

Department of Trade

ACCIDENTS INVESTIGATION BRANCH

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**Piper PA-23 Series 250 (AZTEC) G-AYDE  
and BAC One-Eleven Type 518 G-AXMJ  
Report on the accident at Luton Airport,  
Bedfordshire on 18 April 1974**

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List of Aircraft Accident Reports issued by AIB in 1975

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Piper PA-23 Series 250 (AZTEC) G-AYDE  
and BAC One-Eleven Type 518 G-AJML  
Report on the accident at Luton Airport,  
Bedfordshire on 18 April 1974

Department of Trade  
Accidents Investigation Branch  
Shell Mex House  
Strand  
London WC2R 0DP

26 February 1975

*The Rt Honourable Peter Shore MP*  
*Secretary of State for Trade*

Sir,

I have the honour to submit the report by Mr P J Bardon, an Inspector of Accidents, on the circumstances of the accident to Piper PA-23 Series 250 (Aztec) G-AYDE and BAC One-Eleven Type 518 G-AXMJ which occurred at Luton Airport, Bedfordshire on 18 April 1974.

I have the honour to be  
Sir  
Your obedient Servant

W H Tench  
*Chief Inspector of Accidents*



Accidents Investigation Branch  
Aircraft Accident Report No. 3/75  
(EW/C483)

<i>Aircraft:</i> (1)	Piper PA-23 Series 250 (Aztec) G-AYDE
<i>Engines:</i>	Two Lycoming 10-540-C485
<i>Registered Owner and Operator:</i>	McAlpine Aviation Limited
<i>Crew:</i>	Commander – Killed
<i>Passengers:</i>	One – Injured
<i>Aircraft:</i> (2)	BAC One-Eleven Type 518 G-AXMJ
<i>Engines:</i>	Two Rolls-Royce Spey 512-14 DW
<i>Registered Owner and Operator:</i>	Court Line Aviation Limited
<i>Crew:</i>	Commander – Uninjured Co-pilot – Uninjured
<i>Cabin Staff:</i>	3 – Uninjured
<i>Passengers:</i>	86 – Uninjured
<i>Place of Accident:</i>	Luton Airport, Bedfordshire
<i>Date and Time:</i>	18 April 1974 at 1528 hrs
	All times in this report are GMT

## Summary

The Aztec, which had been cleared by Air Traffic Control (ATC) to a holding point on the taxiway, continued beyond this point on to the runway into the path of a BAC One-Eleven which was taking-off and a collision occurred. Both aircraft were substantially damaged and the pilot of the Aztec was killed and the passenger injured. No-one on board the One-Eleven was hurt. The take-off of the One-Eleven was abandoned and the aircraft was brought to rest within the remaining length of the runway. The report concludes that the accident was caused by the Aztec pilot failing to comply with an ATC instruction to hold his aircraft at a properly defined holding point. The non standard R/T phraseology employed by the Ground Movement Control (GMC) Controller and the absence of any additional safeguards to ensure that aircraft comply with ATC instructions when approaching the holding point were considered to be contributory factors.



# 1. Investigation

## 1.1 History of the flights

### 1.1.1 *The BAC One-Eleven G-AXMJ*

The aircraft, which was operating Court Line flight No. OU95 from Luton to Munich, was cleared by GMC to taxi from the main apron to the holding point Delta for take-off on Runway 08. (See Appendices A and B). On arriving at Delta, the aircraft was held as GMC was still awaiting airways clearance for the flight. When this was received about two minutes later, GMC then cleared the aircraft to enter the runway and backtrack and at the same time passed the airways clearance. This was correctly read back by the aircraft and it was then instructed to contact the Tower on 120.2 MHz, the time being 1525.14 hrs. At 1525.25 hrs the Tower cleared the aircraft to line up and hold and approximately two minutes later, gave it clearance to take-off. This was acknowledged by the aircraft at 1527.31 hrs with the words - 'We're rolling, thank you'.

