

Piper PA-28-181, G-BSAT

AAIB Bulletin No: 11/97 Ref: EW/C97/3/3 Category: 1.3

Aircraft Type and Registration:	Piper PA-28-181, G-BSAT
No & Type of Engines:	1 Lycoming O-360-A4M piston engine
Year of Manufacture:	1980
Date & Time (UTC):	9 March 1997 at 1623 hrs
Location:	1 mile north-east of Biggin Hill Airfield, Kent
Type of Flight:	Private
Persons on Board:	Crew - 1 - Passengers - 1
Injuries:	Crew - Fatal - Passengers - Fatal
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	58 years
Commander's Flying Experience:	403 hours (of which 53 hours were on type) Last 90 days - None Last 28 days - None
Information Source:	AAIB Field Investigation

Flight preparation

The pilot had been approved, by the owner of G-BSAT ('AT'), to hire the aircraft on a self-fly basis. He had not flown since June 1996 so had arranged to fly with a local Instrument Rating Examiner (IRE). He was, however, not available on the day so the aircraft owner agreed to accompany him.

Actual and forecast weather conditions for the day were displayed behind the tower operations desk, which was situated close to the refreshment area where the pilot and owner were joined by another pilot for light refreshments. A local flying instructor, who had noticed the three men meeting that morning, stated that the weather information display at the time showed a cloud base of 100 feet with a visibility of less than 1,000 metres. The forecast indicated that between 1100 hrs and 1300 hrs the visibility would improve to 7,000 metres with the cloud base lifting to 1,500 feet. The

forecast for the period 1400 hrs to 1600 hrs suggested that the visibility would improve to greater than 10km.

The aircraft was hangared with a maintenance organisation situated on the far side of the airfield. It was usual practice to collect the aircraft from the hangar, taxi it back to the tower, shutdown and carry out pre-flight planning before departing. The commander and the aircraft owner of 'AT' left the tower to collect their aircraft from the hangar where the managing director of the maintenance organisation, who saw the two men arrive at the hangar, stated that at that time the aircraft fuel tanks were full. A fuel invoice from Biggin Hill showed that 'AT' was last refuelled with 65 litres of 100LL aviation gasoline on 7 March 1997, 2 days before the accident.

The pilot of another Biggin Hill based aircraft, G-BVWZ ('WZ'), landed at Le Touquet at 1325 hrs and spent several hours in the town before returning to the airfield. On his return he met the two pilots of 'AT' who had eventually decided to fly to Le Touquet and had departed from Biggin Hill at 1300 hrs arriving at Le Touquet at 1347 hrs. They had already planned their return flight to Biggin Hill and during conversation mentioned that the cloud base at Biggin was broken at 300 feet.

The return flight

'AT' departed from Le Touquet at 1532 hrs with the commander having filed a flight plan to Biggin Hill routing via Lydd, with Lydd and Southend as alternate destinations. At 1604 hrs the commander of 'AT' made radio contact with Thames Radar. He informed the Thames Radar controller that he was routing via the Lydd (LYD) and Detling (DET) VORs and was presently five miles from Detling "REQUESTING RADAR VECTORS FOR THE BIGGIN ILS". The controller replied "BEFORE I GIVE YOU THE ROUTING I'LL GIVE YOU THE BIGGIN WEATHER IT'S JUST CHANGED 1600 HRS WEATHER; WIND 050/08 KT; MET VISIBILITY 450 METRES; RVR 750 METRES; FOG; BROKEN CLOUD AT 100 FEET; TEMPERATURE IS EIGHT DEGREES; BIGGIN QNH 1032 MBS". The commander replied "ROGER WE'VE COPIED THE WEATHER AND REQUEST VECTORS". The controller responded with "I UNDERSTAND YOU STILL WISH TO MAKE AN APPROACH?". The commander confirmed his intention to continue to Biggin Hill.

