No: 3/91 **Ref: EW/C1182** **Category: 1c**

Aircraft Type and Registration:	Piper PA-28-161, G-MCPL
No & Type of Engines:	1 Lycoming O-320-D3G piston engine
Year of Manufacture:	1981
Date and Time (UTC):	20 November at about 2020 hrs
Location:	Near Dunbar, Lothian
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - Fatal Passengers - N/A
Nature of Damage:	Aircraft destroyed
Commander's Licence:	Private Pilot's Licence with IMC and Night ratings
Commander's Age:	49 years
Commander's Total Flying Experience:	204 hours (of which 31 were on type)
Information Source:	AAIB Field Investigation

The pilot gained his licence, a PPL(A), in March 1987. In June 1988 he gained an IMC rating and in August of the same year his licence was endorsed for Group B aircraft. In February 1990 he gained a night rating. Since obtaining his IMC rating, the pilot had recorded a total of only 3 hours instrument flying including his renewal in July 1990. Since gaining his night rating he had flown a total of two and a half hours before the accident flight.

The accident flight was originally planned direct from Fairoaks to Edinburgh but the pilot was advised that it would be more prudent to refuel en-route, he therefore planned to refuel at Leeds/Bradford. The weather forecast available to the pilot at Fairoaks indicated that an occluded front would be in the vicinity of Edinburgh at his planned arrival time. The weather associated with this front was forecast to be:

Cloud	-	Base 1500 feet to 2000 feet lowering to 1000 feet in cumulonimbus
Visibility	-	Generally 30 km but falling to 2500 metres in showers with hill fog down to 500 metres
Weather	-	Occasional rain or hail showers
Icing	-	Light to moderate
Freezing Level	-	Generally 2000 feet falling to 1000 feet in heavy showers

A meteorological aftercast obtained from the Meteorological Office at Bracknell was in general agreement with the forecast but indicated rather less severe conditions than those forecast. The NOTAMs displayed at Fairoaks stated that the St Abbs VOR and DME were out of service but that a temporary NDB with a protected range of 30 nm was available. At the start of the flight G-MCPL was serviceable except for its pitot head heater. This information was recorded in the technical log and available to the pilot.

The flight from Fairoaks to Leeds/Bradford was uneventful. G-MCPL was refuelled to full tanks with 59 litres of Avgas 100LL which agrees well with the amount of fuel that should have been used during the flight from Fairoaks. The pilot was seen to check the engine oil and the refueller reports that his manner was friendly and quite normal. Before departure, the pilot obtained Terminal Airfield Forecasts and Actual Weather reports for both Edinburgh and alternate airfields. The weather given did not vary significantly from the forecast obtained before departure from Fairoaks.

G-MCPL departed Leeds/Bradford on a VFR Flight Plan at 1855 hrs with the intention of routing Newcastle - St Abbs Head - Dunbar - Edinburgh. The flight proceeded normally until 1950 hrs, when G-MCPL was some 38 nm south of St Abbs Head at 2000 feet, its track, observed on the Great Dun Fell radar, became erratic (See Appendix). It initially deviated some 40° left of track for 5 minutes before turning right 70° for a further 5 minutes. It then paralleled track 4 nm east for about 2 minutes before turning right a further 40°. At 2004 hrs the aircraft faded from radar 15 nm south east of St Abbs Head. At 2011 hrs the pilot told Scottish ATCC that he could not pick up the St Abbs VOR. Scottish informed him that the VOR was off the air and gave him the frequency of the temporary NDB. It is not known where the aircraft was at this time but it would have travelled some 10 nm from the position where it faded from radar. At 2015 hrs the pilot reported that he had just passed overhead St Abbs NDB. The aircraft next painted on radar at 2016 hrs some 4 nm south west of the St Abbs NDB. At this time G-MCPL was handed over to Edinburgh Approach with a request to 'Squawk 7267'. On initial contact with Edinburgh, the pilot reported that he was at 2000 feet on a QNH of 991 and was heading 310°. Edinburgh confirmed that G-MCPL was requesting a Special VFR clearance into the zone and requested the pilot to report 5 nm from the boundary. The Edinburgh controller confirmed the QNH as 991.

Edinburgh's radar was off the air at this time and they were using the Lowther Hill head to provide a radar service. G-MCPL was not painting on the Lowther Hill radar due to terrain screening so the Edinburgh controller asked the pilot to report his DME range from Edinburgh. The controller also volunteered the information that the pilot should select the Edinburgh ILS frequency 108.9 MHz to obtain a DME range. The pilot acknowledged this transmission at 2017 hrs. Since reappearing on radar at 2016 hrs, G-MCPL had made good a track of 305°T which was his planned track from St Abbs NDB to Dunbar but displaced some 3½ nm to the South. This track took the aircraft over ground rising to 900 feet rather than the coastal route that he had planned.

At 2017 hrs, coincidental with his last radio transmission, the aircraft faded from radar. Also at about this time, G-MCPL was heard by an earwitness located directly beneath the last radar paint on the Great

Dun Fell radar. This witness stated that she initially heard a low flying light aircraft travelling south east. She stated that the engine sounded normal and that 2-3 minutes later she heard what she took to be the same aircraft travelling in a north west direction. She stated that it had been raining earlier but could not be sure if it was raining at the time she heard the aircraft.