### 1.1.2 *The Aztec G-AYDE*

The Aztec, which was operating a charter flight from Luton to Manchester, called for taxi clearance on the GMC frequency at 1525.38 hrs. GMC replied with the surface wind details (namely 030/10) and asked the pilot if he would prefer to use Runway 26 or 08. He replied that he would take 26. The aircraft was then cleared initially to taxi to the intersection (of the west and east taxiways) and shortly afterwards this clearance was amended by GMC with the words - 'Delta Echo cleared to Alpha 26', indicating that the aircraft was to hold at point Alpha preparatory for a take-off on Runway 26. This was acknowledged. At 1527 hrs GMC asked the pilot to 'Report ready for take-off', to which he replied, 'Roger, be ready in 30 seconds'. The Aztec then continued to taxi beyond the holding point Alpha towards the runway. The sole passenger aboard the aircraft, who was also an experienced pilot and sitting in the right hand front seat, queried the pilot on intercom whether they had been cleared to taxi beyond Alpha. He received no reply and by the time he realised that the pilot had not heard him, the Aztec had entered the runway.

### 1.1.3 *The collision*

The One-Eleven was being handled by the first officer from the right hand seat with the commander carrying out co-pilot duties from the left. For the first part of the take-off run, the commander was concerned with checking instrument readings, and in consequence did not look out until the aircraft reached approximately 100 knots. At that moment both pilots in the One-Eleven saw the Aztec entering the runway from the left. When it became apparent that the Aztec was not going to stop, the commander of the One-Eleven took over control and opened both the throttles fully. He then steered the aircraft as far as he could to the right and at the same time attempted to lift the port wing over the Aztec.

At this stage, the passenger in the Aztec saw the One-Eleven approaching from his right and that it was very close. He had time only to duck below the cockpit coaming before the collision occurred and was unable to warn the pilot.

The Aztec was struck by the outer six metres of the One-Eleven's port wing; both propellers were damaged and the cabin top was sliced off to the level of the coaming. The pilot of the Aztec was killed instantly and the passenger injured.

The port wing of the One-Eleven was severely damaged, resulting in a large release of fuel. Nobody aboard the aircraft was hurt and there was no fire. Immediately the impact was felt the commander of the One-Eleven abandoned the take-off and advised the Tower. This was at 1528.15 hrs. By use of full reverse thrust and maximum braking the aircraft was brought to rest in 750 metres, well within the remaining length of the runway.

The commander then ordered the aircraft to be evacuated because of the risk of fire due to the leakage of fuel from the port wing. The evacuation was delayed when the cabin staff had difficulty in opening the two forward exits in order to deploy the escape slides. Eventually, after using considerable force, the commander himself was able to open both doors and the evacuation proceeded normally without injury to passengers or crew.

## 1.2 Injuries to persons

Injuries	Crew		Passengers		Injuries
	Aztec	One-Eleven	Aztec	One-Eleven	
Fatal	1	0	0	0	0
Non-fatal	0	0	1	0	0
None	0	5	0	86	

## 1.3 Damage to aircraft

Both aircraft were substantially damaged.

## 1.4 Other damage

There was no other damage.

## 1.5 Crew information

### 1.5.1 Pilot of Aztec G-AYDE

Age:	53.
Licence:	Airline Transport Pilot's Licence.
R/T Licence:	General.
Instrument Rating:	Valid to 22 August 1974.
Aircraft Ratings:	PA23, also Groups A and B.
Flying Instructors Ratings:	Professional and Private flying - Current.
Total flying experiences:	20,111 hours 43 minutes.
Flying experience on type:	468 hours 47 minutes.
Medical Certificate:	Valid until 8 August 1974. Limitations - 'Holder to wear spectacles which correct for near and distant vision and shall have available a second pair whilst exercising the privileges of the Licence'.

The pilot had been flying from LUTON in the employ of McALPINE AVIATION LTD for an overall period of 21 months. During the previous 28 days he had flown a total of 20 hours 45 minutes, and on the day of the accident had made two flights totalling 1 hour 47 minutes, prior to which he had had a rest period of 13 hours 30 minutes.



## 1.5.2 *BAC One-Eleven G-AXMJ*

### 1.5.2.1 Commander

Age:	43.
Licence:	Airline Transport Pilot's Licence.
R/T Licence:	Restricted.
Instrument Rating:	Valid to 16 June 1974.
Aircraft Ratings:	PA 28 and 32; BAC 1-11.
Total flying experience:	5,169 hours.
Flying experience on type:	2,227 hours 5 minutes.
Medical Certificate:	Valid until 31 May 1974.