At 1615 hrs the radar controller instructed 'AT' to descend to 1,800 feet and turn onto a heading of 020°. The aircraft's position was 6 miles north-east of Biggin Hill and it was No 2 to land behind a Falcon 900 aircraft. At 1618 hrs 'AT' was instructed to turn onto a heading of 240° and to "REPORT ESTABLISHED ON THE LOCALIZER" and was informed that "THE PRECEDING AIRCRAFT, A FALCON 900, HAS JUST GONE AROUND". The Thames radar controller, with reference to Biggin Hill, then transmitted "RVR NOW 600 METRES". The commander replied that he understood and was now established on the localizer. At six and a half miles from touchdown the radar controller cleared 'AT' to "DESCEND ON THE ILS, CONTACT BIGGIN APPROACH".

The approach

The Biggin Hill controller had contacted the Falcon 900 asking the pilot if he wished to make another approach. He replied "NO, THERE'S NO POINT YOU CAN'T SEE A THING THERE...HOW ABOUT (WE GO TO) GATWICK". At 1619 hrs the pilot of 'AT' checked in on the approach frequency. The controller asked him to "REPORT AT 4 DME...RVR IS 600 METRES". Just before 1621 hrs the commander reported at 4 miles on finals. The Biggin controller asked him if the aircraft was fully established on the ILS. He replied " 'AT' IS ESTABLISHED ON THE ILS"

The Thames radar controller, although no longer responsible for controlling 'AT', had noticed on his radar display that the aircraft's mode 'C' readout, from the aircraft's height encoding altimeter, was indicating that the aircraft was 1,300 feet above mean sea level (amsl). At 4 miles on final the aircraft should have been at an altitude of 1,800 feet amsl. The Thames controller, concerned that the aircraft was indicating 500 feet lower than it should have been, contacted the Biggin controller by telephone so that the pilot of 'AT' could be advised. Having asked if the aircraft was 'fully established' the Biggin controller informed the commander of the height discrepancy and again asked him to "CONFIRM THAT YOU ARE FULLY ESTABLISHED ON THE GLIDE PATH". The commander's response was "WE'RE ESTABLISHED, 'AT' ". The Biggin controller then cleared 'AT' to land on Runway 21 with a surface wind of 060°/09.

As 'AT' continued its approach the Biggin controller transmitted to the diverting Falcon 900, on the approach frequency, the Gatwick weather information. The weather was fine with a light southerly wind, visibility in excess of 10 km and no cloud below 5,000 feet.

At 1622 hrs the Biggin controller transmitted the surface wind information again. The commander of 'AT' replied "ROGER". This was the last transmission recorded from 'AT'.

Aerodrome response

After some two minutes the tower controller became concerned that 'AT' had still not arrived on the runway or reported 'going around'. He transmitted a further nine times during the following eight minutes to try to establish contact with the aircraft. He telephoned the Thames radar controller to see if the aircraft was still visible on the radar display. The Thames controller advised that the radar return had disappeared on short final at Biggin Hill and that he had thought that the aircraft had landed. Unable to see the threshold of the runway because of the poor visibility, the tower controller instructed the airport fire service vehicles, that had been on standby near the tower, to proceed closer to the threshold to get a better view of the touchdown zone. He also alerted the 'off-airfield' emergency services.

At 1628 hrs the airfield fire service vehicles proceeded into the field containing the approach lighting and continued toward the public road. At the road boundary they met the local emergency services and together made a methodical search of the approach area. The visibility by this time had reduced to 200 metres. At approximately 1650 hrs a telephone call from a member of the public indicated that the aircraft had crashed 1.5 nm north north-east of the runway. At 1715 hrs the emergency services located the aircraft wreckage which lay in dense woodland. Both occupants had been fatally injured. The only witnesses to the accident were those that heard an aircraft noise but saw nothing.

