

Propeller Technical Manual



Propeller Model C000242-D60P38
Propeller Model C000242-D60P42
Propeller Model C000242-D60P44
Propeller Model 4A401A0D
Propeller Model 4A401B0D
Propeller Model 4A401C0D



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2 Section 2 – Service Manual

2.1 LIST OF EFFECTIVE PAGES

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1	1	16/4/08	9	1	16/4/08	17	1	16/4/08
2	1	16/4/08	10	1	16/4/08	18	1	16/4/08
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6	1	16/4/08	14	1	16/4/08	22	1	16/4/08
7	1	16/4/08	15	1	16/4/08			
8	1	16/4/08	16	1	16/4/08			

Issue Notes

1	Original Issue



3 Introduction

This manual contains JABIRU recommended procedures and instructions for ground handling, servicing and maintaining the following Jabiru propeller models:

C000242-D60P38	-	Jabiru 4 Cylinder Propeller (3 lamination, Ø60" pitch 38")
C000242-D60P42	-	Jabiru 4 Cylinder Propeller (3 lamination, Ø60" pitch 42")
C000242-D60P44	-	Jabiru 4 Cylinder Propeller (3 lamination, Ø60" pitch 44")
4A401B0D	-	Jabiru 4 Cylinder Propeller (3 lamination, Ø60" pitch 38")
4A401A0D	-	Jabiru 4 Cylinder Propeller (3 lamination, Ø60" pitch 42")
4A401C0D	-	Jabiru 4 Cylinder Propeller (3 lamination, Ø60" pitch 44")

These propellers hold an Australian Type Certificate, Number VP503, issued by the Civil Aviation Safety Authority (CASA) of Australia. All propellers listed are certified for use on Jabiru Aircraft Engines.

It is the owner's responsibility to become fully aware of the particular maintenance requirements and limitations applicable to the propellers when used in their application.

The information in this manual is based upon data available at the time of publication, and is supplemented and kept current by Service Bulletins & Service Letters published by JABIRU AIRCRAFT Pty Ltd. These are distributed directly to owners in addition to being posted on the JABIRU website or provided to your local Dealer or Distributor so that they have the latest authorised recommendations for servicing the propellers. New owners of pre-owned certified propellers should ensure that the transfer of ownership has been advised to JABIRU AIRCRAFT Pty Ltd or your local dealer or distributor. Existing owners should ensure that their postal address remains current.

IMPORTANT

All maintenance should be undertaken with careful regard for the procedures outlined in this manual. A detailed record of maintenance undertaken should be recorded in the Aircraft Log Books.

The JABIRU Propellers described in this Technical Manual are Type Certified. As such, they must be maintained by an Authorised Person (LAME for CASA-registered aircraft, Owner or Level 2 Holder for RAAus-registered aircraft). In all cases, NO MODIFICATIONS ARE PERMITTED without approval from a CAR 35 Authorised Person, the aircraft manufacturer or equivalent. It is the owner's responsibility to ensure that their propeller is maintained by an appropriate person.

In the interests of product development, we encourage owners to make suggestions related to design improvements. However, the final decision on their adoption or otherwise rests with JABIRU AIRCRAFT Pty Ltd.



4 Warnings

IMPORTANT

Always think before acting and use common sense.
Working with propellers can be extremely dangerous.

WARNING

DO NOT GO NEAR THE PROPELLER IF THERE IS A PERSON IN OR NEAR THE COCKPIT.

ENSURE AIRCRAFT MASTER SWITCH IS "OFF" BEFORE COMMENCING ANY WORK ON PROPELLER.

DO NOT RUN ENGINE WITH PROPELLER DISCONNECTED OR ENGINE DAMAGE WILL RESULT.

5 Propeller Operation

5.1 Limitations

5.1.1 Maximum RPM

- The propellers covered by this manual are limited to 3300 RPM.

5.1.2 Life

- The propellers are assessed on condition. There is no fixed life.

5.2 Normal Operations:

5.2.1 Ground Handling

Impact from gravel, grass, insects and other objects can damage the propeller. When operating from gravel runways the pilot should be aware of this at all times and plan their operations to suit.

- Take care when carrying out ground tests of the engine – either make sure the propeller is not over any loose gravel or perform run-ups while rolling forwards at normal taxi speed (note that this procedure requires some practice and is not recommended for student pilots).
- Unless required due to short runway length, do not hold the aircraft on the brakes while increasing power at the start of the takeoff roll.
- Take care when taxiing through ditches or over rough or uneven ground. Reduce speed, pass over the ditch diagonally and do not abruptly increase power to climb out the far side. If unsure, stop the engine and push the aircraft across the ditch by hand.