The commander of the One-Eleven had been flying from LUTON in the employ of COURT LINE AVIATION LTD since June 1970. During the previous 28 days he had flown a total of 69 hours; he had not flown previously on the day of the accident, and he had 18 hours 38 minutes rest period prior to reporting for duty.

### 1.5.2.2 First Officer

Age:	23.
Licence:	Commercial Pilot's Licence.
R/T Licence:	Restricted.
Instrument Rating:	Valid to 10 April 1975.
Aircraft Rating:	BAC 1-11 and Beechcraft 95.
Total flying experience:	1,441 hours.
Flying experience on type:	1,170 hours.
Medical Certificate:	Valid until 31 October 1974, no restrictions.

The First Officer had been flying from LUTON in the employ of COURT LINE AVIATION LTD since December 1971. During the previous 28 days he had flown a total of 34 hours 20 minutes; he had not flown previously on the day of the accident, and had had 73 hours rest period prior to reporting for duty.

## 1.6 Aircraft information

### 1.6.1 *The Aztec*

The PA-23-250 (AZTEC) aircraft was built in the USA in 1967. It was registered as G-AYDE in 1970 and was owned by McALPINE AVIATION LTD. The Certificate of Airworthiness was in the General Purpose Category and valid until 24 May 1975. The aircraft had been maintained in accordance with an approved maintenance schedule, and its servicing records showed its documentation to be in order. The records indicated that the aircraft's steering, brakes, and radio installations had given normal serviceability.

The aircraft was fitted with NARCO MK. 12A radio communication equipment. A feature of the radio installation was that there was no side-tone on the transmitter circuit and this was in accordance with current airworthiness requirements for the aircraft type. The result of this was that neither crew member could hear any transmissions made from the aircraft on their headsets, though incoming messages could be heard normally.

Up to the time of the accident the aircraft had flown a total of 2,740 hours of which 349 had been completed since the last renewal of its Certificate of Airworthiness in May 1973.



### 1.6.2 *The One-Eleven*

The BAC One-Eleven (500 series) type FG was built in February 1970. Registered as G-AXMJ, it was owned by COURT LINE AVIATION LTD. The Certificate of Airworthiness was in the Transport Category and was valid until 9 March 1975. The aircraft had been maintained in accordance with an approved maintenance schedule, and its servicing records showed its documentation to be in order. The technical records showed no previous instances of either of the passenger or service entrance doors failing to open or of their escape slides failing to deploy.

The servicing records of the aircraft's safety equipment show that both slides had been maintained in accordance with the approved schedule.

Up to the time of the accident the aircraft had flown a total of 11,153 hours, of which 297 had been completed since the last renewal of its Certificate of Airworthiness in March 1974.

### 1.7 **Meteorological information**

The weather was not a factor in this accident which occurred in daylight. The surface wind observed at the time of the accident was reported as 030°/12 knots. The surface of the runway was dry.

### 1.8 **Aids to navigation**

Not applicable.

### 1.9 **Communications**

The only radio frequencies associated with this accident were 121.75 MHz (GMC) and 120.2 MHz (Tower). The aircraft were not on a common frequency when the accident occurred.

The RTF transcript at Appendix B shows the significant timings of the messages on Tower and GMC frequencies. From the transcript it is apparent that unless the pilot of the Aztec was listening out whilst waiting for GMC to finish working the One-Eleven he was unlikely to have known of its movement. When he made his first call at 1525.32 hrs to GMC the One-Eleven was already on the runway and in contact with the Tower.

### 1.10 **Aerodrome and ground facilities**

#### 1.10.1 *The aerodrome*

Luton Airport has a single concrete runway orientated 26/08 which is 2,160 metres long by 46 metres wide. The taxiways do not give direct access to the take-off positions, and aircraft requiring the full length for take-off on either runway must back track for distances of between a maximum of 1,650 metres and a minimum of 550 metres, according to the point of entry on to the runway. Smaller aircraft are permitted to take-off in either direction from a position on the runway close to the point of entry.

There are four points on the taxiway situated at convenient locations for holding both outgoing and incoming aircraft. These holding points conform to the requirements laid down in the Air Traffic Control Regulations and the ICAO PANS RAC DOCUMENT (Procedure for Air Navigation Services/Rules of the Air and Air Traffic Services DOC 4444 - RAC/501/10) as to distance from the runway edge, ground markings and provision of lighted display boards. There are no traffic lights or stop bar lights at any of the holding points, and there is no requirement that they should be installed.

