

Jabiru Service Bulletin: Engine Through Bolt			JABIRU AIRCRAFT PTY LTD P.O. Box 5792 Bundaberg West Queensland Australia Phone:+61 7 4155 1778 Fax:+61 7 4155 2669 www.jabiru.net.au Email: info@jabiru.net.au		
JSB031-3	Release Date: 15 January 2015	Effective Date: 31 January 2015	Affected Models: See Applicability	S/No. Range: See Applicability	Page 1 of 9

SERVICE BULLETIN: JSB031

Issue: 3

Subject: Engine Through Bolt Replacement and Upgrade

Release Date: 15 January 2015

Effective Date: 31 January 2015

Affected Models: Jabiru 2200 & 3300 Engines in FLIGHT TRAINING

Serial no. Range: 2200 engines in the serial number range:
22A2068 to 22A2102
22A2143 to 22A3483
(including 22B01 to 22B254)
(including 22C001 to 22C018)
3300 engines in the serial number range:
33A961 to 33A2574

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2 Models Affected

- Jabiru 2200 and 3300 engines with a serial number within the ranges contained in the table below:
- **Engines in aircraft used for FLIGHT TRAINING OPERATIONS only**

Table 1: Serial Numbers of Affected Jabiru 2200 and 3300 engine models.

2200 Engines.	22A2068 to 22A2102 22A2143 to 22A3483 (including 22B01 to 22B254) (including 22C001 to 22C018)
3300 Engines.	33A961 to 33A2574

NOTE

Incomplete review of all the information in this document can cause errors. Read the entire Service Bulletin to make sure you have a complete understanding of the requirements.

3 Reason for Revision

JSB031 Issue 1:

- Jabiru Engines are assembled using a combination of Through-Bolts and Studs – as shown in Figure 1 below. The number of through-bolts varies depending on which engine model is considered but there are always 6 studs (not all with the same part number). The through-bolts and studs hold the cylinders in place and the halves of the crankcases together.
- There have been some cases of these bolts failing in service, leading to engine failure.
- In April 2011 JSB031 Issue 1 was issued. This bulletin detailed then-current inspections and alterations required to correct this potential unsafe condition with the through-bolt hardware of certain Jabiru 2200 and 3300 engines.
- JSB031 Issue 1 allowed certain amounts of time for the corrective actions to be taken: These have all since expired. Therefore it is assumed that all engines within the applicable range comply with the requirements of JSB031 Issue 1 or later data approved by Jabiru Aircraft Australia.
- Issue 1 of JSB031-1 has been superseded by this bulletin and must not be used as approved data to carry out inspections or alterations to engines.

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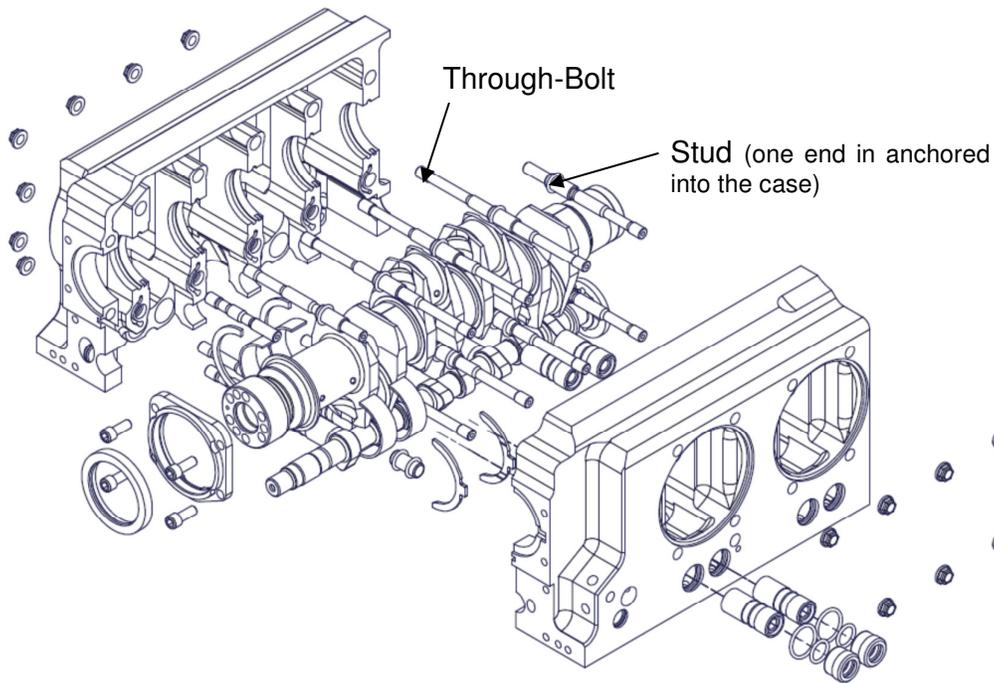


