

AAIB Bulletin No: 8/94

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Category: 1.3

Aircraft Type and Registration: Viking Spitfire Prototype Replica, G-BRDV

No & Type of Engines: 1 Jaguar V-12 automotive piston engine

Year of Manufacture: 1985

Date & Time (UTC): 9 June 1994 at 1125 hrs

Location: Wroughton Airfield, Wiltshire

Type of Flight: Ferry flight

Persons on Board: Crew - 1 Passengers - None

Injuries: Crew - None Passengers - N/A

Nature of Damage: Damage to propeller, right wingtip and right main landing gear actuator mounting structure

Commander's Licence: Basic Commercial Pilot's Licence with IMC and Flying Instructor Ratings

Commander's Age: 66 years

Commander's Flying Experience: 11,294 hours (of which 4 were on type)
Last 90 days - 53 hours
Last 28 days - 23 hours

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

The aircraft was being ferried from Hullavington to Wroughton to take part in a static display. Landing gear retraction following takeoff did not result in any abnormal cockpit indications, however, the pilot was informed by radio from an accompanying aircraft that the landing gear was still in the extended position. Cycling of the landing gear selector failed to retract the gear. The pilot elected to continue to Wroughton and was granted a priority landing. A 'down' selection reportedly resulted in the normal 'down and locked' green light, and the gear position was confirmed by the escorting aircraft. However, a few seconds after touchdown, the right leg started to collapse and the right wingtip then contacted the runway. The aircraft veered off the right side of the runway and came to a halt after gently tipping forwards onto its nose.

The main landing gear legs on this aircraft retract in the outboard direction and the uplock/downlock function is achieved by means of pins, on hydraulically operated lock actuators, engaging in holes in lugs mounted approximately 90° apart, near the tops of the legs. It was apparent that the unlock

actuator pin had not been engaged in its hole in the right leg, but had been bearing against the side of the downlock lug, leaving a witness mark. In this position, the leg would have been close to its fully down position, but clearly not in downlock. It was evident that the leg had been in this position during the landing, with the result that lateral loads on the leg would have been transmitted to the extension/retraction actuator. The latter was mounted to the airframe via a wooden block which had started to fail under the load. Nevertheless it had prevented a complete collapse of the leg, which therefore resulted in minimal damage to the right wingtip.

The hydraulic system that operated the landing gear was designed specifically for this aircraft, using components found in many general aviation aircraft. Hydraulic power was provided by an electrically driven pump, which operated whenever an 'up' or 'down' selection was made. Pressure is ported to the lock actuators, thereby retracting the pins which are spring-loaded to the extended, ie locked, position. This in turn operates a plunger valve which allows pressure to open a pilot control valve, thereby porting fluid to the 'up' or 'down' side of the gear actuators, as appropriate. The sequence is completed by moving the selector to 'neutral', which shuts down the pump, thereby allowing the lock actuator pins to spring into engagement with the holes in the lugs.

In the event of a hydraulic failure, an emergency gear lowering system is provided by means of a pressurised argon gas bottle. Operation of a shut-off valve and a diverter valve cause gas to perform the same functions as the hydraulic fluid. The gas and hydraulic lines are joined by a pair of shuttle valves, one each for the pairs of lock and gear actuators.

Subsequent tests on the aircraft revealed that the shuttle within the shuttle valve upstream of the gear actuators was in the wrong position. This had resulted in it blocking off the return port from the gear actuators, thereby causing a hydraulic lock during the retraction sequence. The shuttle normally never moves unless it is pushed into the as-found position by the action of opening the gas bottle shut-off valve. In this case it was found that a leak within the latter had resulted in a pressure build-up in the line to the shuttle valve to the extent that it caused the shuttle to move over. This dormant fault was compounded by the fact that the pressure gauge on the gas bottle was defective. The needle barely moved, even when the bottle was subsequently discharged during the course of the investigation.

The owner intends to modify the aircraft so that the gas bottle shut-off valve will incorporate a bleed to atmosphere, thereby eliminating the possibility of an undetected pressure build-up in the line to the shuttle valve. In addition, the gas bottle pressure gauge, which is of a commercial standard, will be replaced with one of aviation quality.