ACCIDENT

Aircraft Type and Registration:	Piper PA-28-181, N2405Y
No & Type of Engines:	1 Lycoming O-360-A4M piston engine
Year of Manufacture:	1985
Date & Time (UTC):	10 April 2009 at 1123 hrs
Location:	Near Steep, Petersfield, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Fatal) Passengers - 1 (Fatal)
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	47 years
Commander's Flying Experience:	225 hours on type since August 2006 Last 90 days - 16 hours Last 28 days - 7 hours
Information Source:	AAIB Field Investigation

Synopsis

The pilot had planned a flight from Panshanger to Jersey. The weather forecast was poor, with two fronts expected to be positioned along the route at about the time of the flight. The weather forecast for Jersey was also poor and it was uncertain whether the pilot would be given a Special VFR clearance through the Channel Islands Control Zone. The pilot took off but after 47 minutes the aircraft flew into low cloud covering a ridge of high ground north of Petersfield. About 10 seconds later the aircraft flew into trees just below the ridge line and broke up.

It is likely the pilot succumbed to '*get-there-itis*' in making his decision to take off. It is probable that, as the weather deteriorated on his route, he ran out of '*escape routes*' before inadvertently entering cloud.

History of the flight

The pilot planned to fly from Panshanger aerodrome to Jersey with one passenger. The route would take them to the overhead of Wycombe Air Park, direct to Portsmouth and then NEDUL, the reporting point to the west of the Isle of Wight. From there the route followed the track of Airway R41 to ORTAC, the reporting point at the boundary of the Jersey CTR and London FIR. The final leg was from ORTAC direct to Jersey. The distance was 188 nm, which would take about 1:45 hr in still air at the flight planned speed of 110 kt. The most restrictive controlled airspace on the route as far as the Isle of Wight was the London TMA with a base of 2,500 ft amsl. Figure 1, derived from GPS on board the aircraft, illustrates the flight.

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The aircraft took off at 1037 hrs from Runway 29 at Panshanger and entered a climbing right turn to set heading from overhead the airfield. The pilot contacted Farnborough Radar (north) at 1049 hrs and requested a traffic service. He reported that he was at 1,200 ft on the QNH and was told he could only be given a basic service at that altitude. At 1056 hrs the aircraft was 3 nm to the east of Wycombe Air Park turning towards Portsmouth and ATC instructed the pilot to contact Farnborough Radar (west). There was no response and, after four further attempts, at 1059 hrs the controller asked another aircraft to relay the instruction. The pilot of N2405Y heard the relayed instruction and changed frequency.

At 1100 hrs, the pilot of N2405Y contacted Farnborough Radar (west) and was given a basic service. At 1105 hrs, the aircraft was just south of Wokingham and the controller asked if the pilot could route to the east of Farnborough to avoid departing traffic. The pilot complied with the request. The controller informed the pilot that the Blackbushe Aerodrome Traffic Zone (ATZ) was active but the pilot did not hear properly and asked for the transmission to be repeated. The controller repeated the information but the word 'Blackbushe' was indistinct and sounded more like 'Farnbushe'. The pilot acknowledged that the Farnborough ATZ was active. At 1106 hrs he turned onto a heading that would have taken him through the Blackbushe traffic pattern and over the western end of Farnborough's Runway 24. At 1108 hrs, the controller suggested that the pilot turn to the north east to avoid the Blackbushe ATZ. The pilot turned west to remain clear of the ATZ before turning east towards the town of Farnborough. At 1111 hrs, the controller asked whether the pilot could see Farnborough Airport, to which the pilot replied that he could not. One minute later, he reported flying past the end of Runway 24 at 1,000 ft. The controller responded by saying that the departing traffic had just passed ahead of N2405Y, left to right, at about 1 nm.

The aircraft continued south from Farnborough Airport until it passed south of Farnham, where it turned onto a track of about 210°M to close onto the planned track, which was about 5 nm to the west. At 1122 hrs, the controller suggested that the pilot contact either Goodwood Information or Solent Radar and the pilot said he would contact Solent Radar. There was no record of the pilot contacting any ATC agency after Farnborough.

The aircraft continued heading about 210°M over the low ground towards Petersfield. It crashed at 1123 hrs into trees on the northern, heavily wooded, slope of a ridge of high ground, running broadly east-west, close to a landmark known as Shoulder of Mutton Hill.

