Cessna 172M, G-BXLJ

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Aircraft Type and Registration:	Cessna 172M, G-BXLJ
No & Type of Engines:	1 Lycoming O-320-E2D piston engine
Year of Manufacture:	1976
Date & Time (UTC):	12 February 1999 at 1531 hrs
Location:	Berwyn Mountain, Mid Wales
Type of Flight:	Private
Persons on Board:	Crew - 2 - Passengers - 1
Injuries:	Crew - Fatal - Passengers - Fatal
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Commercial Pilot's Licence with Assistant Flying Instructor's (AFI) Rating
Commander's Age:	41 years
Commander's Flying Experience:	1,002 hours
	Last 90 days - 180 hours
	Last 28 days - 62 hours
Information Source:	AAIB Field Investigation

History of flight

The pilot who hired the aircraft had not flown since 28 November 1998, consequently the AFI accompanied him in order to satisfy the operator's 4 week currency requirement. Although it is probable that the former would have handled the controls during most of the flight, the AFI signed the technical log as the aircraft commander. With no evidence to the contrary, it is assumed that the student pilot who occupied the rear seat played no active role in the conduct of the flight.

At about 1510 hrs, the three occupants were seen to board the aircraft at Welshpool Airfield. The take off time was not noted but it was thought to be shortly after 1515 hrs.

Analysis of data recorded from Clee Hill Radar showed a series of secondary radar returns starting at 1525 hrs, the first of which was 3 nm west of the airfield at an altitude of 1,558 feet. The balance

of evidence suggests that these returns were from 'LJ'. The aircraft tracked about 343°(M) with a groundspeed about 90 kt and it climbed to an altitude of about 2,000 feet. It continued to track north-west and, at 1531 hrs, passed $^1/_2$ nm to the west of the village of Llanfyllin. Radar contact was lost shortly after 1534 hrs when the aircraft had descended to about 1,558 feet amsl as it entered the valley between Llanrhaeadr-ym-Mochant and Tan-y-pistyll. The valley is orientated north-west and the ground on either side rises to about 600 metres amsl (1,970 feet). Eyewitnesses saw the aircraft flying up the valley to the left of the road and parallel to it. It was below the level of the valley side and appeared to be flying normally. The weather was good with only a light wind and the tops of the adjacent hill were not in cloud.

Radar contact was regained at 1536 hrs when the aircraft was at 2,158 feet amsl about 1 nm to the north of the end of the valley. It tracked north and began to climb. It was at 2,358 feet amsl near a lake named Llyn Lluncaws, when the rate of climb increased to about 725 fpm, and the ground speed decreased from about 85 kt to about 45 kt. The last radar contact was at 1536:58 hrs at 2,558 feet amsl. This was about $^1/_3$ nm north of the position where the wreckage was later found and the ground in the immediate vicinity was 800 metres amsl (2,625 feet).

Overdue action and search

When the aircraft had not returned by 1630 hrs, the member of the airfield staff who had been operating the air/ground station became concerned and, at about 1655 hrs, reported this concern to the director of the Welshpool Airport operating company. He made several radio calls to the aircraft but received no reply. He then informed the Distress and Diversion (D&D) cell at the London Area and Terminal Control Centre; the call was logged at 1728 hrs. The D&D controller immediately initiated overdue action and informed the Rescue Co-ordination Centre (RCC). Other airfields in the locality were contacted and a radar replay was initiated. It was noted that one radar track to the north-west of Welshpool disappeared at about 1537 hrs; the position of the last contact was passed to the RCC who alerted the rescue helicopter and the Mountain Rescue Team (MRT) at RAF Valley, Anglesey. The MRT was mobilised, however, the weather in the area precluded a helicopter search. Meanwhile the radar data had been reviewed and a refined position was passed to the RCC. This was used to define the area upon which the search would concentrate.

At 2133 hrs, the MRT met the local police and the search started. The visibility in the search area was estimated as 200 metres in fog. The wreckage was located at 0126 hrs, about $^1/_2$ nm from the position of the last radar contact. It appeared to the MRT that the aircraft had flown into steeply rising ground and tumbled back about 50 metres down the slope.

Medical and pathology

Post mortem examination of the three occupants indicated that the fatal injuries were sustained when the aircraft initially struck the mountainside. There was no evidence that either the pilot or the instructor suffered from a pre-existing medical condition that could have contributed to the accident.

Meteorology

The Meteorological Office at Bracknell produced an aftercast which reported that the synoptic situation at 1600 hrs showed a frontal zone lying from Blyth to Ronaldsway to Dublin. It was moving very slowly southeast and there was a cloudy southerly airstream established over Wales. Generally the weather was intermittent slight rain and drizzle, with mist.

