

# **BAe 146, EI-CLI and Piper PA-38-112, G-BOZM**

**AAIB Bulletin No: 9/99 Ref: EW/C99/4/4 Category: 1.1 & 1.3**

**Aircraft Type and Registration:** i) BAe 146, EI-CLI  
ii) Piper PA-38-112, G-BOZM

**No & Type of Engines:** i) 4 Lycoming ALF 502-R5 turbofan engines  
ii) 1 Lycoming O-235-L2A piston engine

**Year of Manufacture:** i) N/K  
ii) 1978

**Date & Time (UTC):** 28 April 1999 at 1603 hrs

**Location:** Runway 33 at Birmingham Airport

**Type of Flight:** Public Transport

**Persons on Board:** i) Crew - 6 - Passengers - 99  
ii) Crew - 2 - Passengers - None

**Injuries:** None

**Nature of Damage:** None

**Commander's Licence:** i) Airline Transport Pilot's Licence  
ii) Commercial Pilot's Licence with Instructor Rating

**Commander's Age:** i) N/K  
ii) N/K

**Commander's Flying Experience:** i) 10,099 hours (of which 1,680 were on type)  
Last 90 days - 80 hours  
Last 28 days - 23 hours  
ii) 990 hours (of which 300 were on type)  
Last 90 days - 60 hours  
Last 28 Days - 40 hours

**Information Source:** AAIB Field Investigation

**Near ground collision**

The BAe 146 was operating a scheduled service from Birmingham to Dublin. The commander, a line training captain, was seated on the left with a new first officer, who was on the fourth day of his line training, seated on the right. In accordance with company policy a safety pilot was occupying the jump seat.

The aircraft departed the stand and checked in on the tower frequency as it proceeded on taxiway 'D', half way between the 'D3' and 'D4' holds (see diagram). After initial contact the tower controller transmitted "...GOOD AFTERNOON LINE UP RUNWAY THREE THREE THERE'LL BE LANDING TRAFFIC ZERO SIX". The commander replied "ROGER LINE UP AND WAIT THREE THREE..". The crew then completed the take off checklist and held a brief discussion on the use of strobes and the Thrust Management System (TMS).

The PA 38, crewed by an instructor and student, was using Runway 06 for circuit training. The student pilot, seated on the left, had completed 13 hours of dual instruction and was on his second circuit training detail. The aircraft had been instructed to carry out a left hand visual circuit. The circuit direction is often varied so that circuit traffic using Runway 06 can be coordinated with commercial traffic arriving and departing from the main instrument Runway 15/33. The instructor transmitted "...DOWNWIND TOUCH AND GO". Immediately after the BAe 146 had read back his line up clearance the PA38 was cleared by the controller to "TOUCH AND GO ZERO SIX RIGHT HAND CIRCUIT SURFACE WIND 040°/11 KT".

As the BAe 146 lined up on Runway 33 the controller transmitted "... (callsign)..ON PASSING ALTITUDE TWO THOUSAND FEET CONTACT BIRMINGHAM RADAR ONE ONE EIGHT DECIMAL ZERO FIVE". The commander replied "OUT OF TWO THOUSAND ONE ONE EIGHT OH FIVE...". The controller responded "AFFIRM STANDBY". The commander reported that he believed the transmission also included a take off clearance, although this was not included in his readback of the departure instruction. Whilst transmitting this the safety pilot tapped him on the shoulder. He (the safety pilot) had been listening on the radio and had not heard the departure instruction or commander's reply and believed, incorrectly, that the commander had inadvertently transmitted over the PA instead of the radio. The commander checked his station box and confirmed that he was selected to transmit on the radio. The safety pilot checked his station box and found it to be intermittent. At the same time the first officer was momentarily distracted checking the selections on the TMS ready for take off. Believing that the aircraft had been cleared for take off the commander commenced the take-off roll. The first officer was to be the Pilot Flying (PF) therefore as the aircraft accelerated and reached 80 kt the commander handed over control to the first officer. The controller, sitting in the tower and facing Runway 06, heard the increase in engine noise from the BAe 146 as it commenced its take-off roll. Realising immediately that the BAe 146 was taking off without clearance he transmitted "... (Callsign) HOLD POSITION!". The commander heard his callsign but reported that the remainder of the transmission was difficult to hear above the cockpit noise. He did however assume there to be a problem and rejected the take off.

The student in the PA 38 had carried out a high and fast approach to Runway 06 causing the aircraft to land just beyond the normal touchdown zone markings. As the aircraft was just about to touchdown the instructor heard the controller's transmission "(callsign of BAe 146) HOLD POSITION!". The controller's tone of voice alerted the instructor and he looked to his right to see the BAe 146, that he knew had lined up ready for departure, established on its take off roll and approaching the runway intersection ahead. The tower controller continued his transmission instructing the PA38 to "TURN LEFT NOW!".

The instructor took control applied 90% braking, to avoid skidding, and turned the aircraft to the left onto a heading of 330°, stopping next to the runway intersection with the aircraft's right wing

over hanging the edge of Runway 33. The commander of the BAe 146 saw the PA38 at the time he rejected the take off. He attempted to stop before the intersection but the left wing of the BAe 146 passed over the right wing of the PA38 (see Figure 1).

The BAe 146 eventually stopped abeam hold 'K' whereupon the commander transmitted "(callsign) DID WE HIT HIM?". The controller replied "NEGATIVE".

After the incident the PA 38 returned to the threshold of Runway 06, held for 10 minutes and then continued with its circuit detail. The BAe 146 vacated the runway and returned to the stand for a brake check. The aircraft, operated by the same crew, departed for Dublin several hours later.