Witness information

Two days before the flight, the pilot spoke to one of the instructors at his flying club about his planned flight. He said that the long range weather forecast for the route did not look good and would probably preclude the flight. He said he would plan the route in case the forecast proved to be incorrect.

At about 1000 hrs on the day of the flight, the pilot spoke briefly with another pilot and was asked if he had seen the weather forecast, which showed two closely-spaced fronts moving east across his proposed route. The pilot of N2405Y said he had seen the fronts on the forecast and thought he could avoid them. He said he had about 30 hours of instrument training towards his IMC rating and had recently practised many holding procedures and an ILS at Southend. The pilot's instructor later stated that the pilot had about seven hours of formal training towards the IMC rating

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and the instructor believed that the remaining hours claimed were probably obtained during private flights with friends acting as safety pilots.

Two witnesses saw the aircraft about 10 seconds before the crash. Each noted that the aircraft rocked its wings but flew a substantially straight course. One of the witnesses stated that the engine sounded normal. The other said that the aircraft "wasn't flying very high. In my opinion, it was flying around 50 metres or less above the ground. It flew into the fog. I heard a bang around 10 seconds later. The fog covered the top and a large part of the mountain where the accident took place".

A witness was walking very close to where the aircraft crashed. He said there were "showers of drizzle; it was cloudy but still". The visibility under the cloud was quite good but there was a low cloud base. The cloud base altered but he calculated from his map that it "hung around 220 metres, sometimes lower" above sea level.

Recorded data

Information from ATC tapes and radar records is incorporated into the history of the flight.

A Garmin GPSmap296 was recovered from the accident site and was downloaded successfully. The active route recorded in the unit was from Panshanger aerodrome to Jersey and the flight history showed only one flight on the 10 April 2009 (Figure 1).

The track started at 1027:35, showed a takeoff at 1037:10 hrs and ended at 1123:39 hrs. The unit was set up to provide alarms relating to airspace proximity and the alarm records showed that 30 events were recorded on 10 April 2009. Of those events, the majority would have been considered routine 'nuisance' alerts. The route took the aircraft near to a number of ATZs or controlled airspace and most alerts reflected proximity, not infringement, and would be expected.

There were three 'Inside Airspace' alerts which were triggered after the aircraft left the planned route at the request of ATC. The first was when the aircraft entered the Blackbushe ATZ and it was coincident with the air traffic controller's suggestion that the pilot turn north-east. The aircraft flew west but then turned back towards Farnborough, at which point there was a second alert. The final alert was triggered when the aircraft entered the Farnborough ATZ. These alerts were consistent with the pilot trying to position himself to the east of Farnborough.

As well as the track, Figure 1 shows the altitude of the aircraft and the elevation of the ground below it. After the aircraft took off at 1037 hrs, it climbed to 2,000 ft amsl. It then carried out a slow descent to 1,000 ft amsl from 1040 to 1050 hrs. For the next 10 minutes, the aircraft flew at between 800 and 1,200 ft amsl corresponding generally to between 600 and 1,000 ft agl but at 1102 hrs it crossed a ridge at 460 ft agl. The aircraft climbed back to 2,000 ft amsl over the next five minutes but descended back to 1,000 ft amsl by 1110 hrs. For the next 12 minutes, the aircraft remained at 1,000 ft amsl, crossing one ridge at approximately 330 ft agl. Just after 1122 hrs, the aircraft began to descend to 750 ft amsl with an average rate of descent of 200 feet per minute. As the aircraft began its slow descent, the ground below it started to rise gently but in the last 10 seconds before impact the ground rose sharply.

The aircraft ground speed averaged approximately 90 kt during most of the flight. During the final gentle descent it accelerated and stabilised at approximately 100 kt, which was consistent with descents earlier in the flight.