5.2.2 Hand Manoeuvring

The aircraft may be moved by hand using the propeller as a handle. However, the following procedures must be used:

IMPORTANT

Always think before acting and use common sense.
Working with propellers can be extremely dangerous.

**Ensure that the aircraft's master switch is OFF before walking near the propeller
Do not go near the propeller if there is a person in or near the cockpit.**

- Only one person at a time may hold the propeller.
- Always hold the propeller as close as possible to the root – in practice this normally means placing hands immediately beside the spinner.



- Orient the propeller horizontally unless manoeuvring the aircraft past an obstruction which would hit the propeller if it were left horizontal. However, do not park the propeller in a vertical orientation (see notes below – Section 5.2.3)

5.2.3 Parking

To prevent the accumulation of moisture in the lower blade, the propeller must always be left in the horizontal position when the engine is being parked for any length of time, especially in conditions of high ambient humidity.

5.2.4 Daily Inspection

Inspect both blades for:

- Urethane condition: peeling, tears, pitting or abrasion.
- Fibreglass condition: stone chips, trailing edge chips, de-laminations, whitening.
- Resin condition: cracks.

Pictures of typical damage are shown in Section 6.6.1.

5.3 Running In Rain

Jabiru Aircraft do not recommend or endorse operating in rain.

The following is intended as a guide for owners who have, for whatever reason, been forced to fly through rain.

- Do not operate in heavy rain or hail.
- Know your limitations and the limitations of your aircraft. If in doubt, divert or land.
- Maintain situational awareness – do not fly into rising terrain or near high obstacles (radio towers etc) in low visibility conditions.
- If forced to fly through rain reduce engine RPM. 2600rpm or less is recommended – though the pilot must maintain a safe airspeed.
- Monitor propeller condition – on landing check the blades for damage. Minor damage can be repaired in the field in accordance with the details given in Section 7.3.2. Do not fly on with damage beyond the limits set in Section 7.3.2.
- A Urethane leading edge is provided for impact protection and also allows the propeller to be run in rain if required. However, the propeller is not intended for extended operation in heavy rain. Running in heavy rain will erode the Urethane – reducing the efficiency of the propeller blade and upsetting it's balance.
- After extended running in rain the Urethane may become so badly worn that the fibreglass leading edge underneath is exposed. Once exposed, the fibreglass will quickly be damaged by continued operation in rain. It is possible that a propeller which has been damaged to this extent may suffer fibreglass de-lamination from a blade – massively reducing propeller efficiency and increasing vibration to the point where the engine must be shut down. **This makes continued operation with exposed fibreglass edges extremely hazardous.**



6 Propeller Maintenance

6.1 Introduction

The Jabiru Propellers detailed in this manual are 2-bladed fixed pitch designs. They are available in a range of different pitches and are certified to FAR Part 35.

WARNING

ENSURE IGNITION SYSTEM IS "OFF" BEFORE COMMENCING ANY WORK ON PROPELLER.

DO NOT RUN ENGINE WITH PROPELLER DISCONNECTED OR ENGINE DAMAGE WILL RESULT.

6.2 Description

6.2.1 General

The Jabiru Propellers detailed in this manual are made from plantation Hoop Pine sheathed in fibreglass. A Urethane protective coating is applied to the leading edge of both blades.

The propeller finish is normally a clear enamel paint, though other colours may be used for some applications.

6.2.2 Approved Installations

The following combinations are approved for Type Certified Installations:

Table 1. Approved Propeller / Engine / Propeller Flange Combinations

Propeller	Engine	Propeller Flange	Dia x Pitch	Remarks/Limits
C000242-D60P38	Jabiru 2200	Std – 4525064 2" Ext – 4610074	1524 x 965 (60" x 38")	Not above 3300 RPM
C000242-D60P42	Jabiru 2200	Std – 4525064 2" Ext – 4610074	1524 x 1067 (60" x 42")	Not above 3300 RPM
C000242-D60P44	Jabiru 2200	Std – 4525064 2" Ext – 4610074	1524 x 1118 (60" x 44")	Not above 3300 RPM
4A401B0D	Jabiru 2200	Std – 4662084 2" Ext – 466218N	1524 x 965 (60" x 38")	Not above 3300 RPM
4A401A0D	Jabiru 2200	Std – 4662084 2" Ext – 466218N	1524 x 1067 (60" x 42")	Not above 3300 RPM
4A401C0D	Jabiru 2200	Std – 4662084 2" Ext – 466218N	1524 x 1118 (60" x 44")	Not above 3300 RPM