The siting of the Visual Control Room (VCR) in the control tower is such that for the most part outbound taxiing aircraft are tail-on to an observer from the air and ground control positions. This is particularly so in the case of the taxiway leading to holding point Alpha which itself is over 900 metres from the VCR. There is therefore no possibility of using lamp or pyrotechnic signals from the VCR to control outbound taxiing aircraft.

Due to the distance of the VCR from Alpha it is difficult to detect any movement of an aircraft approaching Alpha when viewed tail on. However this was not a factor on this occasion as the GMC controller was not looking out of the VCR at the time the Aztec was approaching Alpha.

Parts of the western half of the runway and the taxiway leading to the 08 entry point are not directly visible from the VCR and this has necessitated the provision of Closed Circuit Television (CCTV) to cover the 'blind' area. Whilst this is obviously of some assistance to ATC it is difficult to interpret in conditions of bright sunlight and also at night. As the CCTV viewing unit is also used to display weather information to the Air Controller there is therefore no continuous picture of this 'blind' area displayed in the VCR although it is available by switch selection.

#### 1.10.2 *Air Traffic Control Personnel*

(a) The Air Controller

The Air Controller had been based at Luton since May 1956. His licence included an Aerodrome Control Rating validated for Luton.

(b) The Ground Movement Controller

The Ground Movement Controller had been based at Luton since 1970, initially as a Student Air Traffic Control Officer. After attending a course at the College of Air Traffic Control in 1973, he was granted a full licence which included an Aerodrome Control Rating validated for Luton.

#### 1.11 Flight recorder

The Aztec was not required to be fitted with a flight recorder and none was installed.

The BAC One-Eleven was fitted with a Sperry SADAS type recorder from which an analogue trace record was obtained. From this it could be seen that the first significant event was a large application of 'down' elevator at an indicated airspeed (IAS) of 87 knots. This was followed 4-5 seconds later at an IAS of 107 knots by an 'up' elevator movement, which corresponded with a small increase in aircraft pitch attitude. Also at this point, there was a change in power supply frequency, indicating a change in engine r.p.m. During the period of the aircraft's acceleration the magnetic heading changed from 79.3 degrees to 87 degrees and then back to 72.6 degrees. The actual speed of the One-Eleven at the moment of collision could not be obtained from the flight recorder read out due to unknown position error effects following the partial rotation in pitch at 107 knots IAS and had therefore to be calculated. Using Flight Manual data against actual ground distances, it was established that the equivalent airspeed (EAS) at the moment of collision was 128 knots and the maximum speed subsequently reached was 136 knots EAS. By correlating both recorded and calculated data, it was deduced that the period from brakes release to impact was 30 seconds.

A study of the recorded and calculated data showed it to be in good agreement with the reports made by both the One-Eleven pilots. The commander's attempt to avoid the collision by steering the aircraft to the right could be clearly seen on the magnetic heading trace. Similarly the activity on the elevator trace is believed to be coincident with the handover of control from the co-pilot to the commander. This confirms the



latter's statement that when the Aztec was seen, the One-Eleven was approaching 100 knots and that he took over control shortly after that. On this basis it is deduced that the period between his taking over control to the moment of collision was 6 seconds. It is considered the 'up' elevator movement commencing at 107 knots occurred coincidentally with the pilot's attempt to raise the left wing and the change in power supply frequency, which occurred at the same time, resulted from his application of full throttle.

## **1.12 Wreckage**

### **1.12.1 *The One-Eleven***

The damage to the One-Eleven was confined to the left wing and extended over a distance of 6 metres inboard from the tip, and included damage to the skin of the leading edge and the underwing surface. The front spar and the integral fuel tank had been penetrated by the rotating propellers of the Aztec; the outer left flap and its outer track fairing were also damaged.

### **1.12.2 *The Aztec***

The damage to the Aztec was confined to both propellers, which had each lost a blade, and the cabin top which had been completely sliced off. Impact marks on top of the nose section and those at various positions along the cabin coaming corresponded with the damage to the outer flap fairing and leading edge of the wing of the One-Eleven. Furthermore, the height of these impact marks was identical to the height of the One-Eleven wing above the runway, indicating that the main wheels of the One-Eleven were in contact with the ground at the moment of collision.