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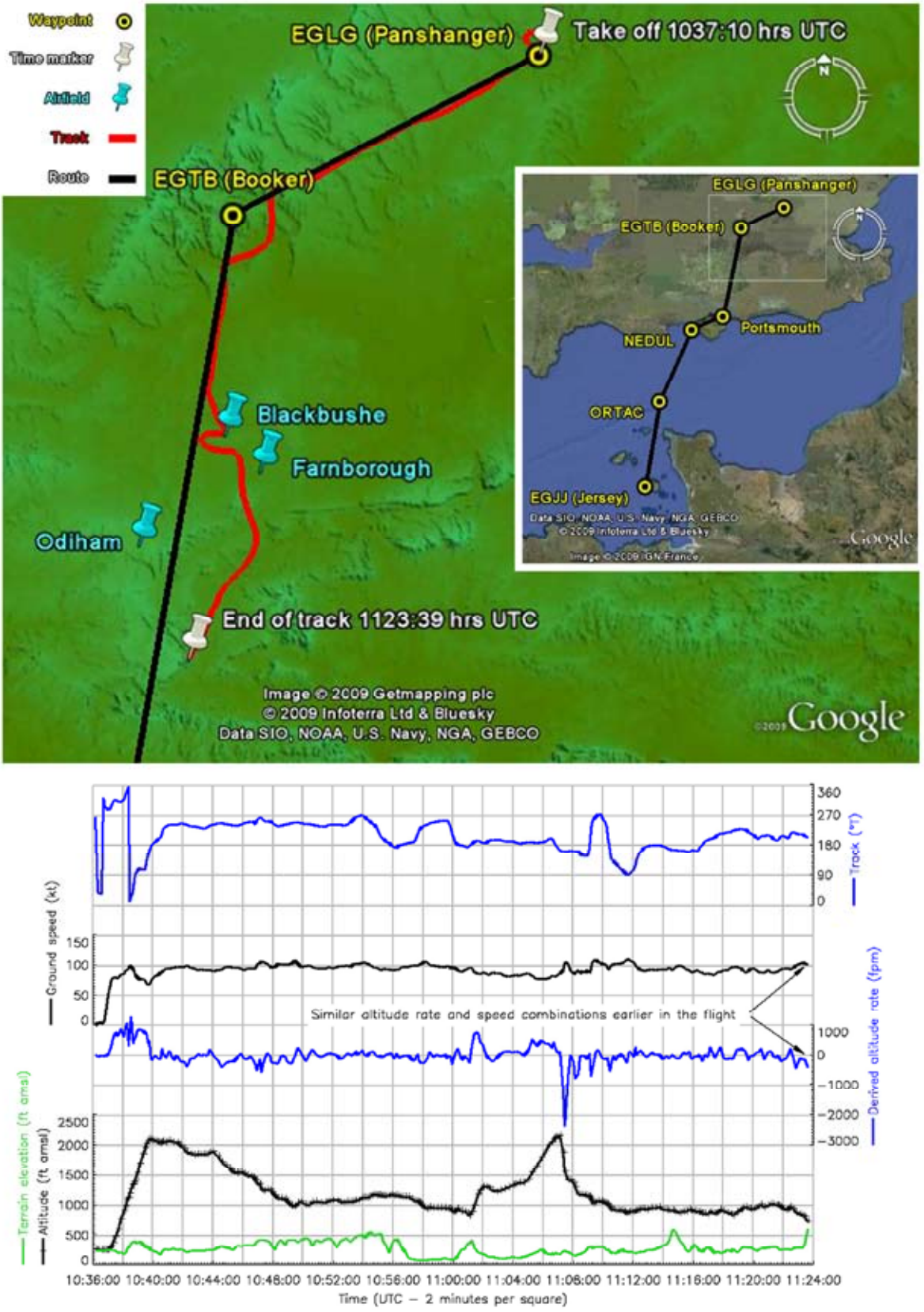

Figure 1

Last flight recorded in the GPS, N2405Y

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Accident site and wreckage information

The aircraft impacted trees situated just before the summit of the ridge, on a southerly track, at a point some 15 ft below the tops of the trees and 40 ft above local ground level. The altitude of the impact point was approximately 675 ft above sea level and some 280 ft above the terrain on the aircraft's approach to the rising ground.

An elliptical zone of debris ranged along the track from the impact point, across the ridge and down the wooded south-facing slope beyond, extending a total distance of 120 metres. Debris on the ground between the initial tree strike and the summit of the ridge comprised pieces of broken tree only. The aircraft's debris began on the ridge itself, with the wings, flaps and ailerons having separated from the fuselage. The engine and propeller were found, still attached to the fuselage, some 60 metres further down the slope. The engine had been driven upwards into, and had pushed back, the firewall, causing deformation of the cabin sidewalls and a shortening of the cabin space. Pieces of engine cowl and miscellaneous debris from the cabin, including seat headrests and mounts for GPS units, were scattered beyond the nose impact point. The furthest items in the debris zone, comprising a single headrest and the nose landing gear strut and wheel, lay separately some 20 metres beyond the fuselage remains.

