ACCIDENT

Aircraft Type and Registration:	Mooney M20B, G-JDIX
No & Type of Engines:	One Lycoming O-360-A1D piston engine
Year of Manufacture:	1961
Date & Time (UTC):	9 May 2010 at 1705 hrs
Location:	Old Buckenham Airfield, Norfolk
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - 1 (Fatal) Passengers N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence
Commander's Age:	66 years
Commander's Flying Experience:	Not established
Information Source:	AAIB Field Investigation

Synopsis

The aircraft was seen to depart from controlled flight whilst flying at slow speed and low height in the vicinity of Old Buckenham Airfield, which was believed to be the point of intended landing. The circumstances which gave rise to the loss of control could not be determined, but sufficient evidence existed to cause doubt about the pilot's fitness to safely act as pilot of an aircraft on the day of the accident.

Background information

The pilot purchased G-JDIX in August 2009 and flew it to Hohenems Airport in Austria, which was close to his home and where the aircraft was to be kept. At that time, the pilot owned and flew a Morane Saulnier 880 Rallye aircraft, which was destroyed in a forced landing accident a short while later, in November 2009.

In February 2010 he flew G-JDIX to Biberach Airport in Southern Germany. It is believed this was to have been a permanent move and that the pilot intended to transfer the aircraft to the German register, but this did not happen. He subsequently made arrangements with a maintenance facility at Old Buckenham Airfield in Norfolk (from where he had purchased the aircraft) for them to carry out maintenance on the aircraft. It was arranged that he would fly it from Biberach to Old Buckenham on 9 May 2010.

History of the flight

Prior to departure, the pilot fuelled the aircraft with 106 litres of fuel, and loaded a single bag into the aircraft. Takeoff from Biberach was at 1226 hrs. The airport operator reported that the pilot rejected the first

takeoff attempt, reportedly for failing to gain adequate airspeed, but took off successfully at the second attempt (the reason for the rejected takeoff was not confirmed). According to information listed on the filed flight plan, the flight was expected to last 3 hours 30 minutes, with a fuel endurance of 4 hours 20 minutes. At about 1620 hrs, the pilot called on the Old Buckenham Air/Ground frequency to request the airfield details, which were passed to him: Runway 07 was in use and the surface wind was from 040°(M) at 8 kt. The weather was fine, with broken cloud cover at about 2,500 ft and visibility in excess of 10 km.

About 10 minutes after his initial call, the pilot called 'DOWNWIND' and then 'FINALS'. When the aircraft had not landed some minutes later, staff checked with Tibenham airfield (4.5 nm to the south-east) and learnt that the aircraft had landed there unexpectedly. Recorded data from the aircraft's GPS navigation unit, which was recovered from the accident site, showed that the aircraft had not in fact made an approach to Old Buckenham, but had landed at Tibenham after first orbiting briefly to the south of the airfield.

Gliding operations were in progress from Runway 03 at Tibenham; there was a launch control vehicle on the airfield and the local Air/Ground frequency was in use. The pilot of G-JDIX made no radio calls on the frequency, and landed on the out-of-use Runway 33, which was across the prevailing wind and across which ran glider launch cables. The aircraft appeared to make a very low approach, and seemed to onlookers to be rather fast, possibly without wing flaps lowered. The aircraft bounced several times on landing and used 1,100 m of the runway's 1,250 m length.

After parking at the clubhouse, the pilot spoke to several club members. They described him as being in a highly agitated, even distressed, state. He was sweating profusely, with sweat-soaked clothing. He was also very voluble, and talked of a number of things, including personal family issues which were obviously a source of concern to him. He was given a hot drink but did not eat anything. His English was not good, but he was able to explain that he had landed at Tibenham because of concerns over the aircraft's brakes and the short runway at Old Buckenham, which is 800 m in length, with a Landing Distance Available of 640 m. The pilot did not seek any engineering assistance, although a club member did carry out a brief external check of the wheels and brakes and found nothing obviously amiss. The pilot did not enquire about refuelling. People who met with the pilot were concerned and thought he should not fly again in his condition. They encouraged him to delay the last stage of his flight, but the pilot was clearly keen to continue.