The Edinburgh controller having heard nothing from G-MCPL since its last transmission at 2017 hrs, attempted to contact the aircraft through various agencies and on various frequencies until 2039 hrs. As he had no success, the Search and Rescue organisation was informed and a search for the aircraft commenced. G-MCPL was found the next morning 5½ nm due west of the last radar fix. It had crashed on moorland 1050 feet amsl and the pilot had been killed on impact. There was no fire and a post-mortem examination failed to reveal any medical condition that could have caused or contributed to the accident.

Examination of wreckage

The aircraft had crashed onto open moorland on a track of 295° magnetic and had come to rest against a wire fence bordering a young conifer plantation after a ground slide of approximately 60 metres. The marks on the ground at the initial impact point indicated that the right wing tip, the right mainwheel, the nosewheel and the left mainwheel had struck the ground in rapid succession. Measurement of these marks showed that the impact attitude was nominally level in pitch but rolled to the right at an angle in excess of 17°. The ground sloped upwards at about 3° along the line of the impact. Some 170 metres back along track from the impact point, and orientated in a north-south direction, was a line of electricity pylons carrying high tension cables. The aircraft bore no evidence of collision with either the pylons or cables. In order to have cleared the highest cable, the descent angle of the aircraft must have been more than 8°. The slope of the terrain resulted in the lowermost cable being level with the impact point: it is considered that had the aircraft flown underneath this cable, then the resulting shallow impact angle would have caused a long ground slide, as opposed to the comparatively abrupt halt that actually occurred. The degree of damage was consistent with the impact speed being around 100 kt i.e the approximate cruising speed of the aircraft.

The wreckage distribution indicated that first the outboard and then the inboard sections of the right wing detached as a result of the initial ground contact. This had also caused disruption to the fuselage, with the door coming open and cabin debris being deposited over the latter part of the ground slide. It was clear that a crater immediately after the nosewheel mark had been made by the nose of the aircraft, with the propeller becoming detached and coming to rest nearby.

Following an on-site examination, the wreckage was recovered to the AAIB at Farnborough for a more detailed analysis.

The propeller bore some leading edge damage and chord-wise scoring, suggesting that the engine was developing power at impact. The tachometer and engine oil pressure gauge indicated 950 rpm and 25 psi respectively, which, while there is no certainty as to whether these were representative of their pre-

impact indications, might tentatively suggest that the engine had been throttled back prior to impact. The fuel cock was found selected to the right tank. No fuel was found in the aircraft as both tanks had ruptured: a strong smell of fuel was observed around the main wreckage however.

Nothing untoward was noted in any of the cockpit indications or selections apart from the pitot heat being off. However an entry in the technical log pointed to the heating element being unserviceable and it is likely the pilot would have known about this. It was observed that the instrument panel illumination rheostat was at its maximum brightness position.

Both radios were found selected to the Edinburgh Approach frequency, and the runway 25 ILS frequency was found selected on one of the navigational boxes. The DME and ADF had gas plasma displays and had to be reconnected to a power supply in order to obtain the selections. These were found to be the Edinburgh ILS/DME and the NDB locator for runway 07.

The vacuum system, which drives the artificial horizon and the directional indicator, was examined in some detail. The pump was found to be in good condition when subjected to a strip examination, and the drive (from the accessory gearbox on the rear of the engine) was intact. Some of the vacuum hoses were found to be disconnected, although this was most likely to have been caused by the engine moving relative to the firewall during the impact. The artificial horizon would not erect when first tested. When the unit was disassembled it was found that one of the pendulous vanes had been dislodged from its mounting. This could only have occurred due to the gyro assembly contacting the inside of the instrument case and thus was almost certainly an impact feature. When the vane was reinstalled the unit functioned correctly. The filament of the vacuum system warning light was examined under a microscope for evidence of stretching, this generally being indicative of the highly ductile state of a hot filament distorting due to impact forces if the bulb had been lit. The result was inconclusive in that there appeared to be a marginal amount of stretching in comparison to a bulb that was known to be unlit at impact. However, the position in the system of the pressure sensing switch (which activates the bulb in the event of a vacuum loss) is such that it would be possible for the vacuum to be lost due to disruption to the engine and firewall at the initial impact, thereby activating the warning light during the subsequent ground slide before the electrical supply was removed as a result of the break up of the aircraft. Thus evidence of a hot filament would not be indicative of a loss of vacuum without additional corroborative evidence. The panel light bulbs were also examined, and many of these showed evidence of filament stretching, which confirmed the availability of electrical power immediately prior to impact.

The electrically driven turn co-ordinator was functioned on a test bench. It operated satisfactorily apart from indicating a very low rate turn to the right whilst in the "straight and level" position. It was considered that this was most likely due to a permanent set in the mechanism as a result of impact forces.

No defect was observed in the flying control operating system: it was noted that the flaps had been in the retracted position at impact.

APPENDIX TO PIPER PA28 G-MCPL **Ref: EW/C1182**