All of the aircraft's extremities, together with all flying control surfaces and associated parts, were identified at the crash site at positions in the debris trail consistent with the aircraft having been intact at the point it entered the trees.

The altimeter, which was undamaged and appeared not to have been disturbed by the impact, was found set to a pressure setting of 1002.5 mb. The throttle and mixture controls were found in the fully forward position, the carburettor heat control lever was set to COLD, and the flap actuating horns were both in the 'flaps fully retracted' position. Assessment of each of these controls suggested that they were not likely to have moved significantly during the impact. Propeller cuts through branches and tree limbs were identified in debris close to the fuselage remains, including one very clean cut at an oblique angle through a 15 cm diameter tree trunk - indicative of high engine power.

The wreckage was recovered from the hillside and taken to the AAIB at Farnborough for further examination. No evidence was found of any prior structural or mechanical failure that could have caused or contributed to the accident.

Impact conditions

The aircraft's path through the trees was consistent with a track of approximately 200°M at a climb angle of about 5°. The pattern of tree impact damage to the wing leading edge structure was consistent with it having been substantially wings-level when it entered the trees.

It was evident, both from the distribution of the aircraft's debris and from the pattern of damage it sustained, that both wings had been torn from the fuselage during the initial part of its swath through the tree-tops approaching the summit of the ridge. Thereafter the fuselage followed an essentially ballistic trajectory before impacting the downward-sloping ground on its right side and coming abruptly to rest. The trajectory followed by the fuselage, from the point where it crested the ridge of the hill to its final impact with the ground, implied a horizontal velocity at the ridge of the order of 60 kt after the loss of the wings by its initial passage through the trees. It follows that the

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aircraft's speed upon first entering the trees would have been substantially greater than 60 kt.

In summary, the physical evidence was consistent with the aircraft having been in wings-level climbing flight when it entered the trees, at cruising speed or thereabouts and with the engine developing significant power.

Pathologist's report

The pathologist, widely experienced in aviation accidents, reported that both the pilot and passenger died of multiple injuries, which were consistent with having been sustained in the impact. None of the injuries would, in either case, have necessarily been immediately fatal but were such that it is unlikely that even immediate medical attention would have altered the outcome.

The pathologist further commented that there was evidence that the passenger was wearing a three-point harness and that the pilot was wearing his lap belt; it was uncertain whether the pilot had also been wearing his shoulder harness. In the experience of the pathologist, the injuries to both occupants were towards the less severe end of the spectrum of injuries seen in fatal aircraft crashes and that this was one of very few fatal light aircraft accidents where the provision of secondary restraint systems, such as airbags, might have had the potential to aid survival.

Aircraft and maintenance history

The aircraft was manufactured in 1985 and was registered and operated in the United States until July 2003, when it was exported to the United Kingdom. Following import into the UK, it was re-registered with the US FAA to a trust created on behalf of the new owners, a group of three persons of which the deceased pilot was one. It was subsequently maintained in accordance with FAA requirements, and certified by FAA-licensed engineers based in the UK.

The most recent log book entry, dated 7 April 2008, certified the satisfactory completion of an annual inspection, valid under FAA rules until the end of April 2009. The tachometer readout at the time of the accident indicated that it had flown a total of some 88 hours since that time - a figure that was broadly consistent with entries made in the journey log maintained by the owner group. Notwithstanding the FAA maintenance regime's '100 hr' inspection cycle, the operator of the aircraft's home-base airfield required all US-registered aircraft based at his field to undergo interim 'oil-change' inspection at 50-hour intervals. The journey log entries implied that this non-mandatory inspection had been carried out on or about 8 August 2008, a nominal 50 hours after the annual inspection.

In summary, the aircraft's documentation showed that following its importation into the UK it had been regularly maintained in accordance with FAA requirements, commensurate with its US registration.

