Piper PA-28-181, G-BSAT

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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'), tohire the aircraft on a self-fly basis. He had not flown sinceJune 1996 so had arranged to fly with a local Instrument RatingExaminer (IRE). He was, however, not available on the day sothe aircraft owner agreed to accompany him.

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

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

The aircraft was hangared with a maintenance organisation situatedon the far side of the airfield. It was usual practice to collectthe aircraft from the hangar, taxy it back to the tower, shutdown and carryout pre-flight planning before departing. The commanderand the aircraft owner of 'AT' left the tower to collect theiraircraft from the hangar where the managing director of the maintenanceorganisation, who saw the two men arrive at the hangar, statedthat at that time the aircraft fuel tanks were full. A fuelinvoice from Biggin Hill showed that 'AT' was last refuelled with65 litres of 100LL aviation gasoline on 7 March 1997, 2 days beforethe accident.

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

The return flight

'AT' departed from Le Touquet at 1532 hrs with the commander havingfiled a flight plan to Biggin Hill routing via Lydd, with Lyddand Southend as alternate destinations. At 1604 hrs the commanderof 'AT' made radio contact with Thames Radar. He informed theThames 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 THEROUTING I'LL GIVE YOU THE BIGGIN WEATHER IT'S JUST CHANGED 1600 HRSWEATHER; WIND 050/08 KT; MET VISIBILITY 450 METRES; RVR 750METRES; FOG; BROKEN CLOUD AT 100 FEET; TEMPERATURE IS EIGHT DEGREES;BIGGIN QNH 1032 MBS". The commander replied "ROGERWE'VE COPIED THE WEATHER AND REQUEST VECTORS". Thecontroller responded with "I UNDERSTAND YOUSTILL WISH TO MAKE AN APPROACH?". The commander confirmedhis intention to continue to Biggin Hill.

At 1615 hrs the radar controller instructed 'AT' to descend to1,800 feet and turn onto a heading of 020°. The aircraft'sposition was 6 miles north-east of Biggin Hill and it was No 2to land behind a Falcon 900 aircraft. At 1618 hrs 'AT' was instructedto turn onto a heading of 240° and to "REPORTESTABLISHED ON THE LOCALIZER" and was informed that"THE PRECEDING AIRCRAFT, A FALCON 900, HAS JUST GONE AROUND". The Thames radar controller, with reference to BigginHill, then transmitted "RVR NOW 600 METRES". The commander replied that he understood and was now establishedon the localizer. At six and a half miles from touchdown theradar controller cleared 'AT' to "DESCEND ONTHE ILS, CONTACT BIGGIN APPROACH".

The approach

The Biggin Hill controller had contacted the Falcon 900 askingthe 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 GOTO) GATWICK". At 1619 hrs the pilot of 'AT' checkedin on the approach frequency. The controller asked him to "REPORTAT 4 DME....RVR IS 600 METRES". Just before1621 hrs the commander reported at 4 miles on finals. The Biggincontroller asked him if the aircraft was fully established onthe ILS. He replied " 'AT' IS ESTABLISHED ONTHE ILS"

The Thames radar controller, although no longer responsible forcontrolling 'AT', had noticed on his radar display that the aircraft'smode 'C' readout, from the aircraft's height encoding altimeter, was indicating that the aircraft was 1,300 feet above mean sealevel (amsl). At 4 miles on finals the aircraft should have beenat an altitude of 1,800 feet amsl. The Thames controller, concernedthat the aircraft was indicating 500 feet lower that it shouldhave been, contacted the Biggin controller by telephone so thatthe pilot of 'AT' could be advised. Having asked if the aircraftwas 'fully established' the Biggin controller informed the commanderof the height discrepancy and again asked him to "CONFIRMTHAT YOU ARE FULLY ESTABLISHED ON THE GLIDEPATH". The commander's response was "WE'RE ESTABLISHED,'AT' ". The Biggin controller then cleared 'AT' toland on Runway 21 with a surface wind of 060°/09.

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

At 1622 hrs the Biggin controller transmitted the surface windinformation 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 eightminutes to try to establish contact with the aircraft. He telephonedthe Thames radar controller to see if the aircraft was still visibleon the radar display. The Thames controller advised that theradar return had disappeared on short finals at Biggin Hill andthat he had thought that the aircraft had landed. Unable to seethe threshold of the runway because of the poor visibility, thetower controller instructed the airport fire service vehicles,that had been on standby near the tower, to proceed closer tothe threshold to get a better view of the touchdown zone. Healso alerted the 'off-airfield' emergency services.