Reports from other pilots

After take off from Le Touquet at 1530 hrs and an uneventful Channel crossing, the pilot of 'WZ' was radar vectored for an ILS approach to Runway 21 at Biggin Hill. He reported that ILS cockpit indications were normal throughout his approach and he saw the approach lights at approximately 500 feet on final. Continuing visually he had to deviate around an approaching bank of fog before touching down at 1608 hrs. After landing he backtracked the runway and noticed that an extensive bank of fog was beginning to cover the final approach path to the runway. Remembering that 'AT' was also inbound to Biggin Hill he advised the tower controller that the weather at Southampton was fine should 'AT' need to divert.

The pilot of a Cessna 172 flying from Munchengladbach in Germany, to a private landing strip near Stansted Essex on the afternoon of the accident, reported that as he flew overhead Dover he observed a complete layer of shallow low cloud with radio masts visible above the cloud top. In order to obtain information on weather conditions in Essex he listened to the Stansted ATIS which was giving an RVR of 200 metres and a cloud base of 200 feet. Similar conditions also existed at Manston, Lydd and Southend. The Le Touquet weather was better with a visibility of 5,000 metres in haze with clear skies. He therefore decided to divert to Le Touquet. He was approximately Mid-Channel when he made contact with Le Touquet tower who asked him to relay to the pilot of 'AT', who had just departed Le Touquet, details of the UK weather conditions. The Cessna pilot explained that Southern England was generally fog bound with visibilities in the order of 200 metres with a cloud base of 200 feet. The pilot of 'AT' thanked him for the information and said 'I'll give Biggin Hill a shot'. The pilot of Cessna continued and landed at Le Touquet.

Radar information

Recorded information, from the radar head at Heathrow airport, showed the aircraft's progress and altitude as it was radar vectored for the final approach. The data shows that the aircraft overflew Swanley before turning onto a heading of 020°. As it approached Crayford it turned onto a westerly heading and intercepted the ILS localizer centre line over Sidcup. Its progress along the centreline was steady but as it reached 2.5 nm from touchdown it began to deviate up to 2.5° either side of the localizer beam.

Recorded altitude data, which gave heights above mean sea level (Biggin Hill Runway 21 touchdown elevation 518 feet amsl) confirmed that at 4 miles on finals the aircraft was in a gentle descent some 400 feet below the ideal glidepath at an indicated altitude of 1,300 feet amsl. At 2 miles from touch down the aircraft was on the glidepath, at 1,200 feet, but deviating above it. By 1.5 nm from touchdown the aircraft was at 1,000 feet amsl in a 1,200 feet per minute steep descent. The last recorded radar data point was at 1.2 nm from touchdown.

The accident site

The area of the accident site was in a valley of agricultural land that lay in a north easterly to south westerly direction interspersed with woodland on the upper slopes of the north westerly side. Within the valley were a few farm and residential buildings. The accident site was at the lower edge of a dense beech wood 0.95 nautical miles from the touchdown point of Runway 21 at Biggin Hill Airfield, about 820 feet to the right of the approach centreline and at a height approximately 50 feet below the height of the runway.

Examination of the accident site showed that the aircraft initially impacted some branches of a beech tree that was at the south eastern edge of the wood with the tip of its right wing whilst flying in a general straight and level attitude at about 85 kt and on a heading of approximately 235°. As a result of the initial impact by the right wing tip the aircraft was slewed to its right which allowed further impacts with other beech trees by the right wing until eventually the forward fuselage made heavy contact with the trunk of a substantial beech tree which resulted in severe disruption and break up of the aircraft structure. There was no fire.