Figure 1 – General Engine Layout

3.1 JSB031 Issue 2:

- In Issue 2 of JSB031 any applicable engines that had not complied with Issue 1 were required to be updated and their cylinders inspected.
- As a result of this many engines will have had their through bolts and studs changed as required by this bulletin.
- Issue 2 of JSB031 has been superseded by this bulletin and must not be used as approved data to carry out inspections or alterations to engines.

3.2 JSB031 Issue 3:

- This bulletin is applicable to the Jabiru 2200 and 3300 engines listed on Page 1.
- This bulletin is equivalent to a Manufacturer's Safety Direction.
- This bulletin has not been mandated (as an AD or similar) by any National Airworthiness Authority at the time of writing.
- This revision was to bring about upgrading the fleet to reduce the continued number of through bolt issues in the flight training fleet.

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4 Required Action

4.1 Engines with 3/8" Through Bolts (excluding roller cam upgraded engines)

- Replace all 3/8" through bolts and studs before reaching 500 hrs¹ in service (time on bolts since installation).
- For aircraft where through bolts have already exceeded 500hrs in service, change at the next 25hrly¹ service interval.

Replacement parts must be current 3/8" through bolt, nut and washer configuration and installed as specified in the Engine overhaul manual (JEM0001-7 or later issue). This varies depending on engine configuration.

Thereafter 3/8" Through bolts and stud bolts must continue to be replaced every 500 hrs¹ (i.e. twice in one engine cycle of 1000 hrs¹).

This requirement for 500 hrly through bolt changes may be discontinued and the normal maintenance regime resumed if the upgrades as outlined in section 4.3 are fulfilled.

Prior to installing the new through bolts and studs, conduct crankshaft friction test as per section 6.2. If even minor fretting is detected the case must be reworked. Consultation with Jabiru Aircraft should be made if this situation is encountered. The details of this service bulletin and any reworking required must be recorded in the Engine maintenance log.

4.2 Engines with 7/16" Through Bolts.

4.2.1 Engines with 12 point ARP nuts and hardened steel washers.

If they are torqued 43ft/lb this service bulletin does not apply, only if the torque of the through bolts is recorded in the log book from previous servicing.

Other wise -

At the next 25hrly service, check the torque setting of 12 point nuts with a calibrated torque wrench. Prior to checking the torque, conduct crankshaft friction test as per section 6.2. If the torque was found to be less than 43 ft/lbs they should be retorqued to 43 ft lbs, if they are less than 43 ft lb. Reapply torque seal. Please see Figure 2.

When re torquing the through bolts, to ensure that the torque value is accurate, the bolts have to be loosened by 1/4 of a turn before torqueing up again. There must not be any locking compound on these bolts/nuts, if there is any indication of locking compound the nuts must be removed and the threads cleaned, then re-installed as per the section below. Loctite prevents the correct bolt tension from being achieved and the torque being checked.

The final step is to check the force to turn the propeller as described in Section 6.2.

¹¹ All time intervals refer to unscaled engine run time (Hobbs time). I.e As measured from engine start to shut down.

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4.2.2 Engines fitted with any other combination of nuts and washers.

(includes engines with 12 point nuts but no hardened washers)

These engines should be upgraded at the next 25hrly service / before 500 hours to 12 point ARP nuts and hardened washers.

Prior to installing the new nuts and/or washers, conduct crankshaft friction test as per section 6.2. This will allow detection of a fretting issue after work is completed.

Only loosen and change the nuts/washers on one bolt at a time. Then torque to 43 ft lb before undoing the next bolt. This will avoid losing too much clamping force of the case. If a locking compound was used on the bolt/nuts, threads must be cleaned before nuts are refitted. Once all bolts are done check the torques and apply torque seal. Please see Figure 2.

Now redo the test in section 6.2. If even minor fretting is detected the case must be reworked. Consultation with Jabiru Aircraft should be made if this situation is encountered. The details of this service bulletin and any reworking required must be recorded in the Engine maintenance log.

