



AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA 18/2/3/8305	
Aircraft Registration	ZU-CIP	Date of Accident	01 June 2007		Time of Accident	1500Z
Type of Aircraft	Jabiru SP - Aeroplane		Type of Operation		Private	
Pilot-in-command Licence Type		Private	Age	38	Licence Valid	Yes
Pilot-in-command Flying Experience		Total Flying Hours	511.5		Hours on Type	229
Last point of departure		Klerksdorp Aerodrome (FAKD)				
Next point of intended landing		Rustenburg Aerodrome (FARG)				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)						
Klerksdorp Aerodrome: S26° 52.00', E026° 43.00', (North West Province)						
Meteorological Information		Wind: North 36, Temperature: 22°C. CAVOK				
Number of people on board	1+1	No. of people injured	0	No. of people killed	0	
Synopsis						
<p>The pilot experienced vibration in the front end of the aircraft after take off. He then decided to turn the aircraft back towards the runway to land and as soon as he turned, the vibration increased. After he turned, the propeller then separated from the engine. He switched off the engine and started descending to land, and subsequently landed hard on the grass area next to the runway. The propeller was never found, and no tests were carried out on the propeller or its securing bolts.</p> <p>The aircraft sustained substantial damages, but the Pilot and the Passenger were not injured.</p>						
Probable Cause						
<p>The aircraft landed hard next to the runway after the propeller separated from the aircraft during take-off. The separation was as result of the loosening of the propeller fastening bolts. This loosening was due to climatic changes, and the lack of knowledge by the pilot about the service bulletin that demanded periodic inspections of these fasteners.</p>						
IARC Date				Release Date		



AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : R.J. Badenhorst
Manufacturer : Jabiru
Model : SP
Nationality : South African
Registration Marks : ZU-CIP
Place : Klerksdorp
Date : 01 June 2007
Time : 1500Z

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation :

*In terms of Regulation 12.03.1 of the Civil Aviation Regulations (1997) this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and **not to establish legal liability.***

Disclaimer:

This report is given without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

1.1 History of Flight

- 1.1.1. The pilot and one passenger were on a private flight from Klerksdorp Aerodrome (FAKD) to Rustenburg when the accident occurred.
- 1.1.2. The pilot stated that after take off, at approximately 300ft, he felt a vibration from the front of the aircraft.
- 1.1.3. The Pilot decided to turn back towards the runway and as soon as he turned back the vibration increased and after completion of the turn, the propeller separated from the engine.
- 1.1.4. The pilot closed the throttle to prevent the engine from over-revving and pushed the nose forward, to maintain airspeed and levelled out to land. He also reported that he landed at an indicated air speed of 65 knots.
- 1.1.5. He landed very hard and the aircraft sustained damage to undercarriage, the bottom surface of the fuselage and the right hand passenger window was broken.

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	-
None	1	-	1	-

1.3 Damage to Aircraft

1.3.1. The aircraft was substantially damaged in the accident, with damages to the passenger side window, undercarriage and under-fuselage.

