

DRAFT SERVICE BULLETIN: JSB 014-1

Issue: 1
Date: 23rd October 2006
Subject: Propeller Installation Maintenance

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2 Applicability

All Jabiru 2200 and 3300 engines.

3 Background

The propeller fitted to all Jabiru Engines is critical in absorbing engine vibrations. If the connection between the engine and propeller deteriorates or the propeller runs less smoothly for any reason, the resulting increase in vibration can cause engine damage. In extreme cases this can lead to failure of the propeller, of the flywheel mounting screws or the crankshaft – any of which can result in in-flight engine stoppage.

This Bulletin has been raised in order to increase owner awareness of the maintenance requirements for their propeller installations.

The propeller installation can be affected by the following:

- Prop strike. Clearly, any time when the tip of the propeller touches another object it has the potential to overload the propeller bolts or the propeller drive bushes.

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- **Abrupt Engine Stoppage** An engine which has experienced an abrupt stoppage – such as is caused by valve or piston failure – may also have caused damage to the propeller attachment.
- **Propeller Bolt Tension.** If the propeller bolts loose tension the propeller may move and fret on the mounting flange of the engine.
- **Propeller Balance.** An out-of-balance propeller creates extra vibration which, over time will damage the propeller drive bushes and loosen the propeller attachment.
- **Propeller Condition.** A propeller with uneven pitch or one damaged blade creates extra vibration and uneven loading.
- **Propeller Drive Bushes.** If the drive spigots which go through the engine flange into the propeller (also known as drive bushes) are a loose this will have the same effect as running with insufficient propeller bolt tension (This condition generally only occurs on propellers which have been previously damaged by running with badly tensioned propeller bolts). Note that drive to Jabiru Propellers is not carried by friction between the propeller and the flange – the torque is transmitted mainly by the propeller drive bushes.
- **Propeller Flange.** Jabiru Aircraft propeller flanges are made to exacting tolerances. Use of a different, non-approved propeller flange is strongly discouraged. Inspection of non-OEM flanges fitted to some engines has shown poor machining and installation – leading to the propeller running off-axis or out of true, creating extra vibration.

3.1 Background – Approved Propeller Types:

All certified Jabiru Aircraft – including Light Sport Aircraft models built by Jabiru Aircraft Australia – must use an approved propeller type. At the time of writing, only Jabiru Propellers are approved for use with Jabiru engines in certified models.

All Jabiru Aircraft used for air work (such as training, hire and glider towing) must use a propeller approved by Jabiru Aircraft Australia. For customers outside Australia Jabiru dealers can provide guidance on which propellers have been approved.

3.2 Background – Fixed-Pitch Wooden Propellers:

Wooden propellers are affected by ambient conditions – changes in heat, cold and humidity will cause the wood to swell or to shrink. This can cause the interface between the engine and the propeller to deteriorate.

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Because of this phenomena, in Australia an Airworthiness Directive (AD/PFP/1 Amdt 3) exists and applies to all wooden fixed-pitch propellers used on VH-registered aircraft. The AD requires¹:

1. *Newly installed propellers: Check the hub bolt nuts for tightness after the first flight.*
2. *All propellers – every 100 hours or 12 months, whichever is the sooner:*
 - (a) *Check the propeller tracking.*
 - (b) *Check the hub bolt nuts for tightness.*
 - (c) *Inspect sheathing and tipping for looseness, separation of soldered joints, loose screws, cracks and corrosion.*
3. *It is recommended that the inspections of para. 2 above be repeated regardless of the time since last 100 hourly check, under the following circumstances:*
 - (a) *When there has been a significant change in the average ambient humidity, due to a seasonal change, or to a change in aircraft locality and,*
 - (b) *Prior to first flight after the aircraft has been idle for an extended period.*

3.3 Background – Other Propellers:

In general, propellers other than fixed-pitch wooden types place more stress on the engine because they do not adsorb and dissipate vibrations in the same way as wooden propellers. In all aero engines it is important to ensure that the propeller is matched to the engine to prevent resonant vibration frequencies from damaging the engine. Operational history of Jabiru Engines has shown that in extreme cases, mismatched propeller installations have caused damage to the propeller, flywheel attachment or crankshaft.

Before Jabiru Aircraft Australia will approve or recommend any propeller for use on Jabiru Engines the following testing must be carried out:

1. Propeller weight. The weight of the propeller is assessed. Heavy propellers are generally rejected unless there is good data available demonstrating the propeller is safe for use.
2. A vibration survey. This type of test generally involves fitting gauges to the crankshaft to measure stress, then running the engine with the propeller fitted and monitoring the stress levels. In some cases the propeller itself may be monitored instead of the engine.
3. An over-rev test. Typically this test involves running the propeller to around 10% beyond the propeller's redline – around 3700rpm for Jabiru Engines.
4. Strength testing. Before the propeller is flown the blade retention system and the blade itself will be tested to ensure adequate strength.

