SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Section/division **Accident and Incident Investigations Division** Form Number: CA 12-12a

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/9553		
Aircraft Registration	ZU-SES	**Date of Accident**	12 May 2016		**Time of Accident**	0545Z	
Type of Aircraft	Jabiru SP		**Type of Operation**		Private (Part 91)		
Pilot-in-command Licence Type	Private Pilot		**Age**	64	**Licence Valid**	Yes	
Pilot-in-command Flying Experience	Total Flying Hours		2498.0		Hours on Type	892.4	
Last point of departure	Kitty Hawk Aerodrome, Gauteng province						
Next point of intended landing	Mooketsi, Limpopo province						
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)							
Plot 15, Boschkop at GPS position S 25°50'56.4" E 028°27'4.5"							
Meteorological Information	Surface wind: 060°/2 Kts, Visibility: 10000m, Temperature: 15.9°C, Dew point: 9.1°C, Cloud cover: 2 Octas, Cloud base: 2000m.						
Number of people on board	1+1	**No. of people injured**	1		**No. of people killed**	1	

Synopsis

On 12 May 2016 at approximately 0543Z the pilot, accompanied by a passenger, commenced their take-off roll from Runway 01 at Kitty Hawk Aerodrome.

During the take-off, the aircraft experience a loss in engine power. It then turned to the right, followed by a (270) two hundred and seventy degree turn to his left, after which the aircraft impacted the ground.

The pilot was fatally injured and the passenger suffered minor injuries during the sequence of the accident. The aircraft was destroyed.

The investigation revealed the pilot attempted an unsuccessful forced landing due to a partial engine power loss. The partial engine power loss was as a result of the number three cylinder, a tappet adjuster of the inlet valve was found at the bottom of the rocker chamber. The loose tappet adjuster renders the valve operation inoperative, which caused the cylinder not to function and resulted in the engine providing power on only three cylinders.

Probable Cause

Unsuccessful forced landing due to a partial engine power loss.

Contributing Factor

Partial engine power loss due to a loose tappet adjuster.
The overweight condition resulted in degraded performance

SRP Date	17 January 2017	Release Date	02 February 2017

AIRCRAFT ACCIDENT REPORT

Name of Owner	**:** AJ Pienaar
Name of Operator	**:** AJ Pienaar
Manufacturer	**:** Shadow Lite cc
Model	**:** Jabiru SP
Nationality	**:** South African
Registration Marks	**:** ZU-SES
Place	**:** Plot 15, Boschkop, Gauteng
Date	**:** 12 May 2016
Time	**:** 0545Z

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 (2011) 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 produced without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 A Jabiru SP aeroplane, registration ZU-SES, took off from Kitty Hawk Aerodrome on a private flight with the intention of landing at an aerodrome at Mooketsi. The private flight was being conducted under visual meteorological conditions (VMC) and during day time.

1.1.2 According to the passenger the aircraft was refuelled to capacity. After taxiing to the holding point of Runway 01 at Kitty Hawk Aerodrome, the pilot commenced with his power checks. The passenger did not notice any abnormality during the power checks and neither did the pilot mention any abnormalities to him.

1.1.3 After the power checks, the pilot did communicate his intentions to someone that was not known to the passenger. They then entered Runway 01 and commenced their take-off roll.

1.1.4 The passenger stated that the pilot did not mention any abnormality during the take-off run, but immediately after they got air borne the pilot mentioned that there was still a vibration on the engine.

1.1.5 The passenger stated that the pilot raised the nose of the aircraft, but it felt if they were not gaining height. The passenger stated that the pilot then made a steep turn to the left and he noticed a decrease in height. The pilot then asked the passenger if he could see the runway. He was looking over his right shoulder to the rear and could only see the hangers at Kitty Hawk Aerodrome. The passenger then felt a negative G condition and when he looked in front of him, he could see the ground approaching. This was the last recall from the passenger before he regained his consciousness after they had impacted the ground.

Figure 1 A picture of the accident aircraft before the accident

1.2 Injuries to Persons

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

1.2.1 The passenger stated that when he had regained his consciousness after the accident, the pilot was still in his seat but unconscious. The passenger then got out of the aircraft as fuel was leaking onto the engine. He then went to the pilot side of the aircraft to move the left wing out of the way to reach the pilot. During this time, the pilot regained his consciousness but did not react to any conversation.

