Australian Ultralight Federation Inc
ARBN 070 931 645
U35/59 Wollongong St
PO Box 1265, Fyshwick ACT 2609
Ph: 02 6280 4700 Fax: 02 6280 4775
Email: tech@auf.asn.au

10 June 2002

GSC Propeller Maintenance Alert
Blade Shedding.

Operators of wooden bladed GSC propellers are warned that there has been another failure and that traditional inspection did not reveal a condition conducive to failure. Operators are warned to treat these propellers with respect and give consideration to their replacement. Because of the history becoming evident with wooden bladed GSC propellers, any further reports might be used as justification for imposing throwaway lifing or withdrawing wooden bladed GSC propellers from service entirely.

Background. The June, July, September, November issues of this magazine carried advice of a wooden bladed GSC propeller shedding blades and carried a maintenance alert requiring owners to verify propeller integrity. The issue is also covered on the Airworthiness page of the AUF web site at http://www.auf.asn.au , at the specific URL www.auf.asn.au/airworthiness/gscpropalert.pdf

The problem covered in those issues related to failure of wooden blades at the glue line adjacent to the socket and possible crushing of the blade root from deterioration or over tightening of the bolts resulting in degraded clamping of the blade. This was aggravated by deterioration of the wood from moisture.

A further (very well compiled) report of blade shedding has been received, this time involving a three bladed wooden GSC propeller fitted to a 912 powered Lightwing. The owner was experimenting with methods of improving engine power output and he had achieved an RPM increase from 5,600 to 5,800 RPM on climb. On levelling at 1,000ft, there was an almighty bang and the motor stopped immediately. The aircraft was landed safely and subsequent inspection revealed that all three blades had parted company with the hub.

The propeller had been removed and refitted some 12 hours before the incident, had been inspected and assessed taking account of the occurrences mentioned above and was considered to be in excellent condition. It had operated at 5,800 (engine) RPM for about 2 minutes immediately before the failure.

Two matters worthy of discussion arise from this. One is the adequacy of conventional methods in establishing integrity of the blades and the other the fact that forces on a propeller are far from linear with increasing power and RPM.

Way back in the past during propeller theory lectures, the "man out the front of the class" used to flog the "Cube Rule" with propellers, ie that the power delivered by a propeller (with all other variables such as speed etc remaining constant) varied in accordance with the cube of the RPM. In this case, 5,600 to 5,800 engine RPM would indicate an increase of about 3.6% in RPM or about 11% in power (note that gear ratio is not relevant as it is a constant). Also, the centrifugal forces on the blades increases with the square of the RPM or about 7% on this case. There would be some combination of these loads which would have been a significant increase over those of previous operation. Strictly, this increase in loading should not have been sufficient to cause the failure if the propeller was sound, but it certainly wouldn't have helped if it wasn't.

R Hewitt-Cook
Technical Manager