As the pilot's headset, all the radio power units, and the entire aerial system had been demolished, a functional test of the installation could not be carried out. However, the headset for the right hand front seat, and the No's 1 and 2 NARCO communications radios were found to be intact with the frequencies 121.75 and 123.6 MHz selected, and with the volume controls tuned to a fairly high setting. When bench tested these operated satisfactorily. The intercom facility, which operated in conjunction with No. 1 Radio, was found to be switched on. When tested, the intercom was found to be serviceable, but it was noted that its output was halved in strength when operated with two headsets.

Only three seats were found installed forward of the rearmost bench seat, and all were securely attached; the fourth removable seat was found stowed in the luggage locker. All seats were fitted with lapstraps only.

The aircraft was jacked up and its brakes, steering, tyre pressures and oleo leg extensions were checked; they were found to be within their permissible limits. The aircraft was then lowered onto the ground and towed by a tractor while its steering and brakes were checked. The nose wheel steering and the toe and parking brake systems were found to function satisfactorily.

## **1.13 Medical and pathological information**

### **The Aztec Pilot:**

The pilot was required to wear spectacles which correct for near and distant vision, and there is evidence that he was wearing spectacles when the accident occurred. A post mortem examination did not reveal any evidence of a medical condition which could have contributed to the accident. Death was instantaneous and due to a fracture of the skull.

## **1.14 Fire**

There was no fire.



## 1.15 Survival aspects

The passenger in the Aztec survived because he saw the One-Eleven approaching and had time to duck below the coaming before the One-Eleven's wing struck the cabin top. Had the pilot taken similar avoiding action, he too would have undoubtedly survived. It is apparent however that he was unaware of the approach of the One-Eleven.

When the One-Eleven came to a stop with fuel pouring from its damaged left wing, the commander decided there was a fire hazard and in consequence he ordered an immediate evacuation. The two doors with their escape slides at the front end of the passenger cabin could not be opened by the stewardesses, and it was only after the use of considerable force by the commander himself that he managed to open the doors and thereby deploy the escape slides. The evacuation of some of the passengers was therefore delayed, though the remainder were still able to leave the aircraft through the rear ventral door.

The forward doors of the aircraft together with the escape slides were later examined by representatives of their respective manufacturers and the Civil Aviation Authority (CAA). Tests were carried out which successfully reproduced the difficulties experienced by the crew in deploying the slides. On further examination it was found that due to inadequate guidance being provided by the manufacturer the escape slides and their release aprons in the doors had been incorrectly stowed, and in one door an incorrect item had been fitted. Following discussions between representatives of the operator, the Airworthiness Division (CAA) and the manufacturers of both the aircraft and the escape slides, a signal was sent warning all other One-Eleven operators and airworthiness authorities overseas of the defects and the remedial action that should be taken.

## 1.16 Tests and research

Nil.

## 1.17 Other information

### 1.17.1 Air Traffic Control Instructions:

Standard R/T Phraseology. Air Traffic Control Instruction Number 6 contained in Appendix A to the *Manual of Air Traffic Control (MATC)* Part 1, current at the time of the accident, states that the following phraseology should be used with respect to aircraft calling for taxi clearance:

'Cleared to holding point . . . . Runway . . . . .'

Supplementary Instruction No. 1 of 1970 contained in the MATC also draws the attention of all concerned to the importance of correct and efficient use of phraseology and procedure for radio telephony. The Instruction also goes on to state that air traffic control staff are 'reminded that by adhering as closely as possible to the correct phraseology and procedure, there is less likelihood of confusion . . . . .'

## 2. Analysis and Conclusions

### 2.1 Analysis

#### 2.1.1 *Relative movement of the two aircraft*

The relative movement of the two aircraft up to the moment when the collision occurred was assessed from an analysis of the timings on the RTF transcript correlated with the time scale on the One-Eleven flight recorder read out. It was assumed for this purpose that the Aztec taxied at a uniform speed of approximately 25 feet per second which was derived from the fact that it covered a total distance of 3,180 feet in a period of about 127 seconds. There is no evidence that the aircraft stopped during this period and it is therefore considered that this average speed represents the best possible estimate for the purposes of this assessment. The collision is believed to have occurred at 1528.01 hrs, that is 30 seconds after the One-Eleven called 'we're rolling'.