1.2.2 The pilot was removed from his seat by his son and bystanders. Shortly thereafter emergency services arrived on scene and they administered CPR for approximately 45 minutes, but the pilot passed away.

1.3 Damage to Aircraft

1.3.1 The aircraft was destroyed during the sequence of the accident.

Figure 2 Damage caused to the aircraft during the accident

1.4 Other Damage

1.4.1 No damage was caused to the surrounded vegetation but minor ground contamination was caused by the leaking fuel and oil.

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	64
Licence Number	0271057051	Licence Type	Private Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	None				
Medical Expiry Date	30 June 2016				
Restrictions	Corrective lenses; Hypertension protocol				
Previous Accidents	No previous accidents on file				

Flying Experience:

Total Hours	2498.0
Total Past 90 Days	45.7
Total on Type Past 90 Days	5.2
Total on Type	892.4

1.5.1 The abovementioned hours were calculated from hours in the flight folio logbooks of various aircraft as the last entry in the pilot's logbook was on 15 June 2015.

1.6 Aircraft Information

Airframe:

Type	Jabiru SP	
Serial Number	461	
Manufacturer	Shadow Lite cc	
Year of Manufacture	2001	
Total Airframe Hours (At Time of Accident)	2656.5	
Last Annual Inspection (Date & Hours)	9 December 2015	2632.0
Hours since Last Annual Inspection	24.5	
Authority to Fly (Issue Date)	10 December 2015	
C of R (Issue Date) (Present Owner)	14 March 2008	
Operating Categories	Private-Part 24	

Engine:

Type	Jabiru 2200
Serial Number	22A1203
Hours Since New	Not known
Hours Since Overhaul	Not known

The hours since new and hours since overhaul are not known as no record was kept of the time and hours. The engine was removed; therefore the engine hours are not available.

Propeller:

Type	Sensenich W62HJ42
Serial Number	AH 0399
Hours Since New	1112.3
Hours Since Overhaul	TBO not yet reached

1.6.1 Aircraft Weight Calculation

Item	Weight kg
Aircraft empty weight	268.2
Pilot	102.0
Passenger	75.0
Fuel (16 l+65 l=81L)	58.2
Baggage	11.5
Total	**514.9**

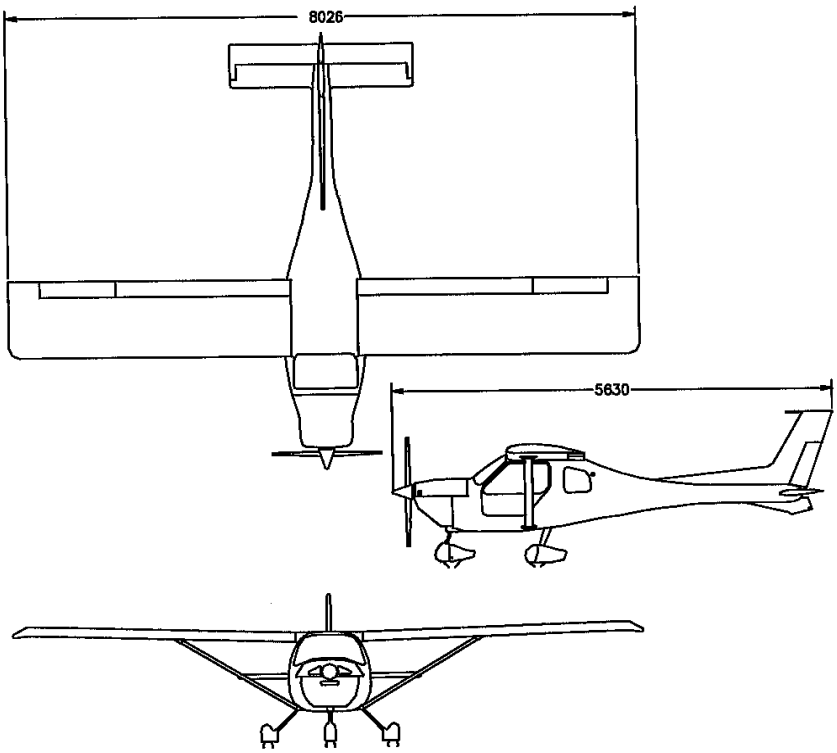
The aircraft was operated at a weight of 514.9 kg which was 44.9 kg more than the certified maximum all up weight of 470 kg.