5. Fit front spinner backing plate to front of propeller. Fit Aluminium Propeller Flange, Belleville Washers - 42 off: (8 per Bolt: assembled in pairs as shown)
6. Progressively tighten bolts ensuring equal distribution of load and in a normal criss-cross torque sequence.
7. Using Torque Wrench, tighten Bolts to 6lb.ft (72 inch/lbs).
8. Check tracking of Propeller by locating a fixed object on a flat floor so that it just clears the Propeller tips when rotating the Propeller by hand. Check that each blade clears the object by the same amount. If the Propeller is outside the approved tolerance, refer to JABIRU Aircraft Pty Ltd or a JABIRU Approved Service Centre.
Maximum Tracking Error Tolerance is +/- 2mm.
9. Locate Spinner on Spinner Flange and fix with Machine Screws through tinnerman Washers.
10. Check Spinner tracking by locating a fixed object on a flat floor to just clear the lower edge of the front dome of the Spinner. Rotate the propeller by hand and check that the Spinner runs true.
11. Correct any run-out by loosening machine screws, realigning spinner then retightening machine screws.
12. Leading edge tape can be applied between the inner edge of the urethane leading edge and the spinner. This optional tape protects the propeller and reduces the chances of moisture ingress.
13. After the first flight following the propeller installation the spinner must be removed and the propeller bolts checked for correct tension.

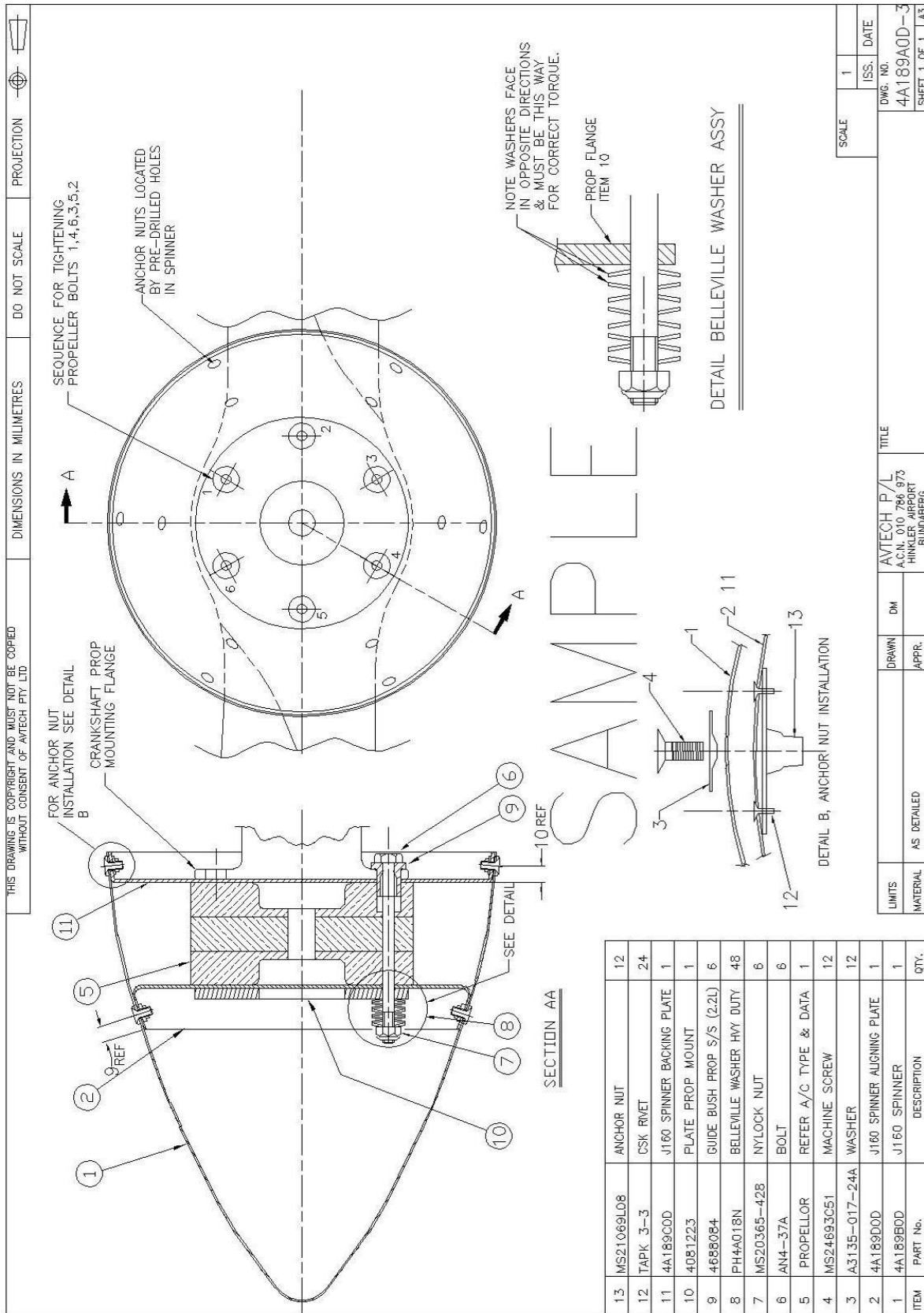


Figure 1 – Typical Propeller Installation

IMPORTANT

For all Jabiru Aircraft Engines the spinner is an important and integral part of the propeller Assembly. It is essential to ensure adequate engine cooling. The aircraft must not be flown with the spinner removed.



