Europa, G-BWUP

AAIB Bulletin No: 11/2002	Ref: EW/G2002/05/17	Category: 1.3
Aircraft Type and Registration:	Europa, G-BWUP	
No & Type of Engines:	1 NSI Propulsion Systems EA-81/100 piston engine	
Year of Manufacture:	1998	
Date & Time (UTC):	31 May 2002 at 1045 hrs	
Location:	Shenington airfield, near Banbury	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Minor damage to rear fuselage and rudder	
Commander's Licence:	Airline Transport Pilot's Licence	
Commander's Age:	52 years	
Commander's Flying Experience:	16,258 hours (of which 115 were on type)	
	Last 90 days - 215 hours	
	Last 28 days - 80 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	
	and additional enquiries by the AAIB	

Circumstances

Whilst the aircraft was being turned to line up for take-off the tail wheel collapsed. The aircraft was brought to a halt and the engine shut down. A subsequent inspection revealed that the tail wheel spring rod attachment bolt had pulled through its hard point in the base of the rear fuselage, allowing the tail wheel assembly to rotate through 90°.

Description of tail wheel installation

The main landing gear on most aircraft of this type consists of a 'mono-wheel' mounted centrally under the cockpit, with lateral stability provided by two 'out-rigger' wheels. Some aircraft, including G-BWUP, have been modified to a conventional two wheeled main landing gear configuration, thus removing the requirement for the 'out-rigger' wheels.

These aircraft were originally designed with the tail wheel mounted on the underside of the rear fuselage beneath the fin. The relatively short distance between the main landing gear and the tail wheel resulted in potential directional control problems.

A manufacturer's modification, No 43 issued in 1997, provided a new tail wheel configuration, positioning the tail wheel further aft and thus increasing the longitudinal stability on the ground. The wheel was attached via a spring rod to a hard point built into the underside of the rear fuselage. Figure 1 shows the details of the installation. It can be seen that the hard point is built up from pieces of plywood interspersed with layers of bi-directional glass-fibre cloth, with a steel plate bonded to the top of the stack. The spring rod is then bolted through the stack and is additionally bonded to the fin structure where it passes through a 23 mm hole.

