AAIB Bulletin No: 12/94 **Ref: EW/G94/08/03** **Category: 1.3**

Aircraft Type and Registration:	Piper PA-28R-201T Turbo Cherokee Arrow, G-OKEN
No & Type of Engines:	1 Continental TSIO-360-FB1 piston engine
Year of Manufacture:	1977
Date & Time (UTC):	6 August 1994 at 1330 hrs
Location:	Barton (Manchester) Airfield
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Extensive airframe damage, beyond economic repair
Commander's Licence:	Private Pilot's Licence with IMC Rating
Commander's Age:	48 years
Commander's Flying Experience:	2,102 hours (of which 710 were on type) Last 90 days - 9 hours Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot and engine strip reports provided by insurance assessors

The engine had been installed in March 1989 following a manufacturer's overhaul. At the time of the accident it had accumulated 359 operating hours. In the last three years the aircraft had been inactive during the winter without engine inhibition. Some time prior to the accident flight, when the engine was started following a six week period of inactivity, it suffered damage from sticking valves and three cylinders had to be replaced. When the engine was first started, following repair, on the morning of the day of the accident it ran normally to begin with but then stopped. Investigation revealed that there was a leak at the fuel filter bowl. This was corrected but during a pre-flight check an excessive 'mag drop' was detected. A chafed HT lead was found and after this was rectified a successful flight was carried out. After the flight the engine and fuel pipes were examined for leaks but none were found.

Later in the day the owner again prepared the aircraft for flight. Following engine start and taxi he switched fuel tanks as part of the normal procedure before carrying out his power checks and selected the electrical fuel pump to 'OFF' as required by the pre-takeoff checklist. During the take-off run, as he was about to rotate the aircraft to lift-off, he felt a slight jolt. Thinking that there was a problem

with the landing gear or brakes he checked the position of the brake lever but this appeared to be 'OFF'. Realising that the aircraft could not now stop before it collided with a hedge and, possibly, a building which were beyond the end of the runway he selected two stages of flap and rotated the aircraft in an attempt to lift-off. However the airspeed began to decay and the aircraft settled towards the ground so he retracted the landing gear hoping that the aircraft would slow down more quickly sliding on its belly. The right wing hit the ground first and slewed the aircraft so that it passed through the hedge sideways before coming to a halt. Both occupants exited the aircraft normally.

When an engineering investigation was started the main fuel line was opened and no fuel was found in it but when the fuel filter bowl was opened it was found to be full of clear clean fuel (Avgas 100LL). The fuel tanks had been drained during salvage but later flow checks found no sign of any blockage or leakage in the aircraft system. After several checks had been carried out on the engine and it had been prepared for test running with a new propeller it was found that, with the aircraft electrical pump switched on, there was a large fuel leak from the mixture control on the engine driven fuel pump. The leak emanated from the seal around the mixture input shaft and from the gasket around the cover which supported the shaft.

The engine was removed from the aircraft and taken to the facilities of a UK distributor for fuel flow checks and a full strip. The leak rate was measured in conjunction with the flow rate through the fuel nozzles and was found to be 4% of total fuel flow at the full throttle condition. It was not considered that this was high enough to cause a power loss. At high power conditions the mixture is set very rich to provide additional internal cooling. When the fuel pump was stripped it was found that the mixture shaft 'O-ring' had rolled partially out of its groove during assembly. No anomalies were noted for the cover other than that the gasket appeared 'dry'. The original manufacturer's seal was still in place on the wire locking of the screws securing the cover and there was no sign that the pump had been disturbed since initial assembly.

The magneto timing was checked, the magnetos were checked with their harnesses and the engine was fully stripped. Valve clearances were found to be satisfactory and, though some water (not emulsified) was found inside the rear cover and there were other signs of prolonged inactivity, nothing was found which could have produced a power loss. A representative of the distributor remarked that he had had previous experience of air entering the fuel system through leaks at the filter bowl and it had been necessary to prime the system to remove airlocks even when an electrical boost pump was in use.