No: 12/91 **Ref: EW/G91/10/07** **Category: 1c**

Aircraft Type and Registration:	Piper PA-24-260 Comanche, G-ATJL
No & Type of Engines:	1 Lycoming IO-540-D4A5 piston engine
Year of Manufacture:	1965
Date & Time (UTC):	11 October 1991 at 1430 hrs
Location:	Near Odiham, Hampshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 3
Injuries:	Crew - None Passengers - None
Nature of Damage:	Extensive internal damage to engine. Damage to left-hand wing and minor damage to engine cowling, landing gear doors, flaps and ailerons, caused by barbed wire fence
Commander's Licence:	Private Pilot's Licence with Instrument and Night ratings
Commander's Age:	37 years
Commander's Flying Experience:	1,672 hours (of which 1,211 were on type)
Information Source:	Aircraft Accident Report Form submitted by the pilot, interviews by AAIB and engine strip witnessed by AAIB.

The aircraft departed from Blackbushe bound for Guernsey, with an IFR flight plan filed: the pilot states that the engine start and run-up were smooth and that the initial climb out of Blackbushe was entirely normal. Shortly after the pilot levelled the aircraft at 3000 feet one of the passengers saw a "puff of smoke" in the cabin and all four occupants noted an oily smell. The pilot reports that at this point the engine was still developing its normal power and that the engine instrument indications were normal but he decided to return immediately to Blackbushe. As he levelled the wings after the turn the engine speed suddenly increased to about 200 rpm over the red-line speed. The pilot immediately reduced the power setting but about 30 seconds later the engine began to vibrate severely so he reduced engine power to idle. During this vibration the pilot saw the access panel on the engine cowling come open (this panel normally gives access to the oil dipstick) and the pilot was aware of a "thin mist of oil" from this area.

At this point it was obvious that, without power, the aircraft could not reach Blackbushe and the pilot selected a field for a forced landing. This forced landing was made into a field of recently-sown winter wheat but just after touchdown the aircraft ran into a barbed wire fence, which caused the damage to the airframe. After the aircraft came to rest all four occupants exited normally and there was no fire. When the engine cowling was opened there was found to be a four-inch hole in the top of the engine crankcase and considerable oil in the bottom of the cowling: it was also apparent that the No. 4 connecting rod had separated from the engine crankshaft and had been extensively heated and damaged. There were a number of internal pieces of engine around the engine compartment but the oil dipstick could not be found. When another dipstick was placed in its hole, however, it would not descend to the proper depth and damage to the screwthreads in the plastic dipstick fitting indicated that the original dipstick had been forced out during the engine failure. The oil sump was drained and the contents were measured: the quantity was two quarts.

After the engine was removed from the airframe it was taken to an overhaul agency for strip examination. A number of anomalies were noted during the examination, including that the oil pump drive had been subjected to heating and had seized in its bearing. The principal damage to the engine, however, was at the big end attachment of the connecting rods to the crankshaft. Of the six connecting rods, two (Nos. 4 and 6) had run dry and, under heavy heating, had failed catastrophically; in the case of No. 4 connecting rod, the big end had then fractured the crankcase. Three of the remaining big end bearings (Nos. 2, 3 and 5) had run totally dry and showed that extreme heating had taken place, even extruding the white metal shells partially out of the bearings. Only one of the bearings (No. 1) was found with normal lubrication. This No. 1 connecting rod journal is fed from the large front-end crankshaft journal bearing: the remaining connecting rod bearings are fed from the smaller crankshaft journals and, in the case of the connecting rods Nos. 2, 3, 4 and 5, two are fed from one intermediate crankcase journal.

The other bearings in the engine were examined but, with the exception of the oil pump drive, all were found to be correctly lubricated and the damage to the oil pump drive was entirely consistent with swarf damage from the disintegration of the big end bearings. All the damage indicated that the initial problem had been of a marginal supply of oil to the crankshaft main journals and this had then resulted in the failure of lubrication to the connecting rod big end bearings which are fed from these journals. Examination of the gear-type oil pump showed that it was intact and that while the engine crankshaft was still turning it would have continued to operate. This failure of oil supply would also have been consistent with the engine overspeed observed by the pilot as the propeller would tend to fine pitch as the constant-speed governor lost its oil supply. After the oil sump was removed from the engine it was filled with various quantities of oil and placed at various angles to the horizontal: a quantity of two

quarts of oil was ample to keep the oil pump inlet completely covered at a flat aircraft attitude but the inlet became uncovered when the sump was placed at increasing nose-up angles of pitch.

Examination of the engine maintenance records showed that the engine had been operated for just over 128 hours since major overhaul at the manufacturer. On the morning of the flight a small amount of work had been done by the aircraft's maintenance organization on the oil cooler and the log book entry stated "oil inlet seal seal weeping - renewed - tested". However, the engineer recalls that the engine ran satisfactorily and that the dipstick showed 11 quarts of oil in the engine (the maximum capacity is 12 quarts): the pilot confirms that the dipstick showed 11 quarts when he performed his pre-flight inspection. After the accident the oil cooler was pressure tested and not found to be leaking. Unfortunately the oil connections between the engine and the oil cooler were disturbed before they could be tested.