The gliding operations were explained to the pilot, who was instructed to taxi for Runway 03 and to contact launch control before takeoff. Contrary to these instructions, he taxied straight out to the start of Runway 33 and commenced a takeoff run without appearing to carry out any engine checks beforehand and without making any radio calls on the local frequency. The aircraft climbed to an estimated 1,000 ft agl and departed on approximately the runway track until out of sight.

At about the time the aircraft took off the pilot called again on the Old Buckenham frequency and asked for the airfield details. After these were passed to the pilot, he made comments about his brakes and about returning to Tibenham. Personnel at Old Buckenham were not certain of the exact meaning of his comments, but took them to mean that he was intending to return to land at Tibenham. When nothing further was heard, Tibenham was called again to see if the aircraft had landed again there, but it had not.

Witnesses saw the aircraft flying in the vicinity of Old Buckenham Airfield at what was described as very low height and speed. Given its proximity to the airfield (only about 500 to 700 m from the Runway 07 threshold), its presence was not remarkable, but the aircraft was not flying on a recognised approach path and even turned away from the airfield shortly before the accident occurred. Witnesses described what appeared to be a low-speed departure from controlled flight, in which the aircraft dropped a wing and descended rapidly, disappearing from view behind trees. There were no reports of smoke or flames, or anything falling from the aircraft. One witness, who was in an open field close to the aircraft's flight path, could clearly see the pilot as the aircraft passed over, and reported seeing the aircraft's anti-collision beacon operating. He described the engine being at near idle power, but thought that the engine noise had increased markedly for a brief moment just before the loss of control.

Witnesses alerted the emergency services and went to the scene of the accident, which was in a field of young crops, a few hundred metres from a road. A fire had broken out and was accompanied by one or more small explosions. Although some paper documents were on the ground outside of the cabin, the cabin door itself was closed and the pilot was seen to be lying, apparently deceased, across the front seats. The fire quickly consumed much of the cabin area. Later examination revealed that the pilot's seat belt was unfastened.

Wreckage

The wreckage site was located in a field approximately one mile west of the threshold of Runway 07 at Old Buckenham Airfield. The aircraft was largely intact and all the wreckage was located within 10 m of the main wreckage. A fire had consumed most of the cockpit and upper fuselage.

There was significant damage to the left wingtip and left wing leading edge. The right wing was less damaged than the left. There was a 10 cm deep by 1 m long vertical mark in the ground next to the lower rear fuselage. This mark was consistent with having been made by the right side of the rear fuselage moving sideways with low energy and with little or no forward velocity. It was concluded that the aircraft had struck the ground in a nose-down, left-wing-low attitude, at a low speed, and with significant rotation. These conditions were consistent with a spin to the left.

The propeller was located 2 m from the main wreckage. One of the propeller blades was buried in the ground; the tip of this blade had sheared off and there were chordwise score marks on the remaining portion of this blade. The other blade was intact, bent backwards and relatively free of witness marks. Next to the propeller were some smooth cuts in the soil, these were black in colour (similar in colour to the propeller blades) and were consistent with propeller ground strikes. It was concluded that the propeller was probably rotating when the aircraft struck the ground, and it had stopped in approximately half a revolution.

Approximately 10 litres of fuel were recovered from the right wing fuel tank.

Aircraft information

The Mooney M20B has conventional three-axis flying controls and is equipped with a retractable landing gear and trailing edge flaps. G-JDIX was aircraft serial number 1866.

The aircraft and engine logbooks were found in the wreckage; however they were significantly fire-damaged. From the remains of the logbooks and maintenance engineering information it was established that the

aircraft had a 50-hour inspection in August 2009, at which time the airframe had completed 1,729 flying hours and the engine 10 hours since complete overhaul. The aircraft's Certificate of Airworthiness had expired in February 2010.

Post-accident performance calculations were made using known flight data from the GPS log and performance data supplied by the Mooney Airplane Company. The pilot's planned 3 hours 30 minutes duration appeared to have been based on still-air direct track calculations, with an allowance for takeoff and approach. The aircraft's track was very close to the direct track. The actual flight time between Biberach and Old Buckenham would have been around 4 hours.