Pilot's experience

The investigation did not have access to the pilot's logbook and the hours used to show the pilot's experience were obtained from the aircraft's technical log.

Weather forecast

The weather forecast for below 10,000 ft amsl issued by the Met Office for the period of the flight is shown at Figure 2.

The worst weather expected for the route was isolated areas with visibility of 3,000 m in heavy rain or thunderstorms. Isolated areas of 2,000 m visibility in

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mist were forecast over the sea and coastal areas. Areas of scattered or broken stratus were forecast with bases between 300 and 800 ft amsl. The tops of the cloud were forecast to be above 10,000 ft amsl.

The forecast for Jersey, valid between 0600 and 1500 hrs, was for a surface wind from 160° at 12 kt, visibility 9 km in light rain, scattered clouds at 500 ft aal and broken cloud at 1,500 ft aal. Temporarily, the visibility was forecast to be 3,000 m in moderate rain with broken cloud at 500 ft aal. Jersey Airport is at an elevation of 277 ft.

Weather aftercast

The Met Office produced an analysis of the weather at the time of the accident. The surface analysis for 1200 hrs is shown at Figure 3.

The aftercast stated in summary that:

> *'It is evident that, whilst varying in time and space, cloud cover over the general area of the site was low. FEW to BKN stratus, base 300 FT to 1200 FT AMSL is estimated to have prevailed across the area and this would have covered the hills and high ground in the area. The area was affected by generally moderate rain or drizzle, which through direct evidence is reported as being between 5000 M and 12 KM. Isolated heavy rain or drizzle is evidenced on the radar, and empirically this might be expected to reduce visibility to 3500 M – though there is no direct evidence of this. Visibility in cloud, and hill fog, is likely to have been below 200 M and given the low cloud base such visibility would have been extant over hills and high ground above 300 FT AMSL.'*