6.4 Operational Checks

- Full power RPM with the aircraft stationary 2800rpm ±50rpm

6.5 Maintenance Schedule

- Note that while the spinner assembly is not considered a part of the propeller, some spinner inspections are included below for reference.

Table 2. Inspection Chart

		Annual Inspection	
		Each 100 Hours	
SPINNER			
1	General condition – cracks etc.	*	*
2	Screw holes are not excessively elongated	*	*
SPINNER FLANGE			
3	General condition – cracks around perimeter of hub etc	*	*
4	Anchor nuts & rivets secure	*	*
5	Visual inspection for signs of fretting / looseness	*	*
SPINNER SCREWS			
6	Head & thread condition	*	*
7	Tightness of screw in nut. Replace anchor nuts if loose.	*	*
PROPELLER			
8	Urethane condition – Refer Section 7.3.2 for details.	*	*
9	fiberglass condition – Refer Section 7.3.2 for details.	*	*
10	Wood condition – Refer Section 7.3.2 for details.	*	*
11	Hub condition – Refer Section 7.3.2 for details.	*	*
PROPELLER BOLTS / NUTS			
12	Condition – corrosion etc.	*	*
13	Bolt / Nut tension	*	*
TRACKING			
14	Propeller tracking	*	*

6.6 Troubleshooting

6.6.1 Defect Recognition

6.6.1.1 Trailing Edge Chip

Figure 2 below shows a minor trailing edge chip, approximately 13mm (0.5") long. This type of damage is normally caused in the hangar or while the propeller is in storage or being shipped.

Recommended Actions:

- In general, whitening is a sign that the resin matrix surrounding the fibreglass has been damaged. This type of damage can allow moisture to enter and act as a starting point from which de-laminations can grow.
- If the fibreglass has been chipped or frayed apply a thin type of superglue to the fibres. Capillary action will draw the glue into the glass and the colour will change from white to translucent.
- If the line of the trailing edge has been notched by a small amount (up to 2mm) the notch can be sanded away to leave a smooth trailing edge. This must be done AFTER the glass weave has been stabilised with superglue.
- Maximum size to repair by the method above: 13mm along the blade and extending up to 10mm towards the blade leading edge.
- After repair: visually monitor the chip for growth.



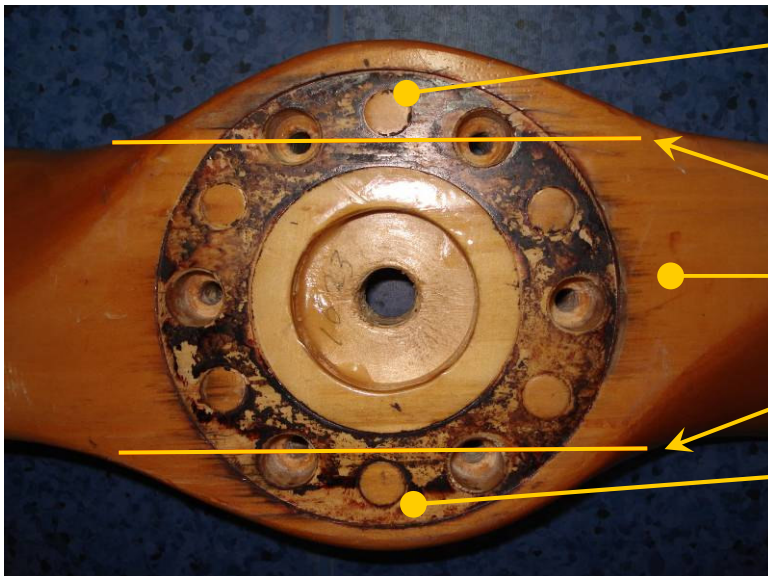
Figure 2 – Trailing Edge Chip

6.6.1.2 Propeller Hub Aging

Figure 3 below shows an older propeller hub. Several small cracks are visible extending along the blade from the hub bolts. This type of damage is typically caused by over-torquing the propeller bolts (or not using Belleville washers on the installation as shown in Figure 1).