The Aztec started to taxi just before 1526.00 hrs at which time the One-Eleven was leaving Delta and entering the runway to backtrack. At 1527.31 hrs, at about which time the One-Eleven began its take-off run, the Aztec was probably between Bravo and Alpha. It would therefore have passed Alpha at 1527.48 hrs when the One-Eleven was probably abeam the Delta intersection and accelerating through 82 kts IAS. Five seconds later, when the One-Eleven was approaching 100 kts IAS, the Aztec was close to the edge of the runway and it was at this point that it was first seen. When the commander of the One-Eleven took over control, it is estimated that his aircraft was about 1,065 feet from Alpha. The collision occurred some six seconds later. There was little in the time available that the commander of the One-Eleven could have done to avoid a collision. Had he abandoned the take-off when he took over control, it is considered that the collision would still have occurred, though obviously at a reduced speed, and at not less than 80 kts IAS. As it was, he did all that he could by steering his aircraft to the right and attempting to raise the left wing. Had he seen the Aztec any sooner, it is not considered that the outcome would have been very different since immediately prior to the actual moment of sighting, the Aztec would have been close to Alpha and therefore not of any particular concern.

#### 2.1.2 *The Aztec Pilot*

It is clear from the evidence that the immediate cause of the accident was the failure of the Aztec Pilot to hold his aircraft at Alpha when he had been instructed to do so. There is no obvious explanation for this. There is the possibility that he misinterpreted the instruction 'Clear to Alpha 26' as 'Clear to enter 26'. Though the word Alpha could be heard quite clearly on the RTF tape recording, this is not to say the pilot did not hear or understand it differently. However at the time it was the clear understanding of the passenger in the Aztec that the aircraft was not cleared to proceed beyond Alpha. If the pilot did in fact have the impression that he had been cleared to 'enter 26', then this could well have been reinforced by the next message, 'Delta Echo, report ready for take-off'. The timing of this message indicates that the aircraft was at Alpha at this moment and this is confirmed by the statement of the passenger. The pilot's reply that he would be 'ready in 30 seconds' indicates that he was probably anticipating a take-off clearance very soon after and that he had overlooked the fact that he had not yet received his airways clearance. This entire sequence of messages suggests that the pilot may well have forgotten by this stage that he was on the GMC frequency and believed he was in contact with the Tower (ie the Air Controller). Whether or not such a misunderstanding did arise cannot, of course, be proved. However, that it was even remotely possible does emphasise the necessity for all RTF messages to be unambiguously worded. Had the GMC controller specifically instructed the Aztec to 'Hold at Alpha' in the same way as he had



instructed the One-Eleven a short while before to 'Hold at Delta', the possibility of a misunderstanding could have been removed.

It is unlikely that the Aztec pilot was unaware that he was taxiing on to the runway, in which case it could be expected that he would have first checked that the runway was clear before entering it. His automatic reaction would have been to look for traffic moving in the 26 direction, that being the one he himself was intending to use. Therefore, if he looked out at all, and it can be assumed that a pilot of his experience would have done so, then it is most likely that he looked to his left. His failure to see the One-Eleven therefore stems in part from the bi-directional use of the runway, involving successive movements in either direction. Unless a pilot was alert to this, his natural tendency would be to look in the direction from where he could expect to see aircraft approaching, and seeing none, assume that it was clear to proceed. Had the Aztec pilot been instructed to use 08 and not been given the choice of using either direction, then it is reasonable to suppose that on arriving at either Alpha or Delta, that he would have automatically looked to his right and thus avoided the collision.

### 2.1.3 *Other factors*

From the foregoing, it can be seen that the accident was probably caused by a simple error on the part of the Aztec pilot which may have arisen from either a momentary act of forgetfulness or a straightforward mishearing of an RTF instruction. Whatever the reason, the accident demonstrated that at Luton there was no provision inherent in the system of Ground Movement Control to ensure that a mistake, once made, did not go unnoticed by the individual making it or the controller concerned.