4.3 Through Bolt and Stud Bolt Upgrade

It is recommended that all engines, to which this service bulletin is applicable and other engines, are upgraded to the most current through bolt configuration which at the time of writing is the following:

- 7/16" Through Bolts (P/No 4A596A0D)
- 7/16" Stud Bolts (P/No 4A595A0D)
- 7/16" Short Stud Bolts (P/No 4A594A0D)
- 12 point ARP nuts (P/No PH4A062N and PH4A056N)
- Hardened steel washers (P/No 4A625A0D)
- Washers for front stud nuts (P/No AN960716)

All must be fitted as per this service bulletin and the latest Engine Overhaul Manual – JEM0001.

Note: if the engine does not already have 7/16" through bolts the cases can be modified. See Section 6.1.

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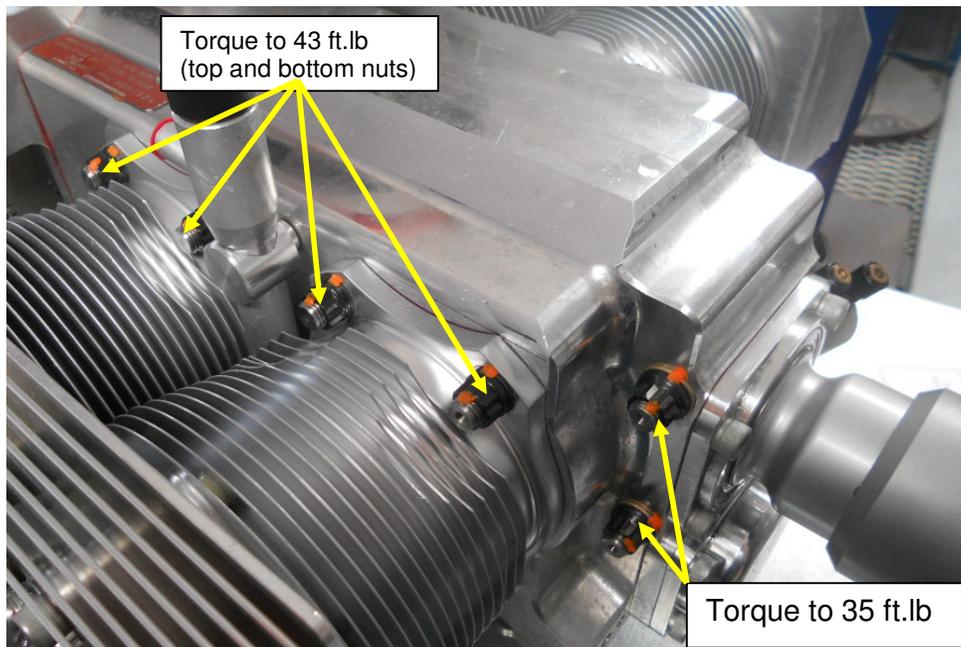


Figure 2: Bolt torques.

4.4 Notes on previously upgraded engines

Engines which have previously been upgraded to the 7/16" through bolts do not meet the upgrade requirements of section 4.3 unless at the time of upgrade the Crankcase faces were inspected for fretting and reworked as required and then torqued to 43 ft.lb.

If this inspection and rework was not conducted or was not torqued to 43ft.lb the engine is subject to the requirements of subsection 4.2 Engines with 7/16" Through Bolts.

5 Compliance:

- Where calendar time spans are given below, the start date is taken to be the effective date of this Service Bulletin – 31 January 2015.

6 Airworthiness Note:

6.1 General

- Maintenance work and inspections called for by this Bulletin must be carried out by authorised personnel only. In Australia this generally means an appropriately-rated RA-Aus Level 2 holder for RA-Aus aircraft or an appropriately-rated Aircraft Maintenance Engineer (AME). See Engine Overhaul Manual – JEM0001 for details on experience required.
- Crankcases and Cylinder barrels which previously used 3/8" through bolts will require the holes being re-bored to accommodate the 7/16" thread. Consultation with Jabiru Aircraft

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should be made if this situation is encountered. Any reworking required must be recorded in the Engine maintenance log.

- The crank case haves can usually be reworked if fretting has occurred, contact Jabiru Aircraft for details of authorized facilities that can perform this work.
- On completion of the work, the authorised person must note the completion of the actions required by this bulletin in the aircraft or engine's maintenance logbook. This note should refer to the completion the requirements of this Service Bulletin, indicate the date and the identity (including license number where appropriate) of the person carrying out the work.

