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SERVICE BULLETIN: JSB 014-2

Issue: 2

Date: 9th June 2011

Subject: Propeller Installation Maintenance

Issue	Reason for Issue	Issue Status
1	Original Issue	CANCELLED
2	Add life for flange screws of some engines, add new maintenance notes	CURRENT

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2 Applicability

- The content of this bulletin is applicable to all Jabiru 2200 and 3300 engines.

Notes:

- i. For aircraft in Light Sport Aircraft categories this Bulletin is equivalent to a Manufacturer's Safety Direction.
- ii. This bulletin has not been mandated (as an AD or similar) by any National Airworthiness Authority at the time of writing.

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3 Background:

3.1 General

- 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. Specifically, details have been added on how it is recommended to maintain an engine which is using a non-approved propeller.

3.2 JSB014 Issue 2

- Issue 1 of this bulletin was released in 2006 and focused on the details of selecting, installing and maintaining the propeller. Recently however there has been a case where an engine which had been fitted with a non-approved propeller suffered the loss of the propeller flange and propeller in flight. The new Issue of this Bulletin adds additional maintenance requirements specifically for engines being operated with a non-approved propeller in addition to the existing installation guidance.
- JSB014-1 (Issue 1) is **cancelled** and must not be referred to.

3.3 Background – Other Propellers

- The following information has been provided to clarify why some propellers are approved and some are not.
- 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 minimum testing must be carried out:
 - a) **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.
 - b) **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.
 - c) **An over-rev test.** Typically this test involves running the propeller to around 10% beyond the propeller's redline – around 3700rpm for Jabiru Engines.
 - d) **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.

3.4 Propeller Installation Risk Factors

- The following are examples of events or factors which can have a detrimental effect on a propeller installation – and on the health of the engine.
- **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. This can lead to damage to the propeller installation and also to the engine.
- **Propeller Bolt Tension.** If the propeller bolts loose tension the propeller may move and fret on the mounting flange of the engine. This will lead to damage to both the propeller and the engine
- **Propeller Balance.** An out-of-balance propeller creates extra vibration which, over time will damage the propeller drive bushes, loosen the propeller attachment and potentially damage the engine.
- **Propeller Condition.** A propeller with uneven pitch or one damaged blade creates extra vibration and uneven loading which can damage the propeller attachment and the engine.
- **Propeller Selection.** Propellers must be selected to meet the limits given in the engine installation manual. Over-pitched, over-weight or otherwise non-compliant propellers can cause propeller or engine damage even if they meet all other requirements.
- **Propeller Maintenance.**
 - Propeller maintenance is absolutely critical to the integrity of the engine and propeller combination. Many of the items on this list of risk factors can be addressed via good maintenance. The propeller manufacturer's maintenance instructions are the best guide – while also being aware of the additional maintenance requirements given below for non-approved propellers.
 - While wooden propellers generally give good performance, light weight and good vibration control they are susceptible to changes in temperature and humidity – which can have the effect of loosening the propeller attachment which can cause engine and propeller damage. 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 (including Jabiru Approved propellers). 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,*

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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(b) Prior to first flight after the aircraft has been idle for an extended period.

- **Propeller Drive Bushes.** If the drive spigots which go through the engine flange into the propeller (also known as drive bushes) are loose this will have the same damaging effects as running with insufficient propeller bolt tension. 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. Even on other propeller makes which are driven by friction a close fit between the drive bushes and the propeller is strongly recommended.
- **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. At the time of writing Jabiru Service Bulletin JSB022 is also current and details the correct installation procedure required to safely install a Jabiru propeller flange.
- **Non-Approved Propeller.**
 - Depending on the design of the propeller it can act as a vibration absorber, a vibration mirror or a vibration amplifier. Non-approved propellers are an unknown in this respect and so we cannot know the effects on the engine. In the worst case severe engine damage can be inflicted in a short time. Manufacturing standards also vary – some propellers are much better built than others.
 - Operators who use a non-approved propeller do so at their own risk. Jabiru accepts no responsibility for the airworthiness or safety of engines with non-approved propeller installations.
 - An Approved propeller is one which has been approved by Jabiru Aircraft Australia for use on our engines. These are designs which we are satisfied will not damage the engine, provided they are operated and maintained properly. Full details of how propellers are approved, which are approved (and which are not) are available from Jabiru Aircraft or our local representative. The engine Instruction & Maintenance Manual and the Installation Manual for the engine also provide guidance for propeller selection. These manuals are updated periodically and the latest versions are available from our website – www.jabiru.net.au
 - 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 2-bladed fixed pitch wooden propellers are approved for use with Jabiru engines in certified models. 2-bladed fixed pitch wooden propellers made by certain manufacturers are approved for kit aircraft and LSA models. Putting a full list of approved propellers in this bulletin is impractical however – operators must contact Jabiru Aircraft or our local representative if they have any questions.
 - All Jabiru Engines being used for air work (such as training, hire and glider towing) must use a propeller approved by Jabiru Aircraft Australia.