Recommended Actions:

- Ensure the propeller is installed as detailed in Figure 1.
- Check the fit of the propeller drive bushes in the sockets is not loose.
- Measure the length of the cracks & compared to the limits shown below.



Maximum crack length outside central zone (beyond lines) 50mm (2") or up to the edge of the propeller. If the crack touches the side of the prop it must be visible down the side of the hob for no more than 10mm. (0.39")

Line through centres of outer bolt holes.

Maximum crack length within central zone (between lines) 25mm (1")

Line through centres of outer bolt holes.

Maximum crack length outside central zone (beyond lines) 50mm (2") or up to the edge of the propeller. If the crack touches the side of the prop it must be visible down the side of the hob for no more than 10mm. (0.39")

Figure 3 – Hub Aging

Figure 4 below shows the side of an older propeller hub. A crack running along the grain is visible. This type of damage is typically caused by over-torquing the propeller bolts (or not using Belleville washers on the installation as shown in Figure 1).

Recommended Actions:

- Check the propeller installation & verify bolt tensions.
- Where the crack has exposed the wood, seal it using a thin type superglue to prevent moisture ingress.
- Overall propeller hub thickness must be greater than 58mm.



Crack

Figure 4 – Hub Compression Cracking

6.6.1.3 Urethane Abrasion, Stone Chips

Figure 5 below shows a stone chip and urethane abrasion near the tip of a propeller blade. In this case some superglue has been applied to the stone chip. This sort of damage is generally caused by operations from gravel runways and flying through rain.

Recommended Actions:

- Stone chips like the one shown below are not generally dangerous, however they should be visually monitored during normal daily inspections as it is possible for glass de-laminations to start from them. Using a thin type of superglue to seal the chip is recommended to seal the damage & stabilise the chip.
- The urethane damage shown below is minor. The edge of the fibreglass is not exposed and there are no loose sections of urethane. Note: due to the abrasion of the urethane this propeller tip will be much more susceptible to damage when flying through rain than it would be if the urethane was in as-new condition.

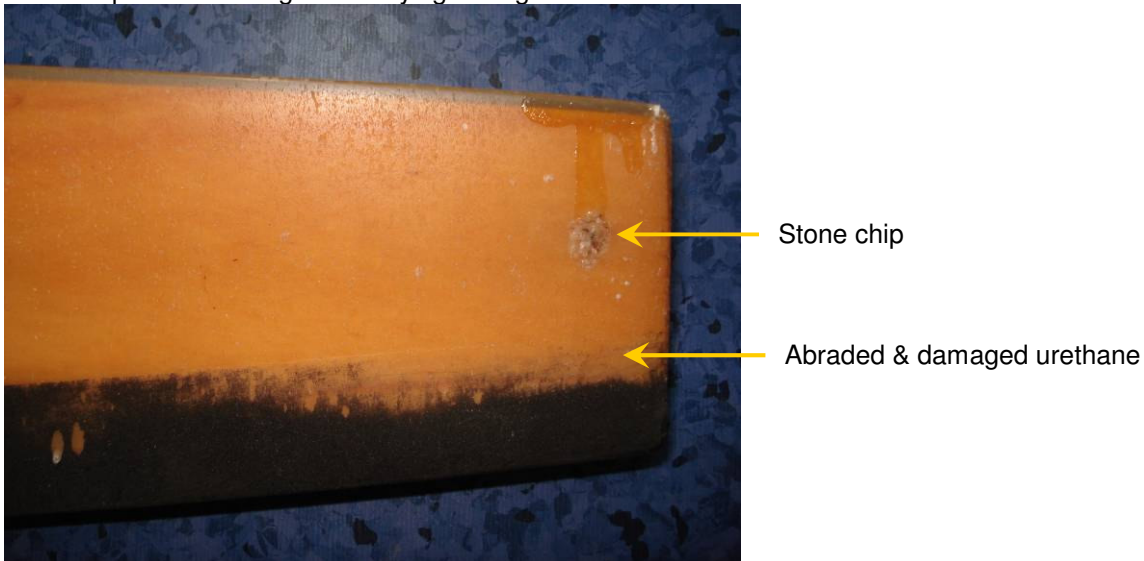


Figure 5 – Stone Chip & Urethane Abrasion

Figure 6 below shows more severe damage to the urethane. This type of damage is generally caused by flying through rain or taxiing through long grass.

Recommended Actions:

- Urethane loss such as shown below is low-medium level damage. The leading edge of the fibreglass has been exposed and while the edges of the urethane appear stable they are irregularly shaped and may begin peeling. A propeller tip in this condition is safe in normal use, however it will be damaged much more rapidly by rain. The irregular ends of the urethane can be carefully removed with a sharp knife and the exposed edge of the fibreglass should be specifically checked during daily inspections.