Surface wind 200°/5 kt

2,000 feet wind 200°/8 kt

Visibility 2,000 to 5,000 metres

Cloud FEW base 1,500 feet

BKN/OVC base 2,000 to 2,500 feet

Temp/Dew point + 3°C/+ 2.5°C at the surface

+ 1°C/+0°C at 2,000 feet

QNH 1026 mb

Estimation of cloud bases in the relatively remote areas, such as where this accident occurred, is extremely difficult because the observational network is very sparse. However, the nearest observation was made at Lake Vyrnwy, which is 360 metres (1,180 feet) amsl and about 7 nm to the south-west.

At 1500 hrs the cloud was overcast, base 500 feet agl. At 1600 hrs, the cloud was still overcast but the base had lowered to 400 feet agl (about 1,600 feet amsl). Although the low level wind flow in these regions is complex, the general mean velocity was 200°/8 kt. This implies that there would have been some flow over higher ground to the west of the aircraft's track that would have provided limited shelter. Consequently, the cloud base in the vicinity of the accident site is likely to have been about 500 feet higher than that reported at Lake Vyrnwy which is about 2,100 feet amsl in the valley. Surrounding ground above this altitude would have been obscured by cloud.

Pilot's flying experience

The AFI had joined the RAF in 1976 and trained as a navigator. When he left the RAF, in 1995 he had accrued a total of 3,645 hours. At the time of the accident he held a Commercial Pilot's Licence. His licence contained an Assistant Flying Instructor's Rating.

The pilot who hired the aircraft started flying at Welshpool in March 1993 and his Private Pilot's Licence was issued on 7 October 1994. He held a current Instrument Meteorological Conditions rating. His Flying Log Book showed a total of 172 hours flying, of which 6 hours were on type.

Both pilots held current medical certificates and were adequately qualified to conduct the flight.

Engineering Investigation

The aircraft was found on the east facing slope of Moel Sych on steeply sloping ground below an escarpment. The escarpment was essentially vertical but was composed of rocky outcrops. The position at which the aircraft came to rest was at about 2,300 feet amsl. About 200 feet higher, on the face of the escarpment, an area of rock surface was found with white and blue paint smears. Immediately below this the rocks and grass were coated with oil and the detached noseleg had lodged somewhat lower at the foot of the escarpment.

Almost all of the aircraft's structure lay at one location held together, for the most part, by the flying control cables. The cockpit and nose had disintegrated and the two wings had separated. The engine and the instrument panel lay close to the main wreckage just above it on the slope. The broken airframe showed much impact damage which had evidently been caused by its tumbling fall down the hillside.

About half of one propeller blade was missing and was not found. The missing portion had broken off in forward bending with 'leading edge upwards' twisting. The other blade had been bent rearwards through a total angle of more than 180° from multiple rotational impacts. It had some leading edge indentation and cordwise scoring. The condition of the propeller showed that considerable power was being transmitted through it at the time of impact. The instrument panel was badly damaged but some information was obtained from the instruments and panel mounted controls. In contradiction of the indications of power on the propeller the pilot's throttle control was found at near the closed position; its stalk was projecting from the panel unbent. It was not possible to determine whether the throttle control had been moved to that position during the impact or whether it had been selected closed before impact. Other panel controls were found in rational positions. The magneto switch was at 'BOTH', the mixture control at 'RICH', the primer was locked and carburettor heat was at 'COLD'. A small amount of fuel was recovered from the left tank and this proved to be clean Avgas 100LL.

The wreckage was recovered to the AAIB headquarters with the assistance of RAF St Athan Aircraft Recovery and Transportation Flight and the RAF Stafford Mountain Rescue Team. Examination showed that the aircraft had been complete at impact and no pre-existing failure was found in the structure or flying controls. Although the aircraft had evidently suffered much secondary damage after the first impact some damage was identified as likely to have been caused by the first impact. There had been a massive impact on the underside of the nose. This had removed the noseleg, crushed the carburettor and silencer and crushed the lower half of the firewall and the fuselage belly structure just aft of the firewall in an upwards and rearwards direction. The blue painted engine sump was scored and damaged and this, together with white paint from the aircraft's fuselage probably identifies this damage with the impact point on the rock face. Another piece of damage was also identified as likely to be in flight impact damage. This was on the leading edge and underside of the right wing tip, just inboard of the plastic tip fairing. The wing skin was crushed rearwards, directly cordwise, and the severity and directionality of the crushing differentiated this from other post impact damage and indicated that this had probably been incurred while the aircraft was in flight. Although this damage was at the right wing tip other evidence shows that the aircraft was approaching the escarpment from the left. This conflict of evidence could be reconciled if the aircraft was steeply banked to the right at the time of impact.

The fore and aft direction of this initial impact damage does indicate that the aircraft was in balanced forward flight at impact, albeit probably banked, and this suggests that there was no loss of control before impact.

The engine was stripped. Nothing was found which was likely to have caused a substantial loss of power and this is consistent with the propeller condition which indicated high rotational energy at impact. The lower compression ring on one cylinder was broken but it remained in its groove and had not caused any secondary damage. The left magneto had broken off but it performed normally on test. The right magneto was found to have internal wear and its internal timing was retarded but its timing on the engine was within limits. It produced some misfiring at low speeds but ran normally above 1800 RPM.