The Mooney M20 Owner's Manual presented fuel planning data for two main cruise configurations: performance and normal. Using normal figures and with due allowance for en route climbs, descents and manoeuvring, calculations showed that the aircraft would have taken off from Tibenham with slightly less than 5 US gallons of fuel on board, sufficient for approximately 30 minutes flying time without reserves. (The total fuel capacity was 48 US gallons of useable fuel.)

Wreckage examination

The wreckage was recovered to the AAIB for further examination. The rudder, elevator and aileron systems were checked for continuity as well as for full and free movement; no anomalies were found.

The engine was stripped and inspected. Heat damage to the engine prevented a detailed assessment of the carburettor and the magnetos. The engine otherwise appeared to be in good condition and no engine defect that might have caused or contributed to the accident was found.

The fuel sample from the right tank was laboratory tested. The fuel had been in the vicinity of the post-crash fire, which made accurate conclusions very difficult, but the results indicated that the fuel was probably fit for purpose.

Recorded information

When found, the aircraft's transponder was selected ON, with altitude reporting selected. However, an analysis of area radar showed no returns for G-JDIX in the accident area, whereas other transponding aircraft were visible on radar down to about 400 ft in the Old Buckenham circuit. The damaged state of the transponder fascia (which was thrown from the main wreckage) and the lack of radar data suggested that the observed selections were functions of the ground impact.

A portable GPS navigation unit was recovered from the accident site and recorded data was successfully downloaded. Data had been stored in the unit in a mix of manually saved data files and automatically saved data logs.

Route data up to early November 2009 had been manually saved, a process which led to some information (notably date and time) being automatically deleted. The majority of the manually saved routes in this period were between Hohenems Airport and two airfields in southern Germany, but included one flight from Hohenems Aiport direct to Old Buckenham, returning via Heligoland, off the north German coast. Based upon the dates on which the data was saved, almost all the recorded flights were made prior to the pilot taking ownership of G-JDIX.

There were 61 active logs in the unit's memory, dating from 7 November 2009 and including the accident flight. The pilot used the GPS for surface travel as well, and only four logs pertained to flights (not including the

accident flight). Three of these were made between 7 and 10 November 2009 in the pilot's Rallye aircraft, the last of which ended when the pilot force-landed the aircraft following engine failure. The fourth was the flight in G-JDIX from Hohenems to Biberach on 27 February 2010.

Accident flight

The GPS track showed an approximately straight line flight from Biberach, at altitudes varying between about 2,000 ft and 4,500 ft over mainland Europe, down to about 500 ft over the North Sea. At about the time the pilot was in contact with Old Buckenham, the aircraft was flying in the vicinity of Tibenham, and completed an orbit before making an approach to Runway 33 (Figure 1).

The aircraft took off again at 1659 hrs, after which a further seven GPS points were recorded. Whilst the GPS positions recorded during the take off at Tibenham correlate well with the runway, the final GPS position at 1704:41 hrs appears to be less accurate in its position, possibly due to satellite tracking issues at or near the accident site.