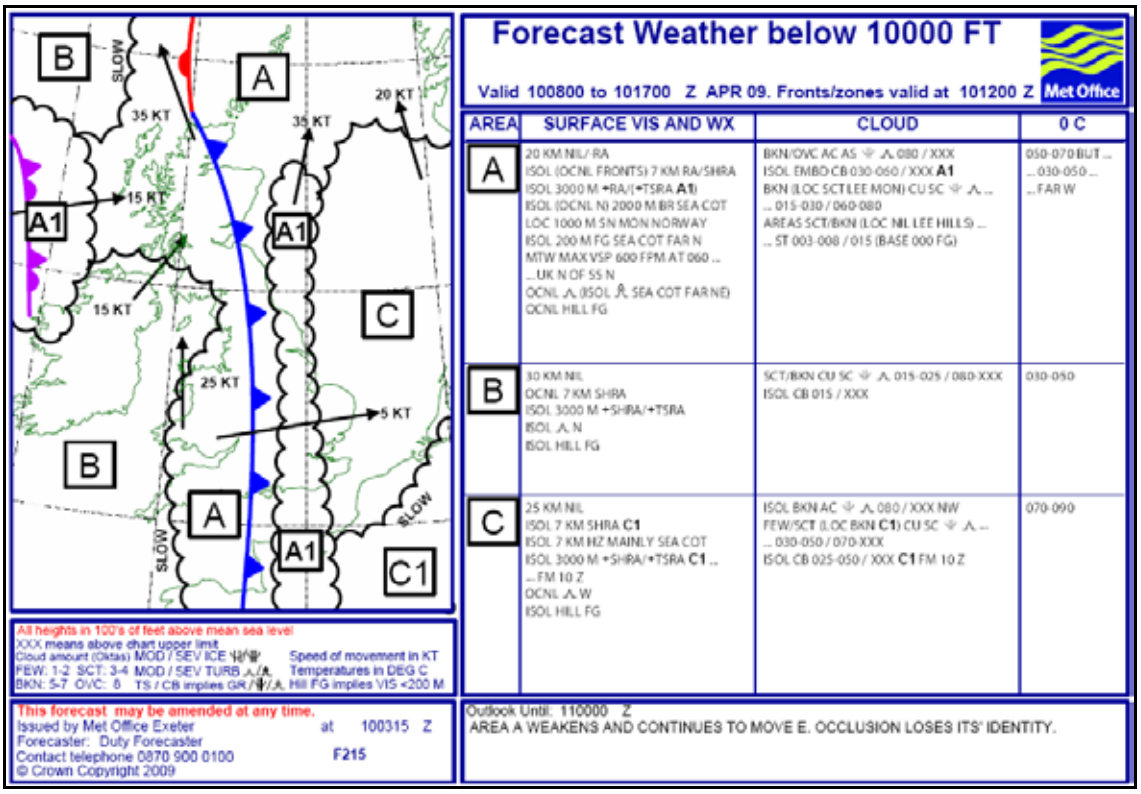

Figure 2

The forecast weather below 10,000 ft

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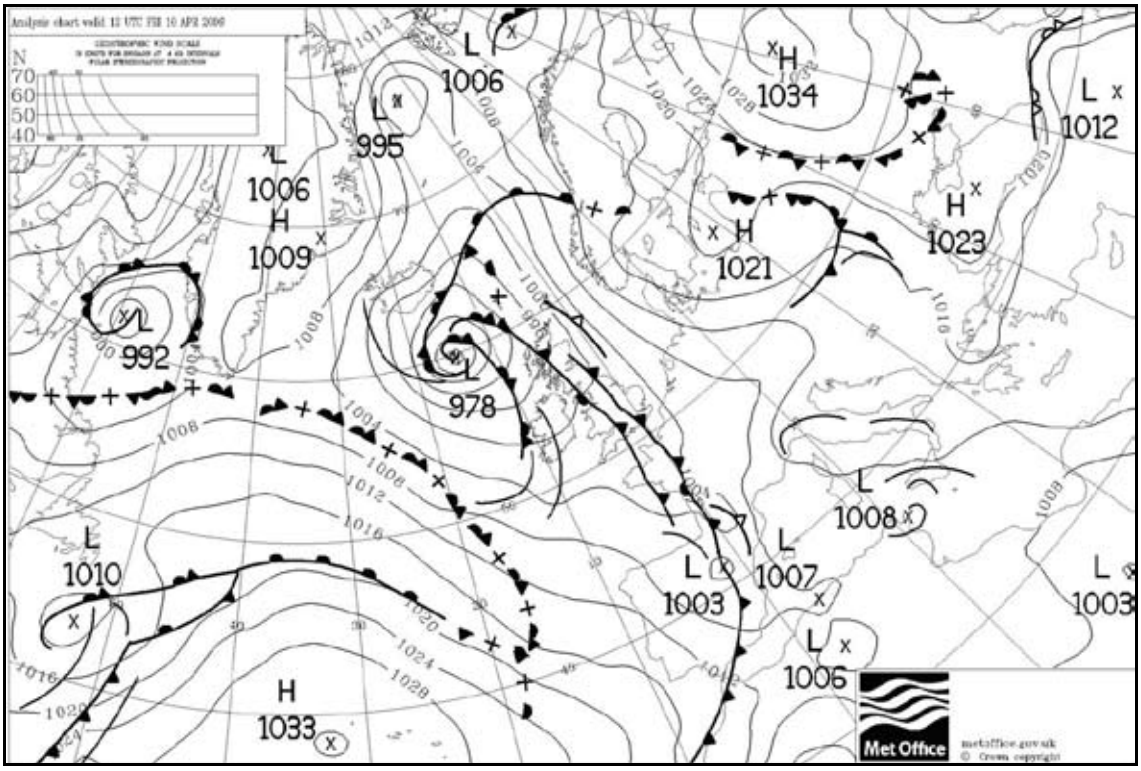

Figure 3

Synoptic situation at 1200 hr

Actual weather report at Jersey

The actual weather reported at Jersey at 1220 hrs was wind from 270° at 4 kt, visibility more than 10 km in light rain, few clouds at 200 ft aal and broken cloud at 3,500 ft. Temporarily, the visibility was 5,000 m in moderate rain with broken cloud at 500 ft aal.