Due to the cost and complexity of such testing, very few manufacturers in the recreational aircraft market have completed it. This means that very few non-fixed-pitch-wooden propellers are recommended by Jabiru Aircraft Australia.

¹ AD requirements have been re-formatted and paraphrased for use in this Bulletin. The original document is available from the CASA website – www.casa.gov.au. Details supplied current at the date of issue.

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3.4 Background – Propeller Flange Extensions:

Propeller flange extensions are used in many installations to allow for a sleeker engine cowl (All current Jabiru Aircraft models use 2-inch extensions). This part is critical to the life of the engine. Use of an extension which is not fitted correctly to the engine's crank axis, is too long or which has machining or dimensional flaws is extremely dangerous. Several engine failures have been caused by using extensions which were not manufactured by Jabiru and which did not meet our requirements – strip-down examinations of the engines usually reveal either crankshaft failure or flywheel attachment failure – both signs of high levels of vibration.

Jabiru Aircraft Australia produce propeller flange extensions in a range of sizes and accept the use of flanges manufactured by a small number of other propeller manufacturers.

4 Recommendations:

- a) **Jabiru propellers:** Jabiru propellers should be installed as detailed in Jabiru Service Bulletin JSB 009.

Jabiru Aircraft consider this mandatory for aircraft being used for air work (such as training, hire & glider towing) and strongly recommend it for all other aircraft.

- b) **Other fixed-pitch wooden propellers:** Propellers should be installed in accordance with the manufacturer's instructions. Jabiru Aircraft strongly recommend the inspection requirements of AD/PFP/1 - given above – be followed. Note that this AD already applies to all VH-registered aircraft.

Jabiru Aircraft consider this mandatory for aircraft being used for air work (such as training, hire & glider towing) and strongly recommend it for all other aircraft.

- c) **Other propeller types:** Only propellers specifically recommended by Jabiru Aircraft Australia should be fitted. Propellers should be installed and maintained in accordance with the manufacturer's instructions. Owners using propellers other than those recommended by Jabiru Aircraft should monitor both the propeller and flywheel attachments and be aware that warranty issues may result.
- d) **Propeller flange extensions:** Only flanges manufactured or specifically recommended by Jabiru Aircraft Australia should be fitted. Installation must be as per the manufacturer's instructions. Owners using flanges other than those manufactured or recommended by Jabiru Aircraft should be aware that warranty issues may result.

5 Compliance – Implementation Schedule:

Note that where date limitations are listed below the start date is taken to be the date of first issue of this Service Bulletin - 23rd October 2006.

Note that Jabiru Aircraft consider compliance mandatory for aircraft being used for air work (such as training, hire & glider towing) and strongly recommend it for all other aircraft

- a) **Aircraft using Jabiru Propellers:** Update to the installation method detailed in Jabiru Service Bulletin JSB 009 within 50 flight hours or 3 months, whichever is the sooner. Thereafter the installation should be maintained in accordance with the requirements of

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Jabiru Service Bulletin JSB 009. Note that JSB 009 uses the same propeller maintenance schedule as is included in the latest Engine Maintenance & Inspection Manuals.

- b) **Other fixed-pitch wooden propellers:** Jabiru Aircraft recommend carrying out an inspection of the propeller installation in accordance with AD/PFP/1 within 50 flight hours or 3 months, whichever is the sooner. Thereafter the propeller installation should be monitored in accordance with AD/PFP/1.
- c) **Other propeller types:** No changes required to aircraft.
- d) **Propeller flange extensions:** No changes required to aircraft.

6 General Engine Maintenance Notes

- Always take care while working around the propeller – ensure the ignitions are turned OFF and that no-one is in the cockpit while working on the engine.
- Always use a good quality tension wrench.
- It is strongly recommended to check the accuracy of adjustable-type tension wrenches at least every year.

7 Airworthiness Note:

Where required, work called for by this Bulletin must be carried out by authorised personnel only. In Australia this generally means the original builder of an Experimental-category aircraft (either RA-Aus or VH registered), an RA-Aus Level 2 holder for other RA-Aus aircraft or a Licensed Aircraft Maintenance Engineer (LAME).

On completion of the work, the authorised person must note the completion of the actions required by this bulletin in the aircraft's maintenance logbook. This note should refer to the completion of maintenance requirements of this Service Bulletin, indicate if anything significant was found during the course of the work (such as signs of propeller fretting or other damage), indicate the date of the work and the identity (including licence number where appropriate) of the person carrying out the work.