It has been calculated the aircraft got airborne overweight and out of the ENVELOPE behind the AFT limit.

Increase in aircraft weight will cause the STALL speed to increase.

An increase in stall speed together with an increase in load factor during the bank when the pilot tried to turn back to the runway will increase the STALL speed even more.

1.6.2 Aircraft Information



1.6.3 The Jabiru SP is a 2 seat, conventional configured high-wing, strut-embraced monoplane with wing flaps, mass balanced elevator and an in-flight adjustable trim. The aircraft is of all composite construction.
The aircraft has a cruise speed of 100 knots at 3050 rpm with a range of approximately 1030 nautical miles.

The Jabiru is equipped with a 4 stroke, 2200cc engine, designed specifically for the Jabiru aircraft.

The aircraft has a fixed tricycle undercarriage with steerable nose wheel with hand-operated in-line hydraulic disk brakes.

1.7 Meteorological Information

1.7.1 Meteorological information entered in the table below was obtained from the South African Weather Service (SAWS).

Wind direction	060°M	Wind speed	2 Knots	Visibility	10000m
Temperature	15.9°C	Cloud cover	2 Octas	Cloud base	2000m
Dew point	9.1°C				

11.7.2 The abovementioned weather report was recorded at Irene, Pretoria at 0600Z and contains the most likely surface conditions at the time of the accident.

1.8 Aids to Navigation

1.8.1 The aircraft was equipped with standard navigational equipment as required by the Regulator. There were no recorded defects to navigational equipment prior to the flight.

1.9 Communications

1.9.1 The aircraft was equipped with standard communication equipment as required by the Regulator. There were no recorded defects to communication equipment prior to the flight.

1.9.2 The pilot did communicate his intentions on very high frequency (VHF) 120.65 MHz.

1.10 Aerodrome Information

1.10.1 The accident happened outside the boundaries of an aerodrome.

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 total flight time from the moment the EFIS system start recording the aircraft speed till the time of impact was 93 seconds and the flight path is illustrated in the figure below.

Figure 3 The flight path from take off

1.12.2 The front section of the cockpit was significantly damaged. Both the left- and right-hand window posts broke off completely and the cockpit floor was impaired. The left wing was broken at the point where it attached to the cockpit of the aircraft.

Figure 4 Damage to the left wing

Figure 5 Broken window posts

1.12.3 The engine remained retained inside the engine mounting support and displayed heavy impact damage at the bottom of the engine.

1.12.4 The propeller was attached to the engine and both the propeller tips were separated from the propeller.

1.12.5 The right wing sustained minimum damage while the left wing was separated from the fuselage at the point where it attached to the fuselage. Orientation of the traces of impact of the left wing on the ground showed that the general flight direction of the aircraft at impact was 080° magnetic. The aircraft came to rest facing 312° magnetic.

1.12.6 The nose landing gear separated from the fuselage and was found in close proximity of the fuselage. The left-hand main landing gear was separated from the fuselage and was found at the impact point.

1.12.7 A few personal objects belonging to the occupants were found ejected around the wreckage. More personal belongings were found scattered inside the cockpit.

1.12.8 Although damaged just aft of the cockpit, the tail section was still attached to the fuselage with minimum damage to the empennage area.

1.12.9 First investigation on the crash site concluded that no part of the airframe structure and no control surface was missing.

1.12.10 All flight controls were checked which proved to be complete. No pre-impact anomaly was found. Flight control continuity was established from the cockpit to the flight controls.

1.12.11 The position of the engine control and carburettor heat could not be established, but it was confirmed that the throttle control and carburettor heat control ends were properly attached at impact.

1.12.12 The flap selector lever was set for 1 notch flaps down (15° flap down), which correlates with the flap position of the flaps after the accident. This is a standard take-off flap setting.