Wreckage examination

A detailed examination of the aircraft and its systems showed that it was in a good serviceable condition when the initial impact occurred. There was no evidence of a control system disconnection or restriction prior to the impact. The wing flaps were found to have been extended to their mid position and the pitch trim at a position slightly forward of neutral which was consistent with the wing flap position. The radio navigation equipment was bench tested at an approved testing facility and it was found to be functioning correctly. Unfortunately the instruments that would have indicated the information received by the radio navigation equipment to the pilot were destroyed during the impact and could not be tested or examined to determine what indications were being displayed at the moment of impact. The aircraft was fitted with two altimeters, one in front of the pilot and one in the middle between the pilot and the front seat passenger. The altimeter in front of the pilot was set to the airfield QFE whereas the altimeter in the middle was set to the regional QNH, a difference of 518 feet. Examination of the engine and its systems showed that it was in a good and serviceable condition and that at impact was producing high power. Examination of the carburettor air heat control system showed that at impact it was selected to cold. The weather conditions at the time of the accident were plotted on a carburettor icing probability chart which showed that there was a severe risk of serious carburettor icing at all engine power settings.

Meteorology - aftercast

An aftercast prepared by the Meteorological Office at Bracknell described the synoptic situation at 1600 hrs in the Biggin Hill area as a weak ridge of high pressure established over the area with a light easterly surface flow. The weather was generally fog with visibilities around 400 metres. Broken to overcast cloud with a base of 100 to 200 feet. covered the area and the surface wind was 060°/08 kt with the wind at 2,000 feet of 120°/15 kt. Generally the temperature was +6°C with a dew point of +5°C.

Terminal Aerodrome Forecasts (TAFs)

The TAF for Biggin Hill issued at 1230 hrs was:

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EGKB 091319 08009KT 3000 HZ FEW018 BECMG 1416 7000 NSW TEMPO  
1819 4000 HZ
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The TAF issued at 1503 hrs revised the forecast and was as follows:

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EGKB 091319 07010KT 2500 HZ SCT005 TEMPO 1319 1200 BR BKN003  
PROB30 TEMPO 1719 0800 FG BKN001
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Actual conditions

The Meteorological observer at Biggin Hill recorded the actual weather conditions at 30 minute intervals throughout the day with a special observation being conducted at 1600 hrs. Included in these observations were records of the Met Visibility and Runway Visual Range (RVR) as well as the Surface Wind, Cloud Amount and Height, Wet and Dry Bulb Thermometer Readings and Sea Level Pressure.

The observations for the 9 March 1997 are tabulated below:

Time	Surface wind	Visibility (metres)	RVR (metres)	Weather	Cloud (type/height ft)	Temperature (Dry/Wet)	Pressure (QNH)
1420	060/10	1600	-	Haze	BKN 300'	11/06	1032
1450	060/08	1600	-	Haze	BKN 300'	10/06	1032
1520	070/08	1200	-	Mist	BKN 300'	09/06	1032
1550	060/08	1000	>750	Fog	BKN 200'	08/06	1032
1600	050/08	450	>750	Fog	BKN 100'	08/06	1032
1620	060/07	500	600	Fog	BKN 100'	08/06	1031
1650	060/07	200	-	Fog	Sky Obscured	07/06	1031
1720	060/07	200	-	Fog	Sky Obscured	07/06	1031
1750	060/07	200	-	Fog	Sky Obscured	07/06	1031

Pilot details

The pilot, who had first flown G-BSAT in February 1990, had a total flying experience of 403 hours. In 1995 he flew 4 hrs 45 minutes and in 1996 he flew 7 hrs 50 minutes. His last recorded flight, conducted totally or partially under instrument conditions either actual or simulated, was on 31 March 1991. He had held a PPL since April 1987.

His IMC rating was initially issued on 24 April 1990 with no renewals recorded in his log book. His last Certificate of Test (C of T) was signed on 11 April 1993 with no subsequent Certificates of Experience (C of E) appearing in his log book.

His licence included a Class III Medical certificate which had been issued on 22 February 1997 and was valid for 12 months. Because he did not meet the necessary colour perception standards she was only allowed to exercise the privileges of his PPL on flights by day only, within UK or other States with a written authorisation; at airfields with RT. There was no evidence of any written permission being granted by the French Authorities for flights within French airspace.