Procedures at Jersey

The UK Air Information Publication (AIP) entry for Jersey airport contains information and instructions for pilots visiting the airport. Aircraft flying to Jersey must pass through the Channel Islands Control Zone (CTR), which is Class A airspace. Aircraft not operating under IFR must be in receipt of a Special VFR clearance and the AIP states:

> *'Special VFR clearance to operate within the CTR, for the purpose of proceeding to or from an aerodrome within the Zone, will not be granted to an aircraft if the reported visibility is less than 3 km or the reported cloud ceiling is less than 600 ft at the aerodrome concerned.'*

VMC minima

The VMC minima applicable to flights flown in Class G airspace below 140 kt and 3,000 ft are: visibility of 1,500 m, clear of cloud and in sight of the surface. The Air Navigation Order prohibits flight closer than 500 ft to any person, vessel, vehicle or structure. For practical purposes, this means that a flight should only be continued if the cloud base is greater than 500 ft above the local ground or obstruction level at a given point.

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Ground elevation under the planned route varied but, apart from the section across the Thames Valley, it was generally above 250 ft amsl. There were two sections of the route where the ground was above 500 ft amsl. There was also a ridge of high ground perpendicular to the planned route and over which the flight would have to pass where ground elevation was sometimes over 800 ft amsl.

CAA Safety Sense Leaflet 1 – General Aviation Good Airmanship

The CAA leaflet on general aviation '*Good Airmanship*' contains a section on weather which states:

> *'Get an aviation weather forecast, heed what it says and make a carefully reasoned GO/NO-GO decision. Do not let 'Get-there/ home-itis' affect your judgement and do not worry about 'disappointing' your passenger(s). Establish clearly in your mind the current en-route conditions, the forecast and the 'escape route' to good weather. Plan an alternative route if you intend to fly over high ground where cloud is likely to lower and thicken.'*

Analysis

The weather forecast issued by the Met Office suggested that the weather along the pilot's route would be poor, with cloud bases between 300 and 800 ft amsl. In order to fly the route as planned and remain VMC while observing the '500 ft rule', a cloud base of at least 750 ft amsl was required for much of the route. Two areas required a cloud base of 1,000 ft amsl and the ridge of high ground required a cloud base of 1,300 ft amsl.

The departure at 1036 hr implied an ETA at Jersey of about 1215 hr. The weather forecast valid for the airport at that time included the possibility of 3,000 m visibility and broken cloud at 500 ft aal. These conditions, if extant when he approached Jersey, might have prevented ATC from issuing a Special VFR clearance, in which case the pilot would not have been able to continue to his destination.

In summary, the weather forecasts for the route and destination cast doubt on whether the pilot would have been able to complete his flight and the aftercast indicated that the weather encountered on the flight was similar to that forecast. In addition, the weather reported at Jersey at the flight's ETA suggested that a Special VFR clearance might not have been available.

Two days before the accident, the pilot had acknowledged that the weather might preclude the flight and yet on the day the weather forecast did not dissuade him from taking off. It is possible, from his comments regarding his training for an IMC rating, that he thought he was well prepared, whereas he was actually required by his licence to maintain VMC throughout the flight, regardless of that training. Pilots who hire aircraft from a flying club are bound by the rules of the club, which might include different weather limits for VFR navigation flights to reflect different experience levels. Pilots who own their own aircraft must rely on self-discipline when there is no external moderation of their decision to fly. It is probable that, in making his decision to take off, the pilot succumbed to the '*get-there-itis*' referred to in the CAA Safety Sense leaflet.

Once airborne, the pilot flew the majority of the route between 1,200 and 1,000 ft amsl, with the last 14 minutes flown essentially level at 1,000 ft amsl. The aircraft's height above ground level varied as the elevation of the terrain over which it flew varied. On one occasion, its height over a ridge was about 330 ft.

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This was consistent with the pilot flying just below a substantially level cloud base to maintain clear of cloud and to maximise terrain clearance. If this was the case, the descent towards the ridge was likely to have been in response to the cloud base lowering from about 1,000 ft amsl to about 720 ft amsl, as reported by the witness at the accident site.

The CAA leaflet refers to establishing an '*escape route'* to good weather. This applies both before takeoff and when actually encountering poor weather during flight. It is possible that the wing rocking observed by the witnesses coincided with the pilot's uncertainty about the limited options available to him. It was at this point that the aircraft entered cloud.

The evidence from witnesses and examination of the wreckage indicates that the aircraft was serviceable prior to impact and it appears that the aircraft hit trees, below the ridge line, climbing at about 5°. It is likely that, having entered cloud and lost all visual references, the pilot initiated a climb because he knew the aircraft was probably close to the ground. His actions were too late, however, for the aircraft to clear the ridge.

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