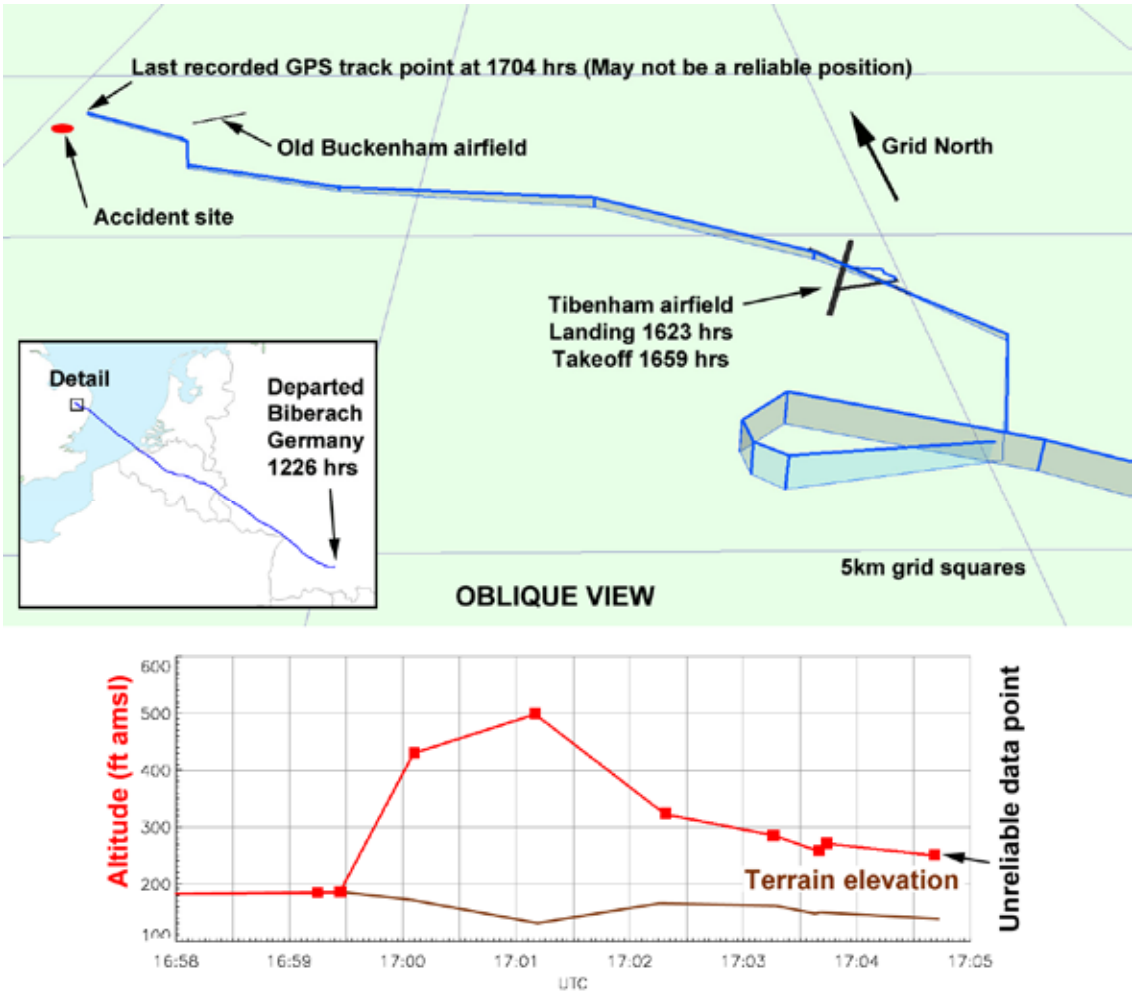

Figure 1

Overview of the last recorded GPS track and an oblique view showing the arrival at Tibenham, ground manoeuvring and onward flight. Graph depicts aircraft altitude for the accident flight

The maximum recorded altitude was 500 ft (370 ft agl) and the maximum groundspeed (averaged between points) was 82 kt. The light wind was generally from abeam, so average groundspeed values would approximate to those for airspeed. For about the last two minutes of flight, the data points show a relatively constant height of about 120 ft agl, with the groundspeed falling to about 60 kt over the final 80 seconds.

Pilot information

The 66 year old pilot was a national of the Czech Republic, living in Austria. He started flying training at Hohenhems in late 2006 and gained a Private Pilot's Licence, issued by the Austrian Civil Aviation Authority, on 5 June 2007. He held a Class 2 medical certificate, issued in October 2009. The Austrian authorities confirmed that the pilot's licence and medical certificate were valid at the time of the accident.

Information about the pilot's flying hours and training records was sought from the Austrian authorities but was not available from official sources. However, some information about the pilot's flying abilities and general disposition was gained from personnel at Old Buckenham, including a pilot who flew with him in G-JDIX prior to its purchase.

