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| Aircraft Type and Registration: | Beagle B121 Series 1 Pup, G-AXNL | |
| No & Type of Engines: | 1 Continental Motors O-200-A piston engine | |
| Year of Manufacture: | 1969 | |
| Date & Time (UTC): | 2 February 2005 at 1047 hrs | |
| Location: | Near Holly Hill Farm, Enfield, London | |
| Type of Flight: | Private | |
| Persons on Board: | Crew - 1 | Passengers - None |
| Injuries: | Crew - 1 | Passengers - N/A |
| Nature of Damage: | Damage to top of fuselage, fin and nose | |
| Commander's Licence: | Private Pilot's Licence | |
| Commander's Age: | 62 years | |
| Commander's Flying Experience: | 219 hours (of which 58 were on type) Last 90 days - 5 hours Last 28 days - 2 hours | |
| Information Source: | Aircraft Accident Report Form submitted by the pilot | |

Synopsis

The aircraft suffered a reduction in power whilst over a densely populated area of North London. The selection of carburettor heat, the electric fuel pump and an alternate fuel tank did not resolve the situation. Realising that the aircraft's continued adequate performance was unpredictable the pilot elected to carry out a precautionary landing in one of the few available fields. After a successful touchdown however, the aircraft pitched inverted as the nose wheel dug into soft ground. No reason could be found, after examination of the aircraft and its systems, for the reduction in performance. The weather conditions however, were conducive to moderate to severe carburettor icing at any power setting and it is possible that the pilot did not apply carburettor heat for the length of time required to clear any intake restriction.

History of the flight

The aircraft was being flown from White Waltham to North Weald on a route that passed over Wycombe Air Park and Elstree Aerodrome; close to substantial urban development. A short

distance beyond Potters Bar, approximately 5 nm east-northeast of Elstree, the pilot noticed a drop in engine power and fluctuation of the fuel pressure gauge. He was unable to restore normal operation despite applying carburettor heat, selecting the opposite fuel tank and operating the electric fuel pump. Although the engine did not misfire or produce any unusual vibration, the extent of the power loss was such that the pilot considered he would not be able to reach Elstree, with whom he was in radio contact. Finding himself over an area of open farmland, he transmitted a MAYDAY message, selected a landing site and carried out a precautionary landing in a field approximately 3 nm south-east of Potters Bar.

The engine continued to produce some power throughout the approach, and the pilot switched off the fuel and electrics just before touchdown. The landing, on upward sloping ground, appeared normal at first but, during the ground roll, the nose wheel dug in to the soft ground and the aircraft somersaulted, coming to rest upside down. The aircraft suffered substantial damage to the fuselage, vertical stabiliser and nose, and fuel was leaking from both wings. However, there was no fire and the pilot was able to escape without serious injury. He was assisted by a number of people walking nearby, who also alerted the emergency services.

Engineering investigation

The aircraft was taken by road to a maintenance facility at Sywell Aerodrome, where an inspection was carried out on behalf of the AAIB. No mechanical defects were found in the fuel, ignition or induction systems that would have caused the engine to lose power in the manner described. The carburettor bowl was full of uncontaminated fuel and both wing tanks contained fuel. It was not possible to rule out particle blockage of the carburettor metering passages or otherwise to test the free flow of an adequate fuel/air mixture into the combustion chambers.

Aircraft fuel system

The Beagle Pup is a single engine, low wing monoplane with up to four seats. The Series 1 aircraft has two fuel tanks, one in each wing, with a total capacity of 24 imperial gallons. Fuel is supplied to the carburettor via a selector marked OFF, LEFT, RIGHT and BOTH. Operators have discovered that if both tanks are selected, and one tank is allowed to run completely dry, air will be drawn into the system. If a sufficient head of fuel remains in the opposite tank, the engine may run intermittently, but will eventually stop even before that fuel is exhausted, unless that tank alone is selected. A bulletin on this subject will be issued shortly by De Havilland Support Limited.

Fuel records obtained from White Waltham indicate that a satisfactory fuel sample was taken from the fuel pump at the start of the day and that G-AXNL was the first aircraft to refuel, uplifting 40 litres of Avgas prior to departure. The aircraft was airborne for approximately 35 minutes. Using

data provided in the aircraft flight manual, total fuel consumption during the flight should not have been more than 23 litres. If both fuel tanks were nearly empty prior to refuelling, and the entire flight had been conducted with the same tank selected, it is possible that all of the fuel in that tank could have been consumed. Even so, the pilot would then have had to select BOTH tanks in order for the condition described in the preceding paragraph to have been a factor. However, selection of the opposite fuel tank and operation of the electric fuel pump would have been sufficient to restore an adequate fuel supply for normal operation almost immediately. Furthermore, the presence of fuel in the carburettor and both wings suggests that adequate fuel was available at the end of the flight.

Meteorology

An aftercast for Elstree at the time of the accident, provided by the Met Office, estimated the temperature and dew point to be 6°C and -1°C respectively. The pilot reported that there was no significant weather and very little cloud. There would have been a risk of moderate to severe carburettor icing at any power setting in these conditions.

The CAA General Aviation Safety Sense Leaflet 14A "*Piston Engine Icing*", suggests that full carburettor heat must be applied for at least 15 seconds in order to remove carburettor ice completely and notes that this 'may feel like a very long time'. Many pilots, familiar with short applications of carburettor heat when downwind in the circuit and prior to landing, apply it for no more than five seconds at a time. Moreover, a significant power reduction following ice accumulation results in lower exhaust gas temperature, reducing further the effectiveness of conventional hot air carburettor heat.

Conclusion

No pre-existing mechanical defects could be found which would have caused the engine to lose power in the manner described. It is possible that the pilot did not apply sufficient carburettor heat to prevent continuous ice accumulation. In the circumstances, his decision to carry out a precautionary landing, rather than to divert to Elstree with the possibility of a total power loss over a built up area, was admirable.