The need for such a provision is particularly important at Luton because of the unconventional layout of its taxiways in comparison with most other airports in the United Kingdom. Though Luton conforms in every particular to the requirements laid down in the Air Traffic Control Regulations 1972 and the ICAO PANS/RAC Document as regards airfield markings and holding point indicator boards, it did not appear to be realised that additional facilities were required at Luton to ensure the same standard of safety which is achieved by other airports with a more conventional layout. The arrangement at Luton whereby departing aircraft have to enter the runway at some point along its length and not at or near either end, which is the more usual arrangement, clearly demands that there should be positive control of aircraft approaching those entry points. At the time of the accident, Ground Movement Control at Luton, in common with most other airports, was effected solely by use of radio. There were no other means by which GMC could communicate instructions to aircraft or ensure their compliance such as would be provided by the use of visual signals, lighted indicator boards, lighted stop bars or traffic lights. Therefore if a pilot forgot or overlooked an instruction to stop his aircraft at a holding point, and this was unnoticed by the GMC Controller, then there was nothing to prevent that aircraft proceeding beyond the holding point and possibly into danger. Though, of course, it cannot be stated categorically that had there been a system of lighted stop bars or traffic lights at point Alpha, the Aztec pilot would not have continued on to the runway, it is reasonable to suppose that the chances of his doing so would have been considerably reduced.

The GMC Controller did not in fact see the Aztec proceed beyond Alpha, and even if he had been looking at the aircraft at the time, it is unlikely that he would have noticed that it was moving. This was because from the tower, which is situated some 900 metres north of the runway, aircraft at Alpha can only be seen tail on. Any movement is difficult to detect, particularly if it is slow.

The situation could be remedied by siting a runway control van (RCV) near the holding points Alpha and Delta and thus provide a valuable back up to ensure that aircraft conform to ATC instruction. RCVs are in use at a number of other airports - notably Liverpool, Manchester and Stansted - and it might be considered that the provision of



such a facility at Luton was justifiable in the light of this accident. It is recognised that the provision of an RCV might render the GMC position redundant and this aspect would obviously need to be considered.

It is evident that more positive control of aircraft approaching the holding points would be obtained if the tower was sited on the south side of the runway so that it faced out-bound traffic. This would at least enable visual light signals to be used in addition to radio. Also the siting of the tower on the south side would provide controllers in the VCR with an uninterrupted view of the runway without the need for recourse to CCTV, which has been shown to be less than satisfactory.

It can be argued that the accident could have been prevented if the GMC Controller had informed the Aztec pilot of the One-Eleven movement, or that 08 runway was active. In fact, the GMC controller was not in a position to know this. Once he had handed control of the One-Eleven over to the Air Controller (which he did before the Aztec first called on the GMC frequency), he no longer knew what the One-Eleven's movements were subsequent to that and he was not required to know. Provided that the Aztec proceeded as instructed, he had no reason to suppose that there was any risk of collision between the two aircraft.

It would seem from this that the separation of functions between the Air and Ground controllers worked against the interests of flight safety on this occasion and that there is a clear need for improved liaison between the two. The GMC position was first conceived with the idea of relieving the Air Controller of some of his duties so that he did not become overloaded when trying to control all aerodrome traffic on a single RTF channel. This development is clearly beneficial in terms of safety and it would be undesirable that any changes were now made which would unnecessarily negate the value of splitting the aerodrome control functions. However at airports such as Luton where the system of taxiways incurs a greater risk of conflict between ground and air movements, some duplication of effort on the part of the two controllers is necessary so that each knows of the movement of aircraft under the control of the other when that movement is in the vicinity of the active runway.

## 2.2 Conclusions

### (a) Findings

- (i) The pilot of Aztec G-AYDE and the commander and crew of BAC One-Eleven G-AXMJ were properly licensed and experienced. All had been based at Luton for some considerable time and were therefore familiar with the procedures in force there.
- (ii) The Air and Ground Controllers were properly licensed and experienced.
- (iii) Both aircraft had been maintained in accordance with approved maintenance schedules and their documentation was in order.
- (iv) The difficulty experienced in operating the escape slides of the One-Eleven had serious implications and could have resulted in risk to life had there been a fire following the release of fuel from the fractured port wing.
- (v) No defect was found in respect of either the braking system or radio communications equipment fitted to Aztec G-AYDE. The intercom equipment was found to be serviceable but operating at half strength.
- (vi) No side tone was available on the radio transmitter circuit of the Aztec and this was in accordance with current airworthiness requirements for the aircraft type. This is considered to be an undesirable feature.