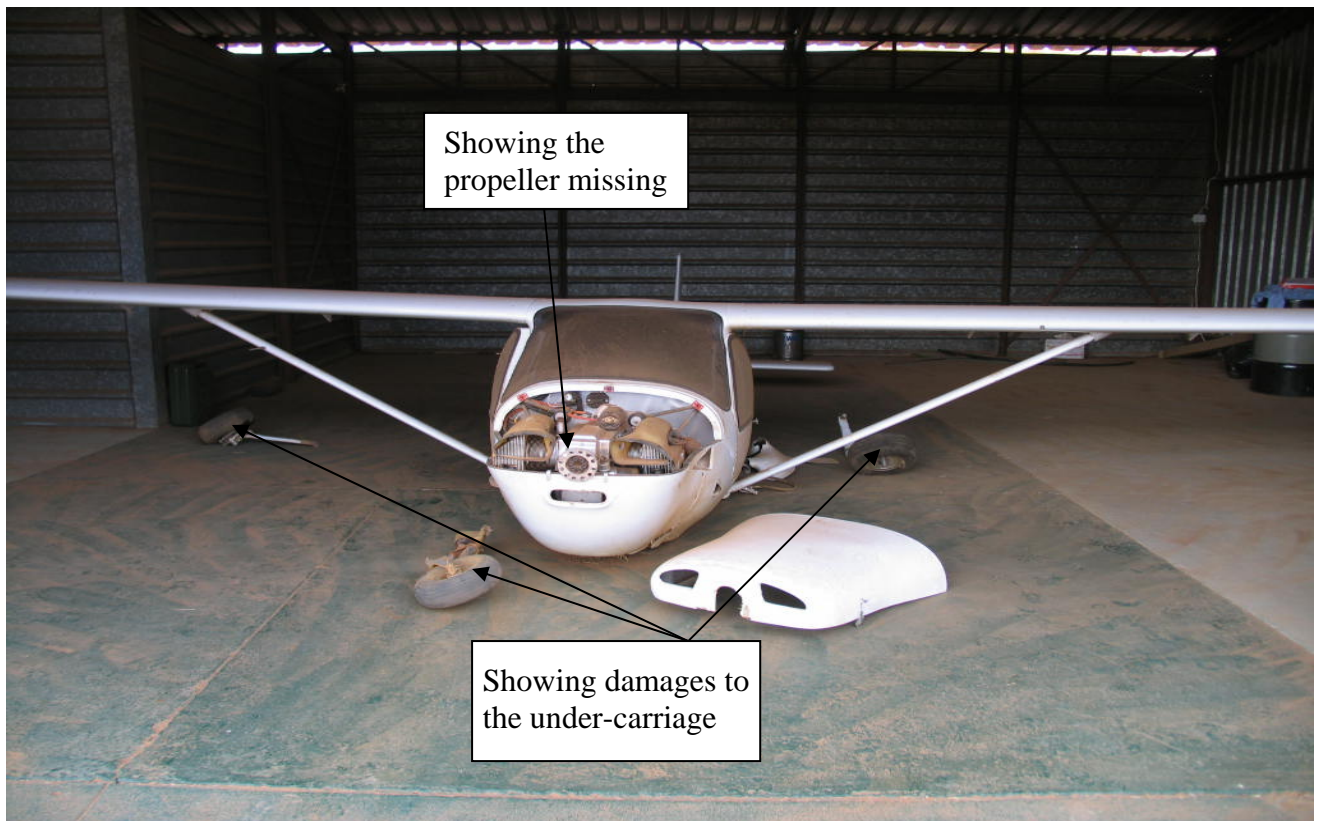


Photo 1: Damage caused to the aircraft

1.3.2. The propeller separated from the engine before the aircraft landed and was never found.

1.4 Other Damage

1.4.1 Damage was limited to the grass area on which the aircraft landed, next to the runway.

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	38
Licence Number	*****	Licence Type	Private		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	27 October 2007				
Restrictions	Corrective lenses				
Previous Accidents	Yes				

Flying Experience:

Total Hours	511.5
Total Past 90 Days	6.5
Total on Type Past 90 Days	6.5
Total on Type	229

1.6 Aircraft Information

1.6.1. Airframe :

Type	Jabiru SP	
Serial Number	422	
Manufacturer	Jabiru	
Date of Manufacture	1 December 2000	
Total Airframe Hours (At time of Accident)	268	
Last Annual inspection (Date & Hours)	16 May 2007,	265
Hours since Last Annual inspection	3	
Authority to fly (Issue Date)	Authority to fly (18 May 2007)	
C of R (Issue Date)	19 May 2005	
Operating Categories	Private authority to fly operation	

1.6.2. Engine :

Type	Jabiru 2200
Serial Number	785
Hours since New	268
Hours since Overhaul	TBO not reached

1.6.3. Propeller :

1.6.3.1. The information on the table below is as it was found in the log books, as the propeller was never found.

Type	Jabiru (wooden)
Serial Number	JJ41605LC
Hours since New	268
Hours since Overhaul	TBO not reached

1.6.3.2. The propeller is normally secured to the propeller flange by six bolts, and to be fastened to a maximum of 6 ft-lb torque.

1.7 Meteorological Information

Wind direction	360°	Wind speed	15-20 kts	Visibility	Good
Temperature	22°C	Cloud cover	None	Cloud base	None
Dew point	None				

1.7.1. The above information was as provided by the pilot on the pilot questionnaire.

1.8 Aids to Navigation

1.8.1. The aircraft was fitted with standard navigation equipment as approved at the time of certification by the regulator, and no defects were reported in respect of this equipment.

1.9 Communications.

1.9.1. The aircraft was fitted with an ICOM A200 VHF Radio as approved by the regulator at the time of certification by the regulator, and no defects were reported in respect of this equipment.