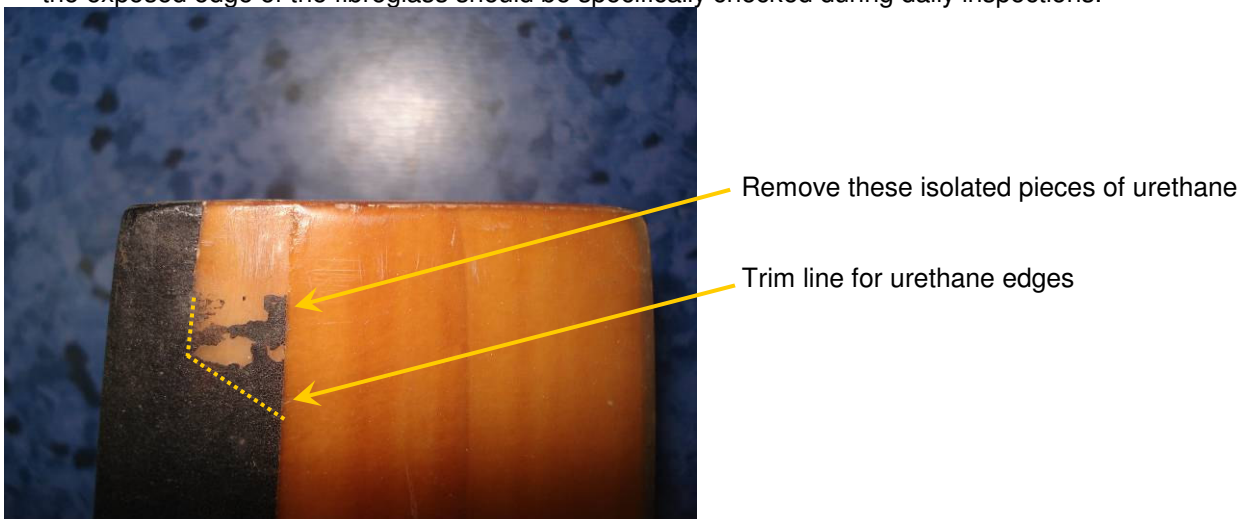


Figure 6 – Urethane Abrasion

6.6.1.4 Urethane Pitting

Figure 7 below shows urethane which has been pitted by flying through rain.

Recommended Actions:

- Minor damage can be sanded slightly to improve the smoothness of the leading edge. The pits shown would be treated this way.
- Major damage must be repaired by replacing the urethane leading edge protection.



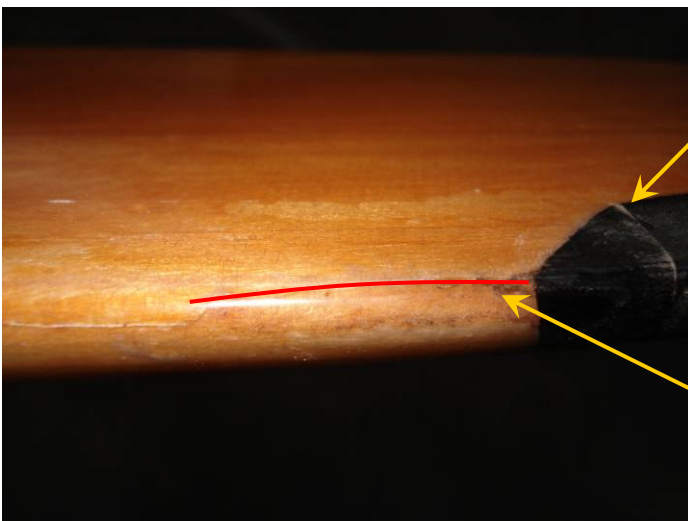
Figure 7 – Urethane Pitting

6.6.1.5 Resin Cracks

Figure 8 below shows cracking in the resin shell of the propeller at the leading edge between the inboard end of the urethane and the start of the spinner. The example shown is also fitted with leading edge prop tape. This damage is usually caused by moisture ingress into the blade causing the wood to swell and crack the resin coating. The moisture can enter whenever the blade is exposed to water: flying through rain, covered by dew overnight etc.

Recommended Actions:

- The damage shown below is a minor example of it's type. At this stage it should be covered with prop tape and monitored.
- If the cracking progresses any open cracks should be sealed with a thin type of superglue. Maintaining a seal over the wood is the best way to prevent this type of damage from spreading.



Prop tape runs from the inboard end of the urethane through to the spinner.

Cracking visible in the resin at the leading edge

Figure 8 – Moisture Ingress – Leading Edge at Root.

