AAIB Bulletin No: 6/93 **Ref: EW/G93/03/09** **Category: 1c**

Aircraft Type and Registration:	Jodel D120A, G-ASXU	
No & Type of Engines:	1 Continental C90-14F piston engine	
Year of Manufacture:	1961	
Date & Time (UTC):	13 March 1993 at 1239 hrs	
Location:	Fenland Airfield, Lincolnshire	
Type of Flight:	Private	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Landing gear collapsed, damage to propeller, lower cowling and wing underside	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	69 years	
Commander's Flying Experience:	894 hours (of which 49 were on type) Last 90 days - 5 hours Last 28 days - 1 hour	
Information Source:	Aircraft Accident Report Form submitted by the pilot, additional AAIB enquiries and examination of the magnetos	

After changing the throttle linkage on the aircraft and having it checked by a PFA Inspector, the pilot started the engine and ran it up to normal operating temperature, checking the magnetos and throttle movement, with no problems apparent. The following day, the pilot and second occupant boarded the aircraft and the engine was again warmed-up for approximately 15 minutes before taxiing checks were carried out. These were satisfactory and the aircraft took off and departed the Fenland circuit, climbing to 1,500 feet. However, during the climb, the engine did not produce normal power and the pilot decided to return to the airfield. The engine was still developing some power on the downwind leg, and the pilot notified the tower of his need for a priority landing. On final approach the airbrakes were selected to reduce speed to 50-60 mph. However, on retraction of the airbrakes, the engine stopped completely and the aircraft rapidly lost height. As it became apparent that the runway could not be reached, the pilot turned the aircraft left through 90° in order to avoid a dyke and a road that bordered the runway threshold. The aircraft landed heavily, collapsing the landing gear and coming to rest in a short distance. Both occupants, who were uninjured, evacuated the aircraft.

The maintenance organisation responsible for the repair of the aircraft suspected a double magneto failure and therefore removed them from the engine for bench testing. This indicated that one unit was totally 'dead' and the other was firing on one lead only. Without further disturbing the magnetos, they were taken to an overhaul agency where they were subjected to a strip examination under AAIB supervision. The findings are summarised below:

The magnetos were Bendix type S4L N-21s. Both were equipped with impulse couplings. The data plates bore 1962 date stamps, and the only maintenance action on them recorded in the aircraft documentation concerned compliance with an Airworthiness Directive (No 74-26-09) in 1976.

When run on a test bench, one unit failed to produce any ignition sparks, at any RPM. Examination of the contact breaker assembly revealed that the points had worn such that the gap was in excess of 0.035 inches, as opposed to the required 0.016 inches. In addition, the mating surfaces of the points appeared to be oxidised and this, in combination with only light contact between them when closed, resulted in a lack of electrical continuity. Replacement with a set of old, but serviceable, points effected a significant improvement when the unit was re-tested, although there was a misfire at sub-idle speeds of 400 RPM and below. The magneto rotor was then re-magnetised and the magneto tested again. This produced a stronger impulse spark, although there remained a tendency to misfire at sub-idle RPM after the impulse coupling had disengaged. Examination of the coil showed it to be dirty in appearance, with two small cracks in the casing and with some evidence of laquer/resin having exuded from the interior. The resistances of the primary and secondary coils were checked and appeared to be satisfactory, although the specification values were not available for comparison. Any magneto of this type sent to the company for overhaul would, as a matter of course, be fitted with a different type of coil.

The second magneto, when tested, produced ignition sparks when the impulse coupling was engaged, but no sparks when the RPM was increased to the point where the impulse drive cut out. Further speed increases to around 300-400 RPM (still sub-idle) resulted in an intermittent spark, with reliable sparks occurring at approximately 430 RPM and above. Examination of the contact breakers revealed a points gap of only 0.004 inches, although the internal timing was still correct. Changing the points for a seviceable set made matters slightly worse on this occasion. However, re-magnetising the rotor did result in sparks on 2-3 leads after impulse disengagement, with smooth running occurring at 400-450 RPM and above. The coil was dirty in appearance, although there were no cracks or leakages. The primary and secondary coil resistances were measured and found to be nominally the same as those on the other magneto.

The above tests therefore confirmed that one magneto was 'dead', with the contact breakers being primarily responsible. However the other magneto, although exhibiting the same symptoms of age and lack of maintenance, appeared to be capable of delivering ignition sparks at normal engine rpm and

thus the engine failure was not explained. There remains a possibility that there was also a problem elsewhere in the ignition system. The possibility of carburettor icing was considered, although an aftercast for the day of the accident indicated a dry southeasterly airflow over the area, with 33% relative humidity, and in consequence a possibility of only light icing. An additional consideration was the possibility of a temporary coil failure. The aircraft repair agency stated that a number of instances of double magneto failure had been experienced where old coils had 'broken down' at high operating temperatures, only to recover after cooling down. Clearly, further exploration of this phenomenon would require endurance testing of the magnetos at high ambient (ie engine compartment) temperatures.

The aircraft had had its Permit to Fly renewed in October 1992 and had only flown only a few hours since. The PFA issues notes to which the PFA Inspectors can refer when conducting Permit Renewals. These notes contain a number of requirements, including one calling for compliance with CAA Airworthiness Directives. The inspection procedures, which are based on the Light Aircraft Maintenance Schedule (LAMS), are very general in nature and contain no specific instructions, for example, to remove and internally inspect the magnetos. In general, the work actually carried out is at the discretion of the Inspector concerned. On aircraft issued with Certificates of Airworthiness, the magnetos should be removed and inspected every 500 flying hours; however this could represent 10-20 year operation at the typically low utilisation rates achieved by PFA aircraft.

Following this accident, the PFA intend to revise the Notes to Inspectors, amplifying the requirements for the inspection of ignition systems.