1.10 Aerodrome Information

Aerodrome Location	Klerksdorp aerodrome (FAKD)		
Aerodrome Co-ordinates	S26° 52.00', E026° 43.00'		
Aerodrome Elevation	4400ft		
Runway Designations	05/23	15/23	18/36
Runway Dimensions	900/25	1000/25	1500/18
Runway Used	36		
Runway Surface	Asphalt		
Approach Facilities	PAPI – fitted only on runway 18		

1.11 Flight Recorders

1.11.1 The aircraft was not fitted with a Cockpit Voice Recorder (CVR) or a Flight Data Recorder (FDR) and neither was required by regulations to be fitted to this type of aircraft.

1.12 Wreckage and Impact Information

1.12.1. The pilot reported that the aircraft experienced a high rate of descent which resulted in a hard landing on the grass area next to the runway. The aircraft then skidded for approximately 10 meters on the grass before it came to a halt, in a wings level attitude.

1.12.3. All the landing gear broke off as a result of the impact and were found in the vicinity of the aircraft, within a 10 meter radius.

1.13 Medical and Pathological Information

1.13.1. Neither the pilot nor the passenger was injured during the accident.

1.14 Fire

1.14.1. There was no pre or post-impact fire.

1.15 Survival Aspects

1.15.1. The pilot and the passenger were properly restrained by their safety restraint harnesses. The accident was considered survivable because of the effects of the impact and the extent of the damages on the airframe, particularly to the cabin area. The occupants of the aircraft did not need help or emergency services to evacuate the aircraft.

1.16 Tests and Research

1.16.1. According to the manufacturer, over time, the thickness of Jabiru wooden propellers can vary at the mounting point due to changes in humidity, and temperature. These thickness changes can sometimes cause the propeller fastening bolts to become loose, leading to damage to the propeller and engine. To avoid this, the Jabiru Maintenance Manuals typically demands inspections of the propeller bolt tensions after the initial 25 hours of engine running and every 50 hours thereafter. (See Appendix 1)

1.16.2. An engineer from the manufacturer on reviewing the photograph of the propeller flange stated that the propeller flange appears partially polished, possibly caused by the loose propeller rubbing against it. He indicated that a normal flange would be darker and dirtier. (See Appendix 1)

1.16.3. The pilot, who is also the operator of the aircraft, stated that he is a qualified diesel mechanic, and he carried out all the maintenance on the aircraft, except the annual inspections and any other major or complicated tasks.

1.16.4. The approved person stated that the pilot had indicated to him, on the day he came to carry out the annual inspection, that he had checked the propeller box himself, two weeks prior to the arrival of the approved person.

1.16.5. The pilot also stated that he had checked and fastened the propeller fasteners, approximately 50 hrs prior to the annual inspection.

1.16.6. According to the manufacturer, generally, shedding of the propellers is caused by maintenance issues with the propeller fasteners. The manufacturer issued a service bulletin (SB JSB 009-1, Appendix 2) on the 4th April 2005, wherein they demand inspections of the propeller bolt tensions after initial 25hrs of engine running, and every 50hrs thereafter. (See appendix 1)

1.16.7. Since the propeller and its securing bolts were never found, no tests could be carried out.

1.17 Organizational and Management Information

- 1.17.1. This was a private flight, as the aircraft was owned and operated privately. The pilot also carried out the minor maintenance tasks himself, as and when this was required.
- 1.17.2. According to records obtained from SACAA, the aircraft was maintained and the last annual inspection was carried out on the 16th of May 2007, at 265 hours and it was carried out by an approved person, AP 77, as required by the regulations.
- 1.17.3. The AP was properly rated for this type of aircraft.
- 1.17.4. The aircraft's authority to fly was issued by the regulator on the 18th of May 2007.

1.18 Additional Information

- 1.18.1. The accident happened on Friday (01 June, 2007) and the SACAA was only informed about it the following Monday (04 June, 2007). The pilot advised that he could not get hold of anyone within the SACAA.
- 1.18.2. The pilot stated that the propeller had never been removed, and neither was there any record showing the removal of the propeller, prior to the accident.
- 1.18.4. The pilot stated that he was not aware of the manufacturer's service bulletin that demanded inspections of the propeller bolt tensions after the initial 25hrs of engine running and every 50hrs thereafter.
- 1.18.5. The pilot was unable to forward copies of the maintenance log book to the investigator in charge, as he indicated that he could not find the original. Although there are copies available showing when the annual inspections were carried out, no records showing any removals or installation of the propeller or any other minor maintenance tasks, could be found.
- 1.18.6. The checklist that the approved person uses to carry out the annual inspection does not require a thorough, detailed inspection of the propeller or its mounting.
- 1.18.7. Although the manufacturer requires that certain checks be carried out at 25, 50 and 100 hour intervals, these were not done on this aircraft as the aircraft only flew 22 hours between the change of ownership inspection on 16 May 2005 and the annual inspection on 15 May 2006 and again another 14 hours before the next annual inspection on 16 May 2007.

