

**ACCIDENT**

<b>Aircraft Type and Registration:</b>	Beagle B121 Series 1, N556MA	
<b>No &amp; Type of Engines:</b>	1 Rolls-Royce 0-200-A piston engine	
<b>Category:</b>	1.3	
<b>Year of Manufacture:</b>	1968	
<b>Date &amp; Time (UTC):</b>	13 July 2005 at 1550 hrs	
<b>Location:</b>	Near Thurrock Airfield, Essex	
<b>Type of Flight:</b>	Private	
<b>Persons on Board:</b>	Crew - 1	Passengers - 1
<b>Injuries:</b>	Crew - 1 (Minor)	Passengers - None
<b>Nature of Damage:</b>	Extensive	
<b>Commander's Licence:</b>	FAA Commercial Pilot Licence with Flying Instructor Rating	
<b>Commander's Age:</b>	48 years	
<b>Commander's Flying Experience:</b>	6,500 hours (of which 10 were on type) Last 90 days - 40 hours Last 28 days - 23 hours	
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB	

**History of the flight**

The aircraft was being flown from Thurrock Airfield back to Norwich Airport, having originally been flown from Norwich Airport by the same pilot. The pilot and his passenger had flown in separate aircraft and delivered one to Thurrock for an annual inspection.

During a conversation with the owner of the resident maintenance organisation, the pilot mentioned that the aircraft was an early Beagle Pup version fitted with a 100 HP engine. The owner of the resident maintenance organisation, himself a private pilot, expressed his concern that the aircraft might be limited in performance

due to the fact that the weather was hot, there was little wind and there are electricity pylons situated on rising ground on the take-off path; he therefore suggested using the 100 m paved extension at the start of Runway 07. This advice was subsequently seen to be heeded.

The pilot reported that the aircraft was started, with approximately 11 imperial gallons of fuel remaining, and taxied out for takeoff. Runway 07 was in use and its 650 m grass surface was dry. Having completed the pre-takeoff checks and selected 10° of flap he commenced the take-off roll. He stated the aircraft

became airborne after a ground run of approximately 300 m and climbed away at 60 kt. At approximately 250 ft the flaps were retracted. On passing 300 ft the engine began to lose power; there were no signs of rough running or noises from the engine prior to this. The pilot verified that the fuel pump was selected ON, both tanks were selected and he checked for carburettor icing by selecting Carburettor Heat to ON momentarily. With the engine running at a reduced power the pilot turned away from the approaching power lines and commenced a turn downwind for Runway 07. After a turning through about 90° the engine stopped. The pilot then completed a flapless forced landing into a field of standing crops below because he had no time to extend the electric flaps.

The aircraft came to rest after a ground run of approximately 25 m. When the aircraft stopped the pilot and his passenger exited the aircraft without assistance and telephoned the emergency services. The pilot suffered a minor back injury and the passenger was uninjured. The crash site was attended 15 minutes later by the police and local fire service.

### Weather

The Meteorological Office provided an aftercast for the area at the time of the accident. It indicated that a ridge of high pressure covered the British Isles with a light air flow over south east England. The surface wind was expected to be 120° at 5 to 10 kt, with a temperature of +24°C, a dew point of +14°C and a relative humidity of 54%. The visibility was expected to be greater than 10 km with little, if any, cloud below 10,000 ft.

The pilot reported that the surface wind was light and variable with a temperature of +22°C and the weather was CAVOK.

### Aircraft examination

The aircraft was inspected by the maintenance organisation from Thurrock Airfield the following morning, before the aircraft was moved. The aircraft was found to be in a severely damaged condition. One blade of the propeller was bent, the undercarriage had collapsed and various engine ancillaries were detached from the bottom of the engine. The engine had a sufficient level of oil, there were no signs of any leaks and the ignition system appeared intact. Before the aircraft was removed approximately 12 imperial gallons were drained from the aircraft's fuel tanks.

The engine was subsequently tested by an independent test facility where it was found to function satisfactorily with a slave oil sump and carburettor.

### Weight and balance

The aircraft last had a weight and balance measurement in September 2002. Utilising these figures a summary of the weights of the aircraft at the time of the accident is shown in Table 1.

Empty weight	1207
Maximum take-off weight	1600
Useful load	393
Fuel on board (11 Imp Gallons)	79 <sup>1</sup>
Weight of pilot and passenger	400
Weight at takeoff	1686

<sup>1</sup> Imperial gallons to lbs conversion is 10.0223 X 0.72 (Specific gravity) X Quantity

**Table 1**

Weight figures for N556MA in lbs

The aircraft therefore exceeded its maximum permitted take-off weight by approximately 86 lbs. However, if the 12 gallons of fuel that were drained from the aircraft are allowed for then it would have been approximately 94 lbs above the maximum permitted take-off weight.

An extract from the CAA's Safety Sense Leaflet 9, *Weight and Balance*, found in LASORS is shown below:

THE LAW AND INSURANCE

a) Article 43(d) of Air Navigation (No. 2) Order 2000 states that 'the Commander of an aircraft registered in the United Kingdom shall satisfy himself before the aircraft takes off that the load carried by the aircraft is of such weight, and is so distributed and secured, that it may safely be carried on the intended flight'.

b) In addition ANO Article 8 requires that all aircraft have a valid Certificate of Airworthiness (C of A) or Permit to Fly. These documents, either directly, or by reference to a Flight Manual/Pilots Operating Handbook which forms part of a C of A, specify the weight and centre of gravity limits within which the aircraft must be operated. If these limitations are not observed, the pilot is failing to comply with a legal condition for the operation of his aircraft.

### Aircraft performance

An eye witness, who was near the threshold of Runway 07, saw the aircraft become airborne having used approximately 75% of the available runway. This equates to a take-off run of about 560 m, including the 100 m of the paved extension that was used.

The take-off distance required, obtained from the aircraft's operating manual at maximum take-off weight

of 1,600 lb and with 10° flap selected, factored for dry grass, is 648 m. The take-off run required should not exceed 60% of the take-off distance; this equates to 389 m.

To ensure a higher level of safety it is strongly recommended by the CAA that a safety factor of 33% is added to figures obtained from operating manuals. This increases the take-off distance required, at maximum take-off weight, to 862 m, with an associated take-off run of 517 m.

Safety Sense Leaflet 7, *Aeroplane Performance*, states that:

*To ensure a high level of safety on UK Public Transport flights, there is a legal requirement to apply specified safety factors to unfactored data (the result is called Net Performance Data). It is **strongly recommended** that those same factors be used for private flights in order to take account of:*

- Your lack of practice
- Incorrect speeds/techniques
- Aeroplane and engine wear and tear
- Less than favourable conditions

### Carburettor icing

The aftercast temperature and dew point, for the time of the accident, were plotted on the Carb Icing Chart in Safety Sense 14, found in LASORS and AIC 145/1997. They fall, at best, in the *Serious icing - descent power* area, and at worst, in the *Moderate icing - cruise power/ Serious icing - descent power* area.

Though carburettor icing might have existed, the ambient conditions and the flight profile were not conducive to its formation.

**Conclusion**

The aircraft exceeded its maximum take-off weight and should not have attempted to get airborne without reducing its weight to 1,600 lbs or less. Since the actual take-off weight exceeded the maximum permissible

take-off weight the take-off distance required will have been in excess of the figures presented above. It can thus be seen that the take-off performance was marginal in the prevailing conditions. No explanation for the reported engine failure could be determined.