Figure 9 below shows cracking in the resin shell of the propeller near the hub. Cracks of this type can occur in older propellers where there is only resin (and no fibreglass) covering the wood.

Recommended Actions:

- The inner end of the fibreglass can be seen as the colour of the composite covering the wood changes from a relatively opaque covering to a clearer coating. Fibreglass/resin composite is more opaque than resin alone. The fibreglass coverings of the propellers covered by this manual run from the tip of the blade to a point approximately 100mm (4") from the centre of the propeller.
- Cracks such as this one are not a structural issue provided that they are no more than 110mm from the prop centre and are no longer than 50mm (2").
- Where a crack has opened slightly it must be sealed with superglue to prevent moisture entering. The black marking of the upper part of the crack shown below is due to moisture staining the wood.

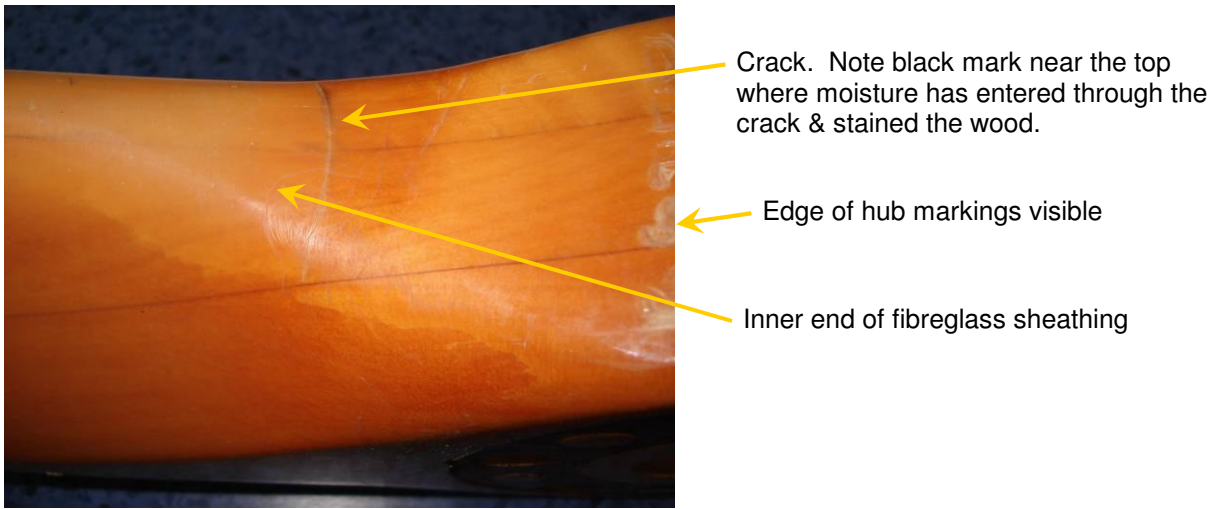


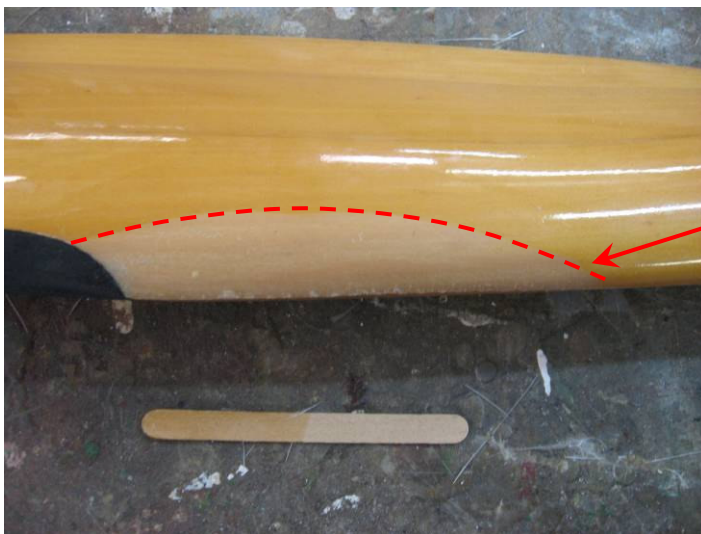
Figure 9 – Resin Crack

6.6.1.6 De-lamination

Figure 10 and Figure 11 below show an extreme example of the same type of damage shown in Figure 8. In this case the initial minor cracking was not sealed. Over a period of several months more water entered and a small de-lamination began; the aircraft continued to be flown. The result is that the fiberglass has delaminated from the wood over a large area.