## **ATC instructions**

In March 1999 the ATC management team issued an instruction (ATCSI 12/99) titled 'AUTOMATIC FREQUENCY CHANGE'. The relevant extract from the document is reproduced below:

### **'Introduction**

Following a recent trial whereby departing IFR aircraft were instructed to make an automatic frequency change to Birmingham radar after passing 2,000 feet it has been decided to establish this on a permanent basis. This instruction will be published on the SID charts and the Flight Procedures section of the Birmingham AIP entry. However this will not be done until 17 June 1999.

In order to allow for this transition period and to ensure Aircraft operators have been given sufficient time to obtain correct documentation the following will be applied until the 30 June 1999:-

### **Transition procedure**

1. Unless otherwise instructed, departing IFR aircraft are to contact Birmingham radar on 118.05 MHz as soon as practicable after passing 2,000 feet QNH.
2. Should ATC wish to change this instruction the aircraft shall be advised prior to being issued with a take off clearance.

*"The instruction will be broadcast on ATIS and all IFR aircraft shall be given the instruction to contact Birmingham Radar on passing 2,000 feet with the take off clearance." '*

After the incident it was considered necessary to re-issue the ATCSI to emphasise to controllers the absolute importance of ensuring that the frequency message was always given as an integral part of the take off clearance. Furthermore, any changes to this instruction would also be given as an integral part of the take off clearance. An example of the phraseology was included in the re-issued instruction thus: '*(Callsign) After passing 2,000 feet contact Birmingham Radar on 118.05. You are cleared for take off (surface wind)*'.

## **Human factors**

### *Hazard analysis*

Prior to the issue of the ATCSI document the air traffic management team conducted a safety assessment of the procedure. Potential hazards relating to the procedure were identified, categorised as to their severity from 1 to 4 (with 4 being the most severe) and an assessment made of how identified hazards would be mitigated and where possible eliminated. As a result of this analysis, the conclusion was reached that the procedure would have no effect on safety. Unfortunately, the hazard analysis concentrated on problems arising from inability to contact an aircraft after departure and did not include a consideration of the circumstances which led to this incident ie that the pilot might respond to a partial instruction and then take off without a clearance. While such methods of analysis can be useful they depend on the analysis including all the relevant, potential hazards. Such a list is not always easy to achieve and may focus on one set of potential problems at the expense of others. In this case a reasonable assumption had been made that the normal mandatory readback of a take-off clearance would invariably occur.

### *Instruction content*

The controller involved in this incident stated that he felt that he had misinterpreted the procedure in so far as he believed that the transmission of the frequency change and the take-off clearance could be legitimately separated. Furthermore, his misunderstanding was fostered by the wording of the second paragraph of the ATCSI, viz. '.....the aircraft shall be advised *prior* (AAIB Italics) to being issued with a take-off clearance'. The initial instruction to an aircraft awaiting departure is the frequency change. This is acknowledged and readback (albeit in an abbreviated form) by the pilot. This is then followed by the controller issuing the take-off clearance. Although the ATCSI contained the words ".....all IFR aircraft shall be given the instruction to contact Birmingham Radar on passing 2,000 feet with the take-off clearance", there was no written example. This was amended in the ATCSI issued following the incident and contained a clear example of the manner in which the transmission was to be made.

### *The role of the pilot*

The pilot had departed from Birmingham at least six times since the procedure had been introduced. After reading back the instruction relating to the frequency change, he was apparently aware of another transmission from the controller but did not register its content. On the assumption that the frequency change is always followed by the take-off clearance, he assumed the missed transmission was the clearance and acted accordingly without attempting a readback or check with the controller that the aircraft had, indeed, been cleared. Having a regular procedure ie giving the frequency change with the take-off clearance is efficient in that pilots are primed to expect it and know what they are meant to do. It is still possible that assumptions may be made without prudent confirmation.

### *Pilot workload*

The desire to reduce pilot workload led to the initiation of the procedure. It was an attempt to comply with a request from pilots using the airport to effect a reduction in workload immediately after take off. One means of achieving this was seen as a reduction in the number of executive

instructions passed by ATC. The decision was taken to place the frequency change instruction with the take-off clearance rather than to include it in the very busy post-departure phase of flight. No consideration was apparently given to the possibility of a pilot taking off prematurely on the assumption that frequency change information was always followed by the take-off clearance. Also the possibility of placing the frequency change with the airways clearance was not considered. This would have satisfied the prime requirement of reducing post-departure workload while the frequency change could not have become associated in the pilot's mind with the take-off clearance thus removing the risk of an incident of this type.

## **Conclusion**

The incident occurred because the BAe 146 took off without a clearance. As with the majority of incidents, this occurrence was the result of an accumulation of factors including the controller's misinterpretation of the ATCSI; the assumption made by the pilot that information on the frequency change would inevitably be followed by a take-off clearance; and most importantly, his perception that a take-off clearance had actually been given, albeit not included in his readback of the departure instruction. This alone denied the controller an opportunity to correct the error. The controller's subsequent transmissions to both aircraft were timely in averting a more serious incident.

The procedure for giving the frequency change with the take-off clearance was instituted in an attempt to reduce pilot workload in the busy post-departure phase and had been subjected to a hazard analysis prior to implementation. Unfortunately, the potential for a pilot taking off without a clearance was not considered in the analytical process which focused on the problems which could arise as a result of a loss of RT contact with the pilot after take off. Consequently the procedure was declared safe and implemented. The procedure became obsolete at the end of June 1999 when the instruction was published on the SID charts and in the Flight Procedures section of the AIP entry for Birmingham.