1.19 Useful or Effective Investigation Techniques

- 1.19.1. None

2. ANALYSIS

- 2.1. The aircraft was serviceable at the time of the accident, and no entries were made against any of its components before take off.

- 2.2. Although the pilot stated that he had inspected the propeller during his pre-flight inspection, he could have failed to pick up any signs of looseness in the propeller securing bolts.
- 2.3. The pilot was carrying out some of the maintenance himself on the aircraft, with the exception being the annual inspections. The pilot could have carried out certain maintenance tasks without the approved basic training, knowledge or tools and as such would not have been adequately qualified to ensure that this is done correctly.
- 2.4. The approved person performed an annual inspection on the aircraft, but he was not obliged to carry out any other tasks than listed on his checklist. He was either limited to what the owner wanted done on the aircraft, or he relied that the owner had carried out certain tasks, if the owner said he had done so.
- 2.5. As stated by the manufacturer, as per the SB, climatic changes could have played a role in the departing of the propeller from the engine.
- 2.6. As the aircraft had flown only a few hours per year, it could be that the propeller bolts never got checked, as the required inspections intervals were not reached before an annual inspection and it gets taken for granted that they will be done at the annual inspection. However, this may then also not be done at an annual inspection either.
- 2.7. After the propeller departed the engine, and with an increasing rate of descent, a hard landing resulted.

3. CONCLUSION

3.1. Findings

3.1.1. Pilot

- 3.1.1.1. The pilot was appropriately licensed in accordance with the regulations and both his licence and his medical certificate were valid at the time of the accident,
- 3.1.1.2. The pilot is a qualified diesel mechanic, and he is also the son of the owner. He was responsible for the general oversight and operation of the aircraft.
- 3.1.1.3. The pilot carried out the minor maintenance himself, but was not aware of the service bulletin that was issued by the manufacturer on April 4th 2005, that required the inspection of the propeller bolt's tension after the initial 25 hrs of engine running and then again every 50 hrs thereafter.
- 3.1.1.4. The pilot did not report the accident immediately after it happened, although he was not injured

3.1.2. Aircraft

- 3.1.2.1. The aircraft had a valid certificate of registration and it had a valid authority to fly.

3.1.3. Maintenance

- 3.1.3.1. Annual inspections at the correct intervals were carried out on the aircraft, as required by the regulations.

- 3.1.3.2. Minor maintenance on the aircraft was carried out by the pilot, but maintenance records revealed that as required by the regulations, all annual inspections were carried out by approved persons.
- 3.1.3.3. The checklist that the approved person used to carry out the annual inspection did not require a thorough, detailed inspection of the propeller or its mounting.
- 3.1.3.4. Although the manufacturer require that certain checks be carried out at 25, 50 and 100 hour intervals, these were not done on this aircraft as the aircraft had only flown 22 hours between the change of ownership inspection on 16 May 2005 and the annual inspection on 15 May 2006. Only another 14 hours were flown before the next annual inspection on 16 May 2007. The aircraft was subjected annual inspections before reaching the interval for the propeller bolts tension inspection.
- 3.1.3.5. The pilot was unable to forward copies of the maintenance log book to the investigator in charge, as he indicated that he could not find the originals.

3.2. Probable Cause/s

- 3.2.1 The aircraft landed hard next to the runway after the propeller separated from the aircraft during take-off. The separation was as result of the loosening of the propeller fastening bolts. This loosening was due to climatic changes, and the lack of knowledge by the pilot about the service bulletin that demanded periodic inspections of these fasteners.

4. SAFETY RECOMMENDATIONS

- 4.1. It is recommended that the Commissioner of Civil Aviation (CCA) should require the SACAA to ensure awareness by owners of the need to have the propeller mounting bolts' torque verified at 25, 50 or 100hrs intervals, or at annual inspections.
- 4.2. It is also recommended that the Commissioner request the SACAA to ensure implementation and compliance to the Jabiru aircraft service bulletin.