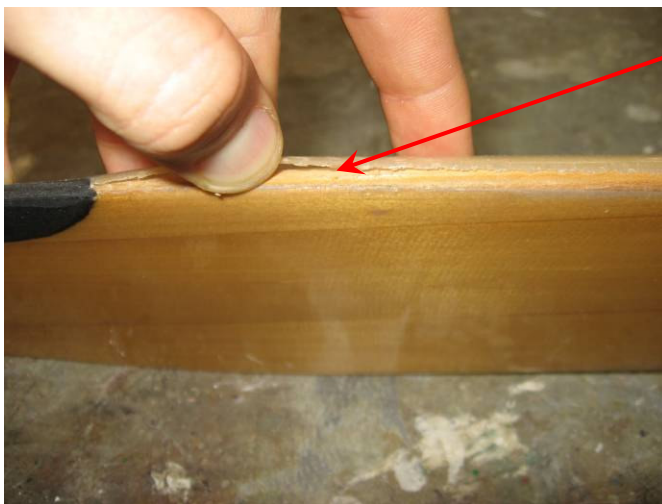
Recommended Actions:

- **IT IS NOT SAFE TO FLY WITH ANY AMOUNT OF DE-LAMINATION.** Whenever de-lamination is found the propeller must be removed from service and repaired.
- It is unusual for a de-lamination to reach this size. Normally air pressure acting on a smaller de-lamination would rip the fibreglass off the entire blade. Happening in flight this leads to an extremely out of balance propeller – normally the engine must be shut down immediately and an emergency landing carried out.



Edge of delaminated area

Figure 10 – Fibreglass De-lamination



Wood exposed at leading edge.
Fiberglass no longer bonded to wood.

Figure 11 – Fibreglass De-lamination



7 Propeller Overhaul

- As there are no removable parts, for these propellers overhaul effectively means major repair. Major repairs may only be carried out by Jabiru Aircraft P/L or authorised agents.

7.1 Propeller Removed Inspections

Whenever the propeller is removed from the engine, the following inspections are to be carried out:

- Drive bush fit into hub – should be a good fit. The bush should not need to be forced into the hub and there must be no slop once the bush is fitted.
- Balancing – checking the balance of the propeller is simple and Jabiru Aircraft recommend checking the balance whenever the propeller is removed from the aircraft.
- Hub condition inspection – whenever the propeller is off the engine the general condition of the hub should be visually inspected. Section 7.3.2 gives details.

7.2 Fits & Clearances

7.2.1 Propeller Drive Bushes

- Drive bushes must be a close fit in the propeller hub. Push the bushes into the hub by hand. If slack can be felt on two or more bushes the hole clearances must be adjusted. Refer to Section 7.3

7.3 Repair Methods

7.3.1 Propeller Balancing Procedure

Propeller balance should be checked by locating a 16mm tube to firmly fit the centre mounting hole of the Propeller and balancing on level "knife edges".

- Place a length of 16mm (5/8") tube into the centre hole of the propeller. The tube must be true and round and be a firm fit.
- The balance rig consists of 2 straight, level "knife edges". Steel rulers are suitable when appropriately mounted. Where possible, the rig should be constructed to allow checking of the blades in the horizontal and vertical positions.
- The propeller is placed on the rig, with the 16mm tube resting on the knife edges. The heavier blade will sink to the bottom.
- Ensure the balancing is being done in a closed room – drafts or gusts of wind will rotate the propeller and give inconsistent balancing.

Tolerances:

- Imbalance shall not exceed the following limit whatever the position of the Propeller in the plane of rotation: 750 mm-gms (approximately 1 gm at the tip).
- The balance may only be corrected by the application of enamel paint. Any other method of securing balance is PROHIBITED.
- Do not apply paint over the Urethane leading edge – it will rapidly flake off in service which is both unsightly and will affect the balance of the propeller.
- Propellers outside these limits should be rejected as unserviceable or returned to JABIRU for assessment and possible repair.

7.3.2 Damage Limits & Repairs

Any service or repair must take account of the risk of subsequent Propeller failure. Therefore repairs by owners are limited to minor damage. Larger damage must be referred to Jabiru Aircraft for repair.

Maximum size of damage approved for owner repair:

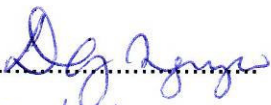
- Nicks in leading edge up to 4mm deep x 20mm long
- Nicks (such as stone chips) across the drive face of the blades (flat sides) up to 2mm deep x 6mm diameter or scratches not more than 0.5mm deep.



8 Airworthiness Limitations Section

The Airworthiness Limitations Section is CASA Approved.

There are no Airworthiness Limitations applicable to the Jabiru C000242 and 4A401 series propellers.

Signed: 
Date: 23/4/08
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Dinh Nguyen
Delegate of the Authority