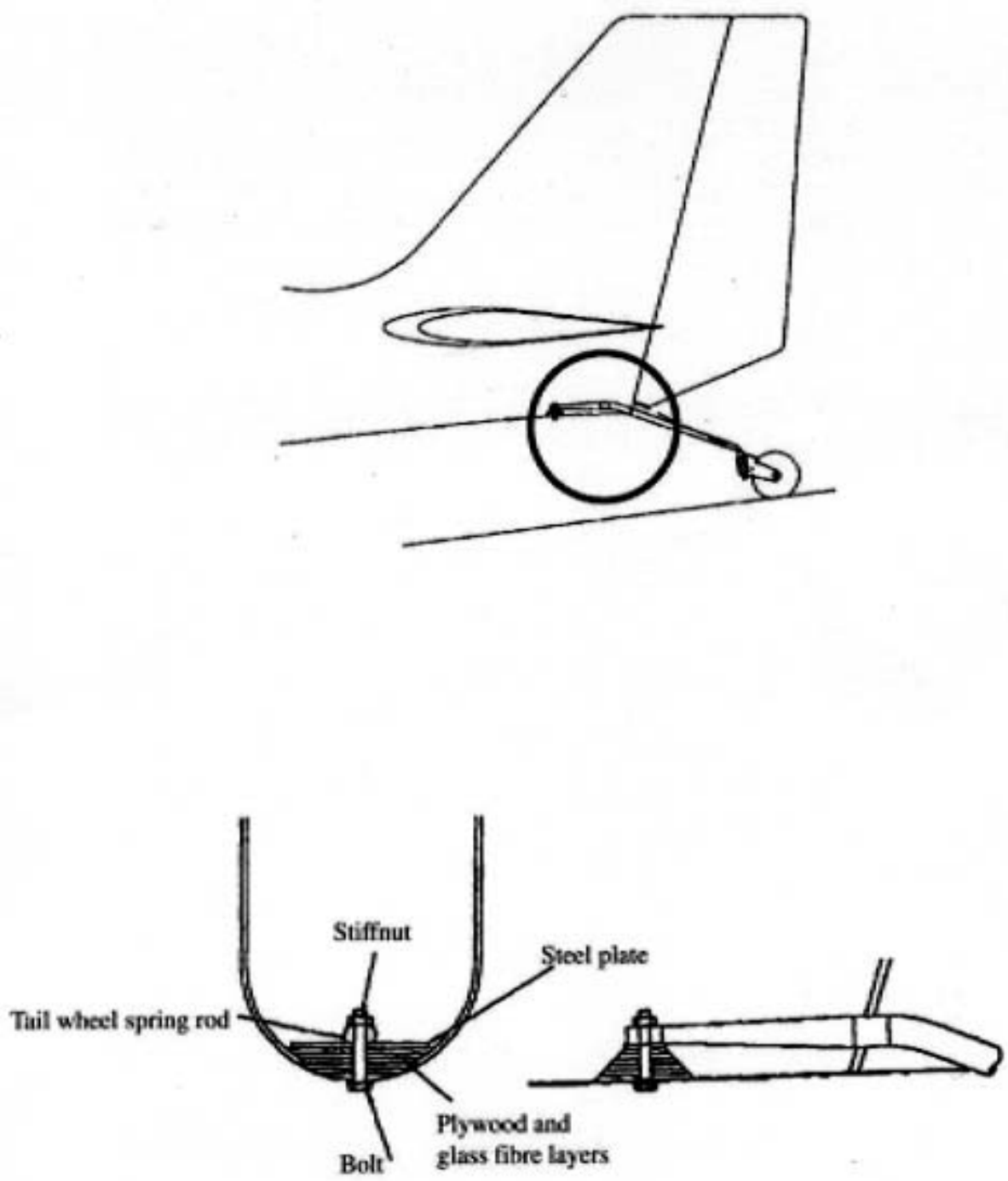

FIGURE 1. Details of Europa G-BWUP tail wheel installation

It was apparent that the collapse occurred in this case when the spring rod, under the influence of lateral force, rotated about the aircraft's longitudinal axis, bending the bolt and crushing the plywood/glass-fibre cloth, with the result that the wheel's plane of rotation was close to the horizontal.

Relevant aircraft history

The airworthiness aspects of this aircraft are the responsibility of the Popular Flying Association (PFA). They had no record of any incident occurring to G-BWUP that might have weakened the tail wheel installation. For their part, the aircraft kit manufacturer stated that they were unaware of any weaknesses with the tail wheel installation and have for many years operated demonstration aircraft around the world without any apparent problems in this area. However, the manufacturers were aware that ground-loop incidents could result in bending of the spring rod attachment bolt.

The PFA noted that a number of owners had chosen to modify their aircraft by replacing the steel plate with two light alloy plates bonded either side of a block of Paxolin, which provides additional lateral support for the bolt. This is now a PFA approved modification and has been accomplished on six or seven 'mono-wheel' aircraft.

Reinforcement to support the bolt above the spring rod was considered by the manufacturer but was rejected on the grounds that loads sufficient to bend the bolt, such as may be imposed during a ground loop, could result in damage to the fuselage that is difficult to detect. A bent bolt would result in the tail wheel assembly not remaining upright and so would readily indicate that a lateral overload had occurred.

The PFA Inspector who carried out the work to modify G-BWUP to its current standard of main landing gear configuration stated that he was additionally asked about the tail wheel attachment modification, although in the event this was never accomplished.

Discussion

Despite the fact that a number of owners have modified the tail wheel attachments of their aircraft, the manufacturer gave a credible reason for not adopting this method of installation. Whilst the circumstances that have resulted in some aircraft being modified are not known, it is possible that aircraft operated from airfields with rough taxiways and/or runways are at greater risk of damage. In the case of aircraft modified to a conventional two wheel main landing gear configuration, it is considered that the availability of differential braking may make them more susceptible to damage in rapid turns, for example if the wheel should encounter a rut or contact an obstruction at the edge of a taxiway.