ACCIDENT

Aircraft Type and Registration:	North American P-51D-20 Mustang, G-BIXL
No & Type of Engines:	1 Packard Motor Car Co Merlin V1650-7 piston engine
Year of Manufacture:	1944
Date & Time (UTC):	13 July 2008 at 1600 hrs
Location:	Duxford Airfield, Cambridgeshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Left landing gear axle, leg and tyre
Commander's Licence:	Airline Transport Pilot's Licence
Commander's Age:	56 years
Commander's Flying Experience:	13,500 hours (of which 140 were on type) Last 90 days - 168 hours Last 28 days - 71 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot, video evidence and further enquiries by the AAIB

Synopsis

G-BIXL was on a final approach to land on a grass runway when the engine began to run roughly. The pilot advanced the throttle which led to a marked reduction in power. The aircraft touched down on the grass short of the runway but was forced back into the air when it crossed the lip of a raised taxiway. During the following touchdown and deceleration, the left main gear was damaged and the propeller hit the ground before the aircraft came to a halt. The cause of the rough running and power loss was not positively determined at the time of publication of this report.

History of the flight

G-BIXL was part of a large number of 'Warbird' type aircraft flying in close formation at an air show and, at the end of the display, the aircraft broke into the circuit. The pilot elected to use the parallel grass runway as the aircraft ahead was using the paved runway. G-BIXL rolled out on final approach at 120 mph, with landing gear down and landing flap (FLAPS 50) selected, and with all other indications normal[1]. At about 300 ft aal the engine started to run "slightly rough" and, as the aircraft started to sink, the pilot moved the throttle approximately ¾ inch forward.

Footnote

[1] The propeller was selected to maximum rpm and the throttle was approximately half open. The right fuel tank, which contained 30 gal, was in use, the booster pump was on with a fuel pressure of 18 psi and the coolant temperature and oil pressure were normal.

There was no increase in power but a puff of white smoke emerged from the left side of the engine and a puff of dark smoke from the right side. The pilot moved the throttle forward another ½ inch and there was a marked reduction in power.

The pilot raised the flaps two notches to FLAPS 30 and changed fuel tanks. Changing fuel tanks had no effect but the pilot assessed that G-BIXL would now reach the airfield although not the runway. With the aircraft pointing just beyond the airfield boundary, speed was reducing but it crossed the boundary at between 95 and 100 mph and touched down in a three-point attitude. The touchdown point was approximately 210 m before the start of the grass runway and a raised taxiway crossed the path between the aircraft and runway threshold. The aircraft hit the lip of the raised surface and was thrown back into the air with a high nose attitude. The pilot lowered the nose and G-BIXL touched down again almost in a three-point attitude but right main wheel first. The left main wheel then dug into the ground causing the axle mounting casting to bend outwards, the oleo to press down onto the tyre and the aircraft to yaw left. The main wheels left the ground again and the pilot applied full right rudder to counteract the yaw. He also applied right brake after the main wheels contacted the ground once more. The aircraft began to skid right while still yawing left and during the deceleration the tail wheel rose up and the propeller struck the ground. The pilot released the right brake and the tail lowered back to the ground. The aircraft came to a halt in the normal landing attitude pointing approximately 90º left of the runway and displaced about 70 m left of the centreline.

During the sequence of events, the pilot transmitted: "ENGINE ROUGH RUNNING", "ENGINE FAILURE", and "STOPPED ON GRASS". None of the transmissions were heard due, in the pilot's opinion, to an intermittent fault in the press to transmit (PTT) switch.

Engineering history

G-BIXL's engine had been rebuilt after a previous accident and the propeller had been overhauled and given two replacement blades. The engine was ground run for five hours following the overhaul and no problems were observed. The aircraft was cleared for flight and flew approximately 11 hours, during which there were no engine problems.

The day before the accident, the pilot flew two display sorties. The first sortie involved a four Mustang tail chase and the engine performed normally. The second sortie was a multi-aircraft formation flight and, prior to landing, the pilot positioned downwind using the same configuration and a similar power setting to the accident flight. At about one mile on final approach the engine began to "run slightly rough". The pilot left the power set and landed normally on the paved runway with the throttle at IDLE. At about 20 kt the pilot opened the throttle slightly and the engine stopped. Further investigation found the booster pump fuel pressure to be normal in each tank and sufficient fuel in the tank in use. The engine was turned by hand and "good compression" was noted with no irregular noises. No water was found in the main fuel filter but some was found in the fuel filler cap rims.

The following day, the day of the accident, an engine ground run was carried out during which there were no symptoms of rough running. A flight test was flown in the overhead of the airfield in various configurations and at various power settings, including in simulated approach conditions, and the engine performed normally. The decision was made to return the aircraft to the display programme and it flew a display tail chase with three other Mustangs during which the engine performed normally. The accident occurred during the following flight.

Analysis

The fault in G-BIXL's engine was intermittent but the symptoms were similar each time: slight rough running followed by significant loss of power when the throttle was advanced. The symptoms did not occur during either of the tail chasing flights but occurred on both of the close formation flights. It is possible that engine handling techniques used in formation flying caused the engine fault to manifest itself. However, the cause of the rough running and power loss was not positively determined at the time of publication of this report.