The pilot's general handling was described as being of a quite low standard. Compared to the Rallye that the pilot was used to, the Mooney approached the runway at a higher speed and with less drag (even with flaps extended), requiring greater attention to speed control to avoid landing too fast. The pilot reportedly used an incorrect technique which consistently resulted in fast approaches and long landings that were also remarked upon by onlookers. It was suggested to the pilot that he should seek the guidance of a qualified instructor whilst he became familiar with G-JDIX, but he was reportedly dismissive of the suggestion.

Personnel at Old Buckenham also had cause to question the pilot's airmanship and approach to safety matters. Their concerns were first raised when it was learnt that the pilot flew from Germany to Old Buckenham with incomplete charts and without any over-water safety aids such as lifejackets. The pilot generally appeared nervous and agitated, with a number of personal family issues which he seemed prepared to discuss freely. These issues, which existed in August 2009 had, according to the accounts from those who met him at Tibenham, escalated by May 2010 and were clearly an ongoing concern for the pilot.

Information from the airfield operator at Biberach indicated similar patterns of behaviour. The pilot was described as appearing confused on occasions, and his arrival from Hohenems in February 2010 involved an approach to the incorrect runway and an attempted wheels-up landing which was only averted when the pilot was warned of the situation.

Regulations pertaining to international flights

As the accident flight originated in a European Union country, there was no restriction on the place of landing in the UK. However, the UK AIP[1] required that the pilot notify HM Revenue & Customs and the UK Border Agency of the flight plan details, for Customs & Excise and Immigration purposes. No such notification was made. A flight plan was required for the international flight, and although the pilot did prepare a flight plan, he did not file it prior to departure. This was done by airport staff at Biberach after the aircraft had taken off.

Footnote

[1] Aeronautical Information Publication Section GEN 1.2 '*Entry, transit and departure of aircraft'*. The UK AIP is published by authority of the UK Civil Aviation Authority.

Medical and pathological information

A post-mortem examination was carried out by a local histopathologist at the direction of HM Coroner. The cause of death was given as multiple injuries; these were all confined to the chest and would have been rapidly fatal. The pattern of injuries described in the post-mortem report was not distinctive enough to reliably comment on whether the pilot's harness was in use at the time of the accident. Toxicological examinations revealed no evidence of alcohol in the pilot's blood. A toxicological screen for drugs was not performed.

Safety action

Concerns about the pilot's competency were raised by the AAIB with the Austrian authorities. The AAIB was informed that a safety audit was to be conducted at the school where the pilot trained.

Analysis

From the ground marks, damage to the wings and the compact spread of the wreckage it was concluded with a reasonable level of confidence that the aircraft had struck the ground in a nose-down, left-wing low attitude, at a low speed, and with significant rotation, these conditions being consistent with a spin to the left.

The damage caused by the post-crash fire made it difficult to establish if there was a defect or problem that had affected the operation of the aircraft. However, since no technical defects were found, and with good evidence that the propeller was rotating under power when the aircraft struck the ground, it was concluded that there was probably no technical defect that had either caused or contributed to the accident. Nothing was found to account for the pilot's reports of poor brake effectiveness, and it was thought this may have been due to landing too fast as a result of a poor approach technique, rather than a technical issue.

Based on the available evidence, it is unlikely that the pilot had gained much experience on G-JDIX and he had not flown it since the flight to Biberach, more than two months before the accident. The pilot's flying abilities and standard of airmanship appeared questionable, considering the events of the accident day and reports from beforehand.

The pilot's mental and physical fitness to fly were also in doubt. As no toxicological screen for drugs was carried out at post-mortem, the investigation was unable to rule out the possibility that the pilot may have been under the influence of drugs.

From eyewitness accounts, it is probable that the pilot became distracted from the task of landing his aircraft at nearby Old Buckenham (if indeed it was his intention to do so), which could easily have been reached had the aircraft turned towards it, rather than away. Instead, the pilot allowed the aircraft to become dangerously slow at very low height. The source of distraction was not identified: the low fuel state perhaps presents the most likely reason, but this could not be confirmed. Given the pilot's questionable state of fitness to safely act as the pilot of an aircraft on the day in question, no further meaningful analysis was possible.