The aircraft owner (passenger)

The aircraft owner had a total flying experience of 492 hours including 36 hours of instrument flying time. His PPL was issued on 25 July 1988 and it included a Night rating and an IMC rating, which was issued on 28 September 1990 and re-validated on 27 February 1997. The Instructor involved in this re-validation check flight described the owner's performance as being generally good with manoeuvres being flown with the prescribed limits. His track keeping on the localizer during the later stages of the ILS approach below a height of 500 feet, however, was described as being 'a little ragged'.

The PPL included a Class III Medical Certificate issued 1 March 1997 with no conditions and valid for 12 months. His log book showed that his Last C of E was signed on 9 February 1997. Most of the owner's flying had been conducted from Biggin Hill.

Pathology

Post mortem examination of the pilots did not reveal any condition which may have caused or contributed to the cause of the accident. Both the aircraft commander and the owner died of severe multiple injuries indicative of a high speed impact.

Biggin Hill Runway 21 ILS

The ILS/DME (109.35 MHz) approach to Runway 21 at Biggin Hill is based on an inbound QDM of 209° with a 3° glideslope. The final approach fix is at 4 DME at an altitude of 1,800 feet amsl (1,282 feet above touchdown) with check heights of 1,528 feet amsl at 3.0 DME and 888 feet amsl at 1.0 DME. The published minimum descent altitude for a category 'A' aircraft is 798 feet amsl (280 feet above touchdown).

The tower controller withdrew the ILS from service as soon as he was aware that the accident had occurred. The following day a 'Partial Flight Inspection' was carried out to ensure that the ILS (Localizer, Glidepath and DME installations) performance conformed to the specified standards. A Flight Inspection Certificate issued on 10 March 1997 confirmed that the ILS performance was satisfactory and its return to service was authorised.

The Air Navigation (No 2) Order 1995 (ANO)

Schedule 8 PART B of the ANO details the ratings that may be included in a pilot's licence and specifies the consequences the inclusion of such a rating shall have in a licence. The sub paragraph covering the details of an Instrument Meteorological Conditions (IMC) Rating (Aeroplanes) is reproduced below:

Instrument Meteorological Conditions Rating (Aeroplanes) shall entitle the holder of a private pilot's licence (aeroplanes) or basic commercial pilot's licence (aeroplanes) to fly as pilot in command of an aeroplane without being subject to the restrictions contained respectively in paragraphs 2 (c) or (2) (b) (vii) of the privileges of such licences set out in Part A of this Schedule provided that he shall not fly:

- (a) on a special VFR flight in a control zone in a flight visibility of less than 3 km;
- (b) when the aeroplane is taking off or landing in a flight visibility below cloud is less than 1,800 metres.

The United Kingdom Aeronautical Information Publication (UKAIP)

The UK AIP section RAC 4-3-4 details the 'Determination of Landing Minima'. Generally it states that the operator of any public or non-public transport aircraft must calculate appropriate minima for landing before carrying out an instrument Approach Procedure. The minima will consist of:

(a) A Decision Height or Minimum Descent Height (DH/MDH);

(b) a Runway Visual Range (RVR);

(c) the visual reference required.

Paragraph 4.1.5, which reflects Article 35 of the ANO and is reproduced below, covers the details of an Approach Ban for Non-public Transport Aircraft:

(a) Firstly, an aircraft when making a descent at an aerodrome to a runway in respect of which there is a notified Instrument Approach Procedure (IAP) shall not descend from a height of 1,000 feet or more above the aerodrome to a height less than 1,000 feet above the height of the aerodrome if the relevant RVR for that runway is at the time less than the specified minimum for landing;

(b) Secondly, an aircraft when making a descent to a runway in respect of which there is a notified IAP shall not:

(i) continue an approach to landing at such a runway by flying below the relevant specified DH; or

(ii) descend below the relevant MDH;

unless in either case in sub para (b) above from such height the specified visual reference for landing is established and is maintained.

(Note: (RAC 4-3-5) states that 'For a precision approach, the specified visual reference should contain at least six consecutive lights, which may be approach lights or runway lights, or a combination of both').

