became momentarily distracted when another aircraft failed to respond to three repeated transmissions after which he became aware that the B737 was significantly to the west of the SID track, he immediately instructed it to turn to the right. He then instructed the BAe 146 to turn to the right and stop the descent. Coincident with the Short Term Conflict Alert warning the controller issued further avoiding action to the B737. Neither aircraft was required to be fitted with TCAS and neither had the system installed.

### **Analysis**

The controller had cleared the BAe 146 to descend to 4,000 feet whilst it was on a radar heading of 120°M, a heading that would take it close to BPK. He then cleared the B737 to climb from 3,000 feet to FL 70 whilst it was on a procedural departure from Stansted in the belief that the aircraft would follow the required track for the SID.

The B737 did not follow the SID, for reasons that the investigation has been unable to determine. The pilots believe that they complied with the tracking requirements for the departure and cannot understand how this deviation occurred. The ground and airborne navigational aids were serviceable and there were no distractions for the flight crew which was well rested. The weather was benign and both flight crew members were familiar with the SID. It is therefore most likely that there was a significant breakdown in the management of the cockpit resources on the flight deck during this departure, particularly with regard to the requirement for the pilot nonflying to monitor the performance of the pilot flying.