1.12.13 The elevator trim was found to be in the neutral position which is the normal setting for take-off.

1.12.14 The fuel tanks were full and the fuel selector was selected to the "on" position. The fuel pump was found in the on position, which is also the normal position for the take-off.

1.12.15 Both the pilot and his passenger were restrained by the aircraft safety harnesses and no damage, distortion, or elongation were found to any of the belts or buckles.

1.12.16 The aircraft was equipped with a MGL Stratomaster EFIS (Electronic Flight Instrument System). The screen of the instrument was separated from the instrument. The memory card was removed and downloaded after the accident. The rest of the aircraft instruments did not sustain any impact damage. The aircraft was fitted with a Garmin Aera 500 GPS (Global Positioning System) which was dislodge from its attachment bracket but did not sustained any visual damage.

1.12.17 The propeller remained attached to the engine. A piece of the propeller tip (approximately 120 mm long) was separated from the propeller and was found approximately 20 meters from the wreckage. The other propeller tip was broken at approximately 280 mm from the tip but was still attached to the propeller. No marks were visible on the propeller, indicating the propeller did not make contact with any object while it was turning.

1.12.18 The engine was retained within the mounting structure, with heavy impact damage to the bottom of the engine and surrounding structure. The engine was removed after the accident and disassembled in order to examine the engine for any internal failures. See Test and Research for a detailed report on the teardown inspection.

1.13 Medical and Pathological Information

1.13.1 The pilot was fatally injured and his passenger sustained minor injuries during the sequence of the accident.

1.13.2 A post-mortem examination was performed on the deceased pilot after the accident. The results of the post-mortem examination and toxicology tests were not available at the time the report was compiled. Should any of the results, once received, indicate that medical aspects may have affected the performance of the pilot, this will be considered as new evidence and the investigation re-opened.

1.14 Fire

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

1.15 Survival Aspects

1.15.1 The accident was considered survivable due to the low kinetic energy associated with the unsuccessful forced landing. The pilot and passenger were wearing their safety harnesses. The pilot survived the accident initially, but his injuries, combined with pathological conditions, caused his death approximately 45 minutes after the accident. The passenger survived the accident.

1.16 Tests and Research

1.16.1 The following is an extract from a document "Managing partial power loss after take-off in single engine aircraft" published by the Australian Transport Safety Bureau.

"Partial power loss occurrences have a very broad range of characteristics by nature. The most effective risk control method for managing these occurrences may be significantly different between pilots of varying experience and training, aircraft models and the environmental conditions."

"Partial engine power loss during and after take-off
A partial engine power loss is where the engine is providing less power than that commanded by the pilot, but more power than idle thrust. A partial engine power loss after take-off event is one that occurs after the aircraft is air borne and on initial climb immediately after take-off, generally below circuit height, while being within close proximity to the departure aerodrome."

"Partial engine power loss is more complex and more frequent than a complete engine power loss.
A partial engine power loss presents a more complex scenario to the pilot than a complete engine power loss. Pilots have been trained to deal with a complete power loss scenario with a set of basic checks and procedures before first solo flight. Furthermore, this training, which emphasises the limited time available to respond, is continually drilled in an attempt to make it second nature. However, pilots are not generally trained to deal with a partially failed engine. Following a complete engine failure, a forced landing is inevitable, whereas in a partial power loss, pilots are faced with making a difficult decision whether to continue flight or to conduct an immediate forced landing.

The course of action chosen following such a partial power loss after take-off can be strongly influenced by the fact that the engine is still providing some power, but this power may be unreliable. As the pilot, you may also have a strong desire to return the aircraft to the runway to avoid aircraft damage associated with a forced landing on an unprepared surface. The complexity of decision making in such circumstances is further compounded by the general lack of discussion and training on this issue. In dealing with this, you will need to rely on your knowledge and experience.

As occurrences of partial engine power loss occur three times more often than a total power loss, your pre-flight planning should consider a partial engine power loss scenario as much as a complete power loss situation."

Examples of the causes of engine power loss include, but are not limited to:
Mechanical discontinuities within the engine.
Restricted fuel or air flow or limited combustion in the engine, often due to fuel starvation, exhaustion or spark plug fouling.
Mechanical blockage in the engine setting controls, such as a stuck or severed throttle cable.