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4 Requirements:

4.1 General

- All propellers must meet the parameters given in the appropriate Engine Installation Manual for maximum / minimum RPM, diameter etc.

4.2 Jabiru Propellers

- Jabiru propellers must be installed as detailed in Jabiru Service Bulletin JSB 009.
- Jabiru propellers must be maintained in accordance with the Propeller Technical Manual, Engine Instruction & Maintenance Manual and the aircraft Technical (or Service) Manual in conjunction with any relevant local Airworthiness Directives (such as AD/PFP/1 in Australia).

4.3 Other fixed-pitch wooden propellers

- Propellers must be installed in accordance with the manufacturer's instructions.
- The propeller installation must be maintained in accordance with the propeller manufacturer's instructions. Where such instructions are not available the requirements of AD/PFP/1 must be met – in conjunction with any relevant local Airworthiness Directives.

4.4 Other Propeller Types

- Where operators choose to use them, other types of propeller should be installed and maintained in accordance with the propeller manufacturer's instructions.
- The propellers must be maintained in accordance with the manufacturer's instructions in conjunction with any relevant local Airworthiness Directives (such as AD/PFP/1 in Australia).
- Owners using non-approved propellers should carry out the additional propeller and engine maintenance detailed in Section 6.

4.5 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.
- The requirements of JSB022 must be complied with.

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5 Compliance – Implementation Schedule:

- Where date limitations are listed below the start date is taken to be the date of the current issue of this Service Bulletin - 9th June 2011.

5.1 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 Jabiru Service Bulletin JSB 009, the current Jabiru service documentation and any relevant local Airworthiness Directives (such as AD/PFP/1 in Australia).

5.2 Other Propeller Types:

- Maintain the engine as detailed in Section 6.

5.3 Propeller flange extensions:

- Ensure that the requirements of JSB022 have been met within the compliance limits set in that bulletin.

6 Special Maintenance Schedule for Non-Approved Propellers

- This section gives additional maintenance procedures which are recommended for operators who choose to use a non-approved propeller. However, as we cannot know every possible failure mode for an unsuitable installation this information is not definitive. Maintaining the engine to these requirements does not guarantee the airworthiness of the installation or change the fact that operators are flying at their own risk.

WARNING

**Using a non-approved propeller may lead to unforeseen operational, airworthiness, warranty, safety, financial, legal or other issues.
Jabiru Aircraft accept no responsibility for such issues.**

- The following are recommended **IN ADDITION** to the normal engine maintenance program.
- Where the maintenance requirements listed below differ from those of a third-party supplier the lesser time interval should be used. i.e. if the table below calls for the propeller to be re-balanced annually but the propeller manufacturer recommends balancing every 100 hours or 6 months then the 6-month / 100-hourly interval should be used.
- Visual inspections of the propeller and propeller flange installation should check for excess metal oxide (appears as rust) or black chaffing dust originating from the flange. This is often an early indication of movement between the parts and potential failure. Oil leaks etc in this area and around the flywheel must be addressed quickly as they can mask other problems.
- Maintainers must refer to the latest approved issue of the engine Instruction & Maintenance Manual and Overhaul Manual for details of the correct procedures to use in carrying out the work outlined below.

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		Annual Inspection			
		Each 500 Hours			
		Each 100 Hours			
		Each 50 Hours			
1	Spinner, spinner flange & hardware – Check condition.		*	*	*
2	Propeller general condition – visual/hand check	*	*	*	*
3	Propeller blade pitch, tracking		*	*	*
4	Propeller mounting hardware (bolts, nuts, bushes etc) tension & condition check		*	*	*
5	Propeller balance			*	*
6	Propeller flange installation – visual inspection (no disassembly required)	*	*	*	*
7	Propeller flange screws – REPLACE Refer to engine overhaul manual for guidance			*	
8	Propeller flange run-out check (per prop strike inspection detailed below)			*	
9	Crank run-out check (per prop strike inspection detailed below)			*	
10	Flywheel Screws – REPLACE Refer to engine overhaul manual for guidance			*	

7 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 tension wrenches at least every year.
- Maintainers must refer to the latest approved issue of the engine manuals for details of the correct procedures to use in carrying out the work discussed in this bulletin.

8 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

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other damage), indicate the date of the work and the identity (including licence number where appropriate) of the person carrying out the work.



Safety Directive: JSD 014-2
Issue: 2
Date: 9th June 2011
Subject: Propeller Installation Maintenance

Applicability:

- The content of this bulletin is applicable to all Jabiru 2200 and 3300 engines.

Requirement:

- Operators of engines in the Serial Number ranges given within Light Sport Aircraft categories must comply with the requirements of Jabiru Service Bulletin JSB 014-2

Compliance:

- The compliance details given in JSB 014-2 must be met.

Background:

- This Safety Directive has been prepared to make mandatory the requirements of JSB 014-2 for engines operating within Light Sport Aircraft Categories.