At 1628 hrs the airfield fire service vehicles proceeded intothe field containing the approach lighting and continued towardsthe public road. At the road boundary they met the local emergencyservices and together made a methodical search of the approacharea. The visibility by this time had reduced to 200 metres. At approximately 1650 hrs a telephone call from a member of thepublic indicated that the aircraft had crashed 1.5 nm north north-eastof the runway. At 1715 hrs the emergency services locatedthe aircraft wreckage which lay in dense woodland. Both occupantshad been fatally injured. The only witnesses to the accidentwere 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 Channelcrossing, the pilot of 'WZ' was radar vectored for an ILS approachto Runway 21 at Biggin Hill. He reported that ILS cockpit indicationswere normal throughout his approach and he saw the approach lightsat approximately 500 feet on finals. Continuing visuallyhe had to deviate around an approaching bank of fog before touchingdown at 1608 hrs. After landing he backtracked the runway andnoticed that an extensive bank of fog was beginning to cover thefinal approach path to the runway. Remembering that 'AT' wasalso inbound to Biggin Hill he advised the tower controller thatthe 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 afternoonof the accident, reported that as he flew overhead Dover he observeda complete layer of shallow low cloud with radio masts visibleabove the cloud top. In order to obtain information on weatherconditions in Essex he listened to the Stansted ATIS which wasgiving an RVR of 200 metres and a cloud base of 200 feet. Similarconditions also existed at Manston, Lydd and Southend. The LeTouquet weather was better with a visibility of 5,000 metresin haze with clear skies. He therefore decided to divert to LeTouquet. He was approximately Mid-Channel when he made contactwith 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 generallyfog bound with visibilities in the order of 200 metres with acloud base of 200 feet. The pilot of 'AT' thanked him for theinformation and said 'I'll give Biggin Hill a shot'. The pilotof 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 vectoredfor the final approach. The data shows that the aircraft overflewSwanley before turning onto a heading of 020°. As it approachedCrayford it turned onto a westerly heading and intercepted theILS localizer centre line over Sidcup. Its progress along thecentreline was steady but as it reached 2.5 nm from touchdownit began to deviate up to 2.5° either side of the localizerbeam.

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

The accident site

The area of the accident site was in a valley of agriculturalland that lay in a north easterly to south westerly directioninterspersed with woodland on the upper slopes of the north westerlyside. Within the valley were a few farm and residential buildings. The accident site was at the lower edge of a dense beech wood0.95 nautical miles from the touchdown point of Runway 21 at BigginHill Airfield, about 820 feet to the right of the approach centrelineand at a height approximately 50 feet below the height of therunway.

Examination of the accident site showed that the aircraft initiallyimpacted some branches of a beech tree that was at the south easternedge of the wood with the tip of its right wing whilst flyingin a general straight and level attitude at about 85 kt and ona heading of approximately 235°. As a result of the initialimpact by the right wing tip the aircraft was slewed to its rightwhich allowed further impacts with other beech trees by the rightwing until eventually the forward fuselage made heavy contactwith the trunk of a substantial beech tree which resulted in severedisruption and break up of the aircraft structure. There wasno fire.

Wreckage examination

A detailed examination of the aircraft and its systems showedthat it was in a good serviceable condition when the initial impactoccurred. There was no evidence of a control system disconnectionor restriction prior to the impact. The wing flaps were foundto have been extended to their mid position and the pitch trimat a position slightly forward of neutral which was consistentwith the wing flap position. The radio navigation equipment wasbench tested at an approved testing facility and it was foundto be functioning correctly. Unfortunately the instruments thatwould have indicated the information received by the radio navigationequipment to the pilot were destroyed during the impact and couldnot be tested or examined to determine what indications were beingdisplayed at the moment of impact. The aircraft was fitted withtwo altimeters, one in front of the pilot and one in the middlebetween the pilot and the front seat passenger. The altimeterin front of the pilot was set to the airfield QFE whereas thealtimeter in the middle was set to the regional QNH, a differenceof 518 feet. Examination of the engine and its systems showedthat it was in a good and serviceable condition and that at impactwas producing high power. Examination of the carburettor airheat control system showed that at impact it was selected to cold. The weather conditions at the time of the accident were plottedon a carburettor icing probability chart which showed that therewas a severe risk of serious carburettor icing at all engine powersettings.

Meteorology - aftercast

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

Terminal Aerodrome Forecasts (TAFs)

The TAF for Biggin Hill issued at 1230 hrs was:

EGKB 091319 08009KT 3000 HZ FEW018 BECMG 1416 7000 NSW TEMPO

1819 4000 HZ

The TAF issued at 1503 hrs revised the forecast and was a follows:

EGKB 091319 07010KT 2500 HZ SCT005 TEMPO 1319 1200 BR BKN003

PROB30 TEMPO 1719 0800 FG BKN001

Actual conditions

The Meteorological observer at Biggin Hill recorded the actualweather conditions at 30 minute intervals throughout the day witha special observation being conducted at 1600 hrs. Included inthese observations were records of the Met Visibility and RunwayVisual Range (RVR) as well as the Surface Wind, Cloud Amount andHeight, 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 atotal flying experience of 403 hours. In 1995 he flew 4 hrs 45minutes and in 1996 he flew 7 hrs 50 minutes. His last recordedflight, conducted totally or partially under instrument conditionseither actual or simulated, was on 31 March 1991. Hehad held a PPL since April 1987.