Note: In the above paragraph 'specified' in relation to Aerodrome Operating Minima (AOM) as have been notified in respect of the aerodrome or, if the relevant minima have not been notified, such minima as are ascertainable by reference to the notified method in the UK AIP for calculating AOM.

Paragraph 4.3.1.2 states that 'Pilots with a valid IMC rating are recommended to add 200 feet to the instrument rated pilot's DH/MDH, but with absolute minima of 500 feet for a precision approach and 600 feet for a non-precision approach'.....

Paragraph 4.3.3.1 states that 'If a pilot has not flown Instrument Approaches within the previous few weeks he should try to avoid having to make an instrument approach in bad weather. If he has to make such an Approach, even if he is fully confident of his abilities, he is advised to add 100 feet to his calculated DH/MDH. Further increments should be added depending on when the pilot was last in full practice, his or her familiarity with the aircraft, the procedure and the aerodrome environment. Note: A pilot who has conducted an actual or practice Instrument Approach during the previous 28 days can be considered as being in current practice'.

Section RAC 4-3-9 tabulates the Decision Height (DH) and minimum RVR for an ILS approach to Runway 21 at Biggin Hill. They are 330 feet and 900 metres respectively.

Manual of Air Traffic Services Part 1

A draft Supplementary Instruction in The Manual of Air Traffic Services Part 1 (MATS) has been drawn up in response to a Safety Recommendation made by the AAIB following an accident to a Boeing 737-2D6C during an approach to Coventry airport in poor visibility conditions on 21 December 1994. (Aircraft Accident Report 1/96) The draft Instruction, which has not yet been approved or incorporated, changes the RT phraseology to be used by controllers to a pilot making an approach to an airfield when the reported RVR for the approach is less than the notified 'absolute minimum' value.

An extract of the draft Instruction is reproduced below:

Existing legislation applies to both Public Transport and civil non Public Transport aircraft making instrument approaches to airfields. When the reported RVR, or calculated equivalent RVR, is less than the minimum calculated for the instrument approach procedure, a pilot may not descend below a height of 1,000 feet above the aerodrome. However, if the pilot is already below this level and the RVR then reduces below the minimum, it is permissible to continue the approach to the relevant specified Minimum Descent Height or Decision Height. If at that point, the required visual reference for landing cannot be established then a missed approach must be commenced in accordance with normal practice.

Should a pilot indicate that he/she intends to make an approach when the reported RVR or equivalent RVR is less than the notified 'absolute minimum' value, the controller must inform the pilot with the following phraseology:

"(callsign) you are advised that the notified minimum RVR for this approach is (number) metres. At present weather reports an RVR/visibility of (number) metres. What are your intentions?"

If the pilot states that he/she intends to continue the approach they should be advised:

"(callsign) your planned flight appears to contravene current UK legislation. If you continue the approach I shall be required to report the facts, acknowledge."

Controllers must ensure that pilots are told as early as practicable, when they indicate that they wish to make an approach, that the RVR or visibility is less than the notified 'absolute minimum'. Once a pilot has stated that he wishes to commence an approach controllers will continue to pass any changes in the weather throughout the aircraft's approach.

Controllers are reminded that the decision whether or not to commence an approach rests with the commander of the aircraft. Nothing in this supplementary instruction permits controllers to prohibit approaches being made

Summary

The accident occurred when the commander of the aircraft allowed it to descend below the specified minimum decision height for an ILS approach to Runway 21 at Biggin Hill and he did not hold a current IMC rating. The aircraft owner, although IMC rated and in recent flying practice, was a passenger who was occupying the right hand front seat but was not seated directly in front of the panel containing the main flight instruments. The pilot's altimeter was set correctly to indicate the

aircraft's height above the runway threshold. The pilot was fully aware of the prevailing weather conditions at Biggin Hill and of the better weather conditions at Gatwick.