6.2 General Engine Maintenance Notes

- **The work detailed in this Bulletin requires extensive skills, experience and training in engine maintenance – as well as special tools and equipment. Unskilled personnel or those lacking the correct tools and training must not attempt this work. Refer to the current Jabiru Engine Overhaul Manual, Document JEM0001 Issue 7 (or later approved issue) for personnel, tool & equipment requirements.**
- 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.
- Perform a crankshaft friction test before through bolt engine work commences. This can be done by measuring the force required to turn the propeller with a spring scale. Remove one spark plug from each cylinder. Turn the engine over several times. Position the crankshaft so that the magnets are almost lined up with the ignition coils, see Figure 3. Then using a spring balance at the tip of the propeller blade, (take care not to damage the propeller blade) pull the prop slowly in the direction of rotation. Take note of the reading on the scale as you do this. You will only get about 150mm of movement before the camshaft causes the prop to move more easily.

Note: It may be difficult to attach a spring balance to the tip of a composite propeller, in this case choose and make a location as close to the tip as possible. Mark the same location on all blades, for consistent measurements.

Rotate the prop ½ turn and measure the force to turn the propeller again. Repeat until you have at least 3 consistent readings., perform the pull-tests again. If the force measurements obtained are more than 400 grams higher than obtained in the measurements taken before the through bolts were torqued, it shows that fretting of the crankcase has reduced main bearing clearances to an unacceptable level. The engine should be disassembled and the crankcase repaired by a Jabiru Authorised facility.

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Figure 3: Coil position.

- Use a spring balance that can read at least 3 kg with a maximum of 50 gram increments.



Figure 4: Suitable spring balance.

7 Applicability note:

If doubt exists regarding the applicability or action required by this service bulletin for a given engine, prompt contact should be made with Jabiru Aircraft Pty Ltd for direction.

8 History

Almost all of recorded cases of Through bolt failures within the **Australian** population of Jabiru Engines have been in aircraft used in Flight Training operations.

Several factors were identified as being common attributes for engines which have suffered a through bolt failure.

- 2200 Engines in **Aircraft used primarily for Flight training** are seen as having a more common occurrence of through bolt failures:
 - Flight training operations are considered rigorous due to the increased number of takeoff and landing events as well as go-arounds, simulated engine failure and stall recovery operations. This subjects the engine to quick changes in throttle setting and relatively fast changes and extremes in engine temperature.

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- By comparison 3300 engines represent a very small proportion of all through bolt failures in Jabiru Engines. They are not commonly used for circuit training in flight training schools.
- The latest through bolt configuration of 7/16" through bolts and studs, 12 point ARP nuts and hardened steel washers all installed without thread locker to a torque setting of 43ft.lb (35ft.lb for the front two short studs) has been developed to increase the life of the through bolts of engines used in flight training.
- The most important change is the increase in bolt torque. The increased tension better negates joint relaxation which is responsible for movement between the case halves causing the crankcase mating faces to fret and this relieves the through bolt tension, leading to fatigue failure. The change in bolts, nut and thread was made to allow 43ft.lb to be reliably reached without damaging bolt thread and produce a more consistent tension preload for the given torque setting.
- Engines with older through bolt configurations which used Loctite are more prone to bolt installation errors if the quantity of Loctite was insufficient, excessive or allowed to partially set, all of which can give false torque readings and reduced bolt tension.
- 3/8" bolts **should not** be torqued to 43 ft.lb, they are currently torqued to 35 ft.lb. Don't be tempted, this will generate excessive bolt tension!

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LSA SERVICE BULLETIN: LSA JSB 031-3

Issue: 3

Subject: Engine Through Bolt Replacement and Upgrade

Release Date: 15 January 2015

Effective Date: 31 January 2015

Affected Models: Jabiru 2200 & 3300 Engines

Affected S/No: As Detailed on Page 1 of JSB031

Requirement:

- Operators of engines in the Serial Number ranges given within Light Sport Aircraft categories must comply with the requirements of Jabiru Service Bulletin JSB031.

Compliance:

- The compliance details given in JSB031 must be met.

Background:

- This Safety Directive has been prepared to make mandatory the requirements of JSB031 for engines operating within Light Sport Aircraft Categories.