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

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

The aircraft owner (passenger)

The aircraft owner had a total flying experience of 492 hoursincluding 36 hours of instrument flying time. His PPL was issuedon 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 February1997. The Instructor involved in this re-validation check flightdescribed the owner's performance as being generally good withmanoeuvres being flown with the prescribed limits. His trackkeeping on the localizer during the later stages of the ILS approachbelow a height of 500 feet, however, was described as being 'alittle ragged'.

The PPL included a Class III Medical Certificate issued 1 March1997 with no conditions and valid for 12 months. His log bookshowed that his Last C of E was signed on 9 February 1997. Mostof the owner's flying had been conducted from Biggin Hill.

Pathology

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

Biggin Hill Runway 21 ILS

The ILS/DME (109.35 MHz) approach to Runway 21 at Biggin Hillis 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 feetamsl (1,282 feet above touchdown) with check heights of 1,528feet amsl at 3.0 DME and 888 feet amsl at 1.0 DME. The publishedminimum descent altitude for a category 'A' aircraft is 798 feetamsl (280 feet above touchdown).

The tower controller withdrew the ILS from service as soon ashe was aware that the accident had occurred. The following daya 'Partial Flight Inspection' was carried out to ensure that theILS (Localizer, Glidepath and DME installations) performance conformedto the specified standards. A Flight Inspection Certificate issuedon 10 March 1997 confirmed that the ILS performance was satisfactoryand 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 includedin a pilot's licence and specifies the consequences the inclusionof such a rating shall have in a licence. The sub paragraph coveringthe 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 pilotin command of an aeroplane without being subject to the restrictionscontained respectively in paragraphs 2 (c) or (2) (b) (vii) ofthe privileges of such licences set out in Part A of this Scheduleprovided that he shall not fly:

(a) on a special VFR flight in a control zone in a flight visibilityof less than 3 km;

(b) when the aeroplane is taking off or landing in a flight visibilitybelow 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 LandingMinima'. Generally it states that the operator of any publicor non-public transport aircraft must calculate appropriate minimafor 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 reproducedbelow, covers the details of an Approach Ban for Non-public TransportAircraft:

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

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

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

(ii) descend below the relevant MDH;

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

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

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

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

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

Section RAC 4-3-9 tabulates the Decision Height (DH) and minimumRVR for an ILS approach to Runway 21 at Biggin Hill. They are330 feet and 900 metres respectively.

Manual of Air Traffic Services Part 1

A draft Supplementary Instruction in The Manual of Air TrafficServices Part 1 (MATS) has been drawn up in response to a SafetyRecommendation made by the AAIB following an accident to a Boeing737-2D6C during an approach to Coventry airport in poor visibilityconditions on 21 December 1994. (Aircraft Accident Report1/96) The draft Instruction, which has not yet been approvedor incorporated, changes the RT phraseology to be used by controllersto a pilot making an approach to an airfield when the reportedRVR 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 civilnon Public Transport aircraft making instrument approaches toairfields. When the reported RVR, or calculated equivalent RVR,is less than the minimum calculated for the instrument approachprocedure, a pilot may not descend below a height of 1,000 feetabove the aerodrome. However, if the pilot is already below thislevel and the RVR then reduces below the minimum, it is permissibleto continue the approach to the relevant specified Minimum DescentHeight or Decision Height. If at that point, the required visualreference for landing cannot be established then a missed approachmust be commenced in accordance with normal practice.

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

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

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

"(callsign) your planned flight appears to contravene currentUK legislation. If you continue the approach I shall be requiredto 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 theRVR or visibility is less than the notified 'absolute minimum'. Once a pilot has stated that he wishes to commence an approachcontrollers will continue to pass any changes in the weather throughoutthe aircraft's approach.

Controllers are reminded that the decision whether or not to commencean approach rests with the commander of the aircraft. Nothingin this supplementary instruction permits controllers to prohibitapproaches being made

Summary

The accident occurred when the commander of the aircraft allowedit to descend below the specified minimum decision height foran ILS approach to Runway 21 at Biggin Hill and he did not holda current IMC rating. The aircraft owner, although IMC ratedand in recent flying practice, was a passenger who was occupyingthe right hand front seat but was not seated directly in frontof the panel containing the main flight instruments. The pilot'saltimeter was set correctly to indicate the

aircraft's heightabove the runway threshold. The pilot was fully aware of theprevailing weather conditions at Biggin Hill and of the betterweather conditions at Gatwick.