5. APPENDICES

- 5.1. Appendix 1 – Manufacturer's correspondence.
- 5.2. Appendix 2 – Manufacturer's Service Bulletin

END-

Report reviewed and amended by the Advisory Safety Panel

APPENDICES:

Appendix 1 – Manufacturer's correspondence

Jabiru Propellers are used on an on-condition basis – they do not have a fixed life. The propeller is in the final stages of Certification to FAR Part 35, so the design has met all the requirements of that part.

Without inspecting the propeller it is impossible to be certain, however generally shedding of the propeller is caused by maintenance issues with the propeller fasteners. JSB009 (attached) refers to the installation of Jabiru Propellers. The propeller flange appears partially polished, possibly caused by the loose propeller rubbing against it – a normal flange is darker and dirtier.

In the past we have had some propellers shed their fiberglass sheathing from one blade, (resulting in a very out of balance propeller) and the propeller has remained attached to the engine despite the massive loads. The only cases we have seen where the propeller departs the engine have resulted from failure of the attaching bolts due to too low bolt tensions, worn out self-locking nuts etc.

Regards,

Doug Smith

Engineer, Jabiru Aircraft

Appendix 2 – Service Bulletin

JABIRU AIRCRAFT PTY LTD

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Queensland, Australia. Email: info@jabiru.net.au

SERVICE BULLETIN: JSB 009-1

Issue: 1

Date: 4th April 2005

Subject: Alternate Propeller Mount System

1. Applicability:

All Jabiru aircraft.

2. Background:

Over time the thickness of Jabiru wooden propellers can vary at the mounting point due to changes in humidity, temperature etc. These thickness changes can sometimes cause the propeller fastening bolts to become loose, leading to damage to the propeller and engine. To avoid this, Jabiru Maintenance Manuals typically demand inspections of the propeller bolt tensions after the initial 25 hours of engine running and every 50 hours thereafter.

Jabiru aircraft have developed an alternate propeller mounting system to allow an increase in inspection intervals for propeller mount bolts. This system is applicable only when using Jabiru 2-bladed wooden propellers. When using this propeller mounting system the propeller bolts should be checked after the initial 25 hours of engine running, then annually thereafter.

3. Recommendations:

It is recommended that owners upgrade to the new system as it provides a more tolerant system of maintaining propeller bolt tensions.

4. Compliance:

This modification is optional, though recommended for all owners.

The new system has been introduced as standard from the following aircraft serial numbers:

Model LSA, SP, UL: - From airframe S/No. 642 onwards.

Model J400 Family: - From airframe S/No. 240 onwards.

Model J160 Family: - From airframe S/No. 26, then 32 onwards.

5. Procedure:

i) Note that all work must be conducted by an authorised person, such as the kit builder or a holder of an Australian Level 2 Maintenance Authority (or equivalent under local regulations).

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ii) Mark the spinner to show it's orientation relative to the propeller and backing plate(s).

This step is very important to ensure simple re-assembly. Remove the spinner.

iii) While it is possible to change the bolts on some models without removing the

propeller, it is recommended that the propeller be taken off to allow inspection of the propeller drive faces and drive bushes.

iv) Visually inspect the drive face of the propeller for damage. Slide the drive bushes into the holes in the propeller hub by hand. The bushes should be a light push fit. If the bushes are loose in the propeller they can allow it to move, which in time will damage both the propeller and the engine. If the propeller has damage to the drive face or loose drive bushes, contact Jabiru Aircraft or our local representative for a repair scheme.

v) Re-fit the propeller to the aircraft using the longer bolts and Belleville washer stack as shown generally in Figure 1 below (contact Jabiru Aircraft or our local representative for aircraft specific details). Note that the bolts must be oriented with the threaded end facing away from the engine. Details of the variations to the propeller installation for the different Jabiru models are available from Jabiru Aircraft or our local representative.

vi) Nominal bolt tension is 6 ft-lb. Track propeller in accordance with normal Jabiru procedures, taking care not to exceed 6 ft-lb as tightening the bolts beyond this tension will flatten the washer stack completely and prevent it from moving to accommodate changes in propeller thickness.

vii) Re-fit the spinner, aligning it with the propeller and backing plates using the marks made in step i). Check the spinner tracking in accordance with the procedure outlined in the installation manual.

viii) Annotate the aircraft's maintenance log to show that Jabiru Service Bulletin JSB 009 has been carried out.

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