

AAIB Bulletin No: 11/95 **Ref:** EW/G95/06/22 **Category:** 1.3

Aircraft Type and Registration: Denney Kitfox Mk 2, G-KAWA

No & Type of Engines: 1 Rotax 582 piston engine

Year of Manufacture: 1994

Date & Time (UTC): 30 June 1995 at 0920 hrs

Location: Wavendon, Buckinghamshire

Type of Flight: Private

Persons on Board: Crew - 1 Passengers - 1

Injuries: Crew - None Passengers - Minor

Nature of Damage: Extensive to landing gear, propeller, cowlings, fuselage and wing struts

Commander's Licence: Private Pilot's Licence with IMC and Night Ratings

Commander's Age: 42 years

Commander's Flying Experience: 242 hours (of which 47 were on type)
Last 90 days - 20 hours
Last 28 days - 6 hours

Information Source: Aircraft Accident Report Form submitted by the pilot and AAIB telephone enquiries

Flight History

The aircraft was refuelled to full tanks with unleaded Mogas at Enstone Airfield, Oxfordshire, and took off for a flight to a Popular Flying Association (PFA) Rally at Cranfield Aerodrome, Bedfordshire. In preparation for an upcoming Permit to Fly renewal the pilot conducted a timed climb during the flight to provide rate of climb performance data. This included a period of flying with a steep nose up attitude before proceeding towards Cranfield. The weather at Cranfield included good visibility, no cloud, a wind of approximately 5 kt from the east and a surface ambient temperature of 33°C. The circuit was very busy with a large number of arriving aircraft.

After the aircraft had descended to 800 feet aal and when about 2 nm from touchdown on the grass Runway 04 the engine suddenly lost power, with one cylinder cutting out followed very shortly by the other. The pilot made a Mayday call and prepared for a forced landing to the left of his track to avoid interference with traffic on finals for the hard Runway 04. He was unable to use a golf course because of the presence of people and bunkers and was forced to land in a field of standing wheat, on a northerly track. After flaring to as slow an airspeed as possible the aircraft descended into the crop

and nosed over onto its back. The pilot and the passenger were using four-point harnesses and evacuated the aircraft without severe injury. There was no fire. The emergency services were rapidly at the scene in response to the Mayday call and a sighting report by another aircraft.

Aircraft

The Kitfox is a single-engined, two-seat, high wing monoplane supplied in kit form. There are approximately 50 operational aircraft of the type in the UK. The Avid Flyer is similar to the Kitfox in many respects.

Fuel System

The pilot believes that the power loss resulted from engine fuel starvation as a result of a vapour and/or air lock in the fuel system. Fuel is carried in a 6 USG (United States Gallon) tank in each wing. Each wing tank gravity feeds by a separate pipeline to a header tank located on the aircraft centreline just behind the engine firewall, from where it passes to a shut-off valve, a gascolator, a filter and an engine driven pump. The feed pipe from each wing tank comprises a 0.25 inch internal diameter (ID) aluminium pipe that initially runs almost horizontally across the aircraft to a shut-off valve and then down behind and beneath the seat on the opposite side before passing up and forward to the header tank. The aircraft can be flown with either one or both wing tanks selected on. It is intended that the header tank, of 1 USG capacity, would normally remain full; in the event of loss of feed from the wing tanks the header tank contents would provide around 20 minutes running at typical usage rates.

Information from the Kitfox Club of Great Britain noted that on earlier standard aircraft the header tank could be vented only on the ground, via an overboard pipe with a manually operated tap. Operation of the vent to eliminate air/vapour was required to be done as a pre-flight item but problems were experienced with vapour and/or air building up in the header tank during flight, believed to be as the result of situations where the selected wing tank outlet(s) became uncovered by fuel. The difficulties and the associated possibility of engine failure were noted in PFA Letters to UK Kitfox Owners in 1992 and 1993. These recommended the fitment of either a fuel low warning system for the header tank; a header tank manual vent system operable from the cockpit with the overboard drain visible from the cockpit; or an open header tank vent pipe terminating either above or within the wing tanks. The manufacturer produced a modification adding a 0.25 inch ID vent pipe connecting the top of the header tank to the vent space in the left wing tank. This measure has apparently not been successful in ensuring that the header tank remains full of fuel at all times but the vent pipe is transparent and located at the side of the windscreen and thereby can provide a visual indication to the pilot. If the fuel level in the vent pipe is seen to fall, the problem is readily resolved by sideslipping the aircraft; it is believed that the flow of fuel between the two wing tanks thus induced has the effect of driving out air/vapour locks in the supply pipes that are causing the problem.

A number of UK Kitfox owners have introduced some or all of these measures. It appears that most have incorporated a vent from the header tank to a wing tank. Some aircraft have a solid state fluid sensor fitted in the top of the header tank which operates a flashing indicator light on the instrument panel if the tank begins to empty. A facility for pre-flight checking of the system is incorporated. Some aircraft also have an additional manually operated vent to the fuselage undersurface teed from the vent line between the header tank and the wing tank. This can be operated in flight and has been found to be capable of eliminating a feed system blockage; an indicator light is provided that illuminates to warn that the valve is open. Modifications have also been made to provide larger bore wing tank feed lines and header tank vent line ($\frac{5}{16}$ inch instead of $\frac{1}{4}$ inch) and to re-route the lines.

G-KAWA was fitted with a $\frac{5}{16}$ inch header tank vent to the fuel tank and with the fluid sensor system but the latter was unserviceable at the time of the accident. The pilot reported that he normally keeps a frequent check on the fuel level in the vent pipe but was distracted on the accident flight by the high volume of traffic in the Cranfield area. He noted the higher vapour pressure associated with Mogas compared to Avgas and the unusually high ambient temperature at the time of the accident. He estimated the time between his climb performance check and the power loss as around 20 minutes.

Other Kitfox owners have reportedly eliminated air and/or vapour lock problems in the fuel system by fitting larger bore re-routed wing tank feed lines, a permanent header tank vent and a header tank low level indicator system. However, SkyStar Aircraft Corporation Service Bulletin 29 for Kitfox aircraft, dated 15 December 1992 and headed Mandatory, recommended the replacement in all cases of the forward mounted header tank by a rear mounted header tank located to eliminate any high points in the system. It also recommended the removal of both individual fuel tank valves, noting that this helps prevent air entrapment in the fuel lines.

It was reported that the Avid Flyer has a similar fuel system and has suffered from similar problems.

Safety Recommendation 95-36

It is recommended that the CAA in conjunction with the PFA collect and collate for UK registered Kitfox aircraft an assessment of the fuel system and consider the need for:

1. The fitment of a system to provide clear warning of a low fuel level in the header tank.
2. Mandatory modification aimed at ensuring automatic fuel feed in all circumstances.
3. Action for other aircraft types that may suffer from similar effects.