- (vii) The Aztec had been cleared by Ground Movement Control to proceed only as far as holding point Alpha, though the manner in which this clearance was given was not in accordance with the standard phraseology laid down in the *Manual of Air Traffic Control Part 1*.
- (viii) Aztec G-AYDE proceeded beyond the holding point Alpha without authorisation and taxied on to the runway into the path of the One-Eleven, which was taking-off, and which had been cleared to do so. No reason for the action of the Aztec pilot could be positively established, but it is possible that the non-standard phraseology used by GMC when clearing the Aztec to holding point Alpha was misinterpreted or misheard by the Aztec pilot and understood by him to constitute a clearance for him to proceed on to the runway. However the passenger in the Aztec, who was an experienced pilot, had no doubt that the aircraft had been cleared to proceed only as far as holding point Alpha.
- (ix) The pilot of the Aztec was probably unaware of the One-Eleven movement and that the runway was active.
- (x) Both aircraft were operating on different radio frequencies from the time the Aztec first called.
- (xi) There was nothing that the commander of the BAC One-Eleven could have done to avert the collision of his aircraft with the Aztec.
- (xii) Having handed control of the One-Eleven to the Air Controller, the GMC controller was not in a position to know of its subsequent movements. There was no requirement for the GMC controller to advise the Aztec pilot of the movement of the One-Eleven once it had passed from his control.
- (xiii) The taxiway system at Luton Airport obliges aircraft requiring the full length of the runway for take-off, to back track for a considerable distance. There is therefore a potential risk of conflict with the mainstream of air traffic using the runway. This situation is further compounded by light aircraft taking-off from a mid-point on the runway, sometimes in the opposite direction to that being used by preceding and succeeding aircraft.
- (xiv) The system of control over aircraft approaching the holding points Alpha and Delta lacks sufficient safeguards to ensure compliance with radioed instructions by GMC. Although the siting and marking of the holding points conforms to the requirements of the Air Traffic Control Regulations and the ICAO PANS/RAC Document, additional measures are required at Luton airport to ensure positively the safe movement of aircraft on the ground near those holding points.
- (xv) Luton GMC is effected solely by the use of radio. No other means are available to control aircraft approaching holding points Alpha and Delta.
- (xvi) The Visual Control Room (VCR) situated in the control tower is some 900 metres from the runway and aircraft taxiing out can only be viewed from tail on. The movement of aircraft approaching holding point Alpha is difficult to detect from the VCR.
- (xvii) Parts of the western half of the main runway cannot be seen from the VCR due to intervening buildings and other structures. Visual coverage of the area is accomplished by the use of closed circuit television, but the performance of this equipment is greatly affected by certain conditions of light. However this was not a factor in the accident.



(b) Cause

The accident was caused by the pilot of the Aztec failing to comply with an air traffic control instruction to hold his aircraft clear of the runway at a properly defined holding point, with the result that he taxied his aircraft on to the runway into the path of another aircraft which was taking-off. The non standard R/T phraseology employed by the GMC controller when issuing this instruction together with the absence of any additional safeguards to ensure that aircraft comply with ATC instructions when approaching the holding point were considered to be contributory factors.



### 3. Recommendations

It is recommended that:

- (1) At airfields where the active runway is also required for taxiing aircraft and where a ground movement control is established as part of the Aerodrome Control Service, a procedure be instituted whereby there is effective liaison between air and ground controllers so that each has knowledge of the movement of aircraft under the control of the other when this movement is in the vicinity of the active runway.
- (2) Consideration be given to providing additional positive control of aircraft approaching holding points to runways, where those holding points are not at or near the extremities of the runway concerned. The means whereby this additional control is provided should be effectively 'fail safe'.
- (3) Whenever bi-directional use is made of the main runways at Luton airport, additional safeguards should be implemented to ensure that the pilots of taxiing aircraft are aware of the movement of other aircraft using the runway.
- (4) Consideration be given to a requirement that aircraft capable of being operated by two crew members have a capability whereby each if he so chooses can hear the radio transmission being made by the other, even though that aircraft is approved for single pilot operation.

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