1.16.2 After the accident the memory card of the MGL Stratomaster EFIS system was downloaded and analysed. The investigator was assisted by a pilot who was in possession of the software to download the information. The information obtained indicated some banking manoeuvres towards the end of the recording but not in access of 30° . A reasonable attempt to flare the aircraft, approximately 15°, was also evident at the end of the recording.

It was evident between 15 and 20 seconds after the aircraft had reached a speed of 30 knots that something had happened within the engine which caused a significant drop in engine revolutions per minute (RPM) from approximately 2780 RPM to approximately 2390 RPM. The RPM continued to drop till the end of the recording, when it dropped to approximately 2300 RPM.

The following graphs indicate changes in engine parameters between 15 and 20 seconds after the aircraft reached a speed of 30kts on the runway:

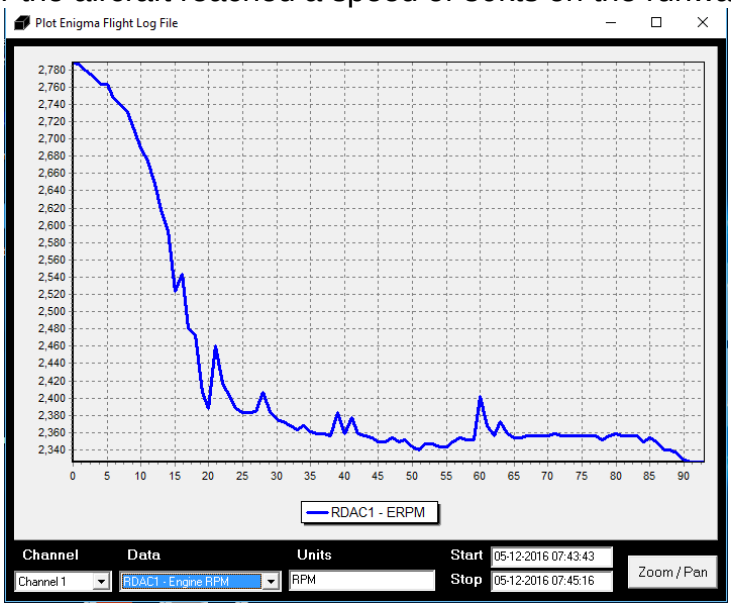


Figure 6 Engine RPM during the entire flight

At approximately the same time interval, the fuel flow increased.

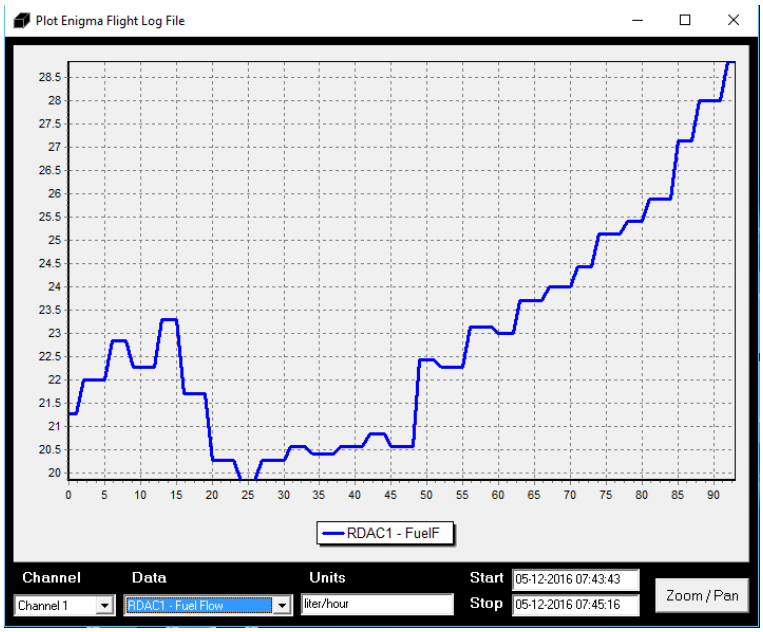


Figure 7 Indication of an increase of fuel flow

At approximately the same time, a loss in exhaust gas temperature (EGT) and a loss in cylinder head temperature (CHT) were experienced on cylinder number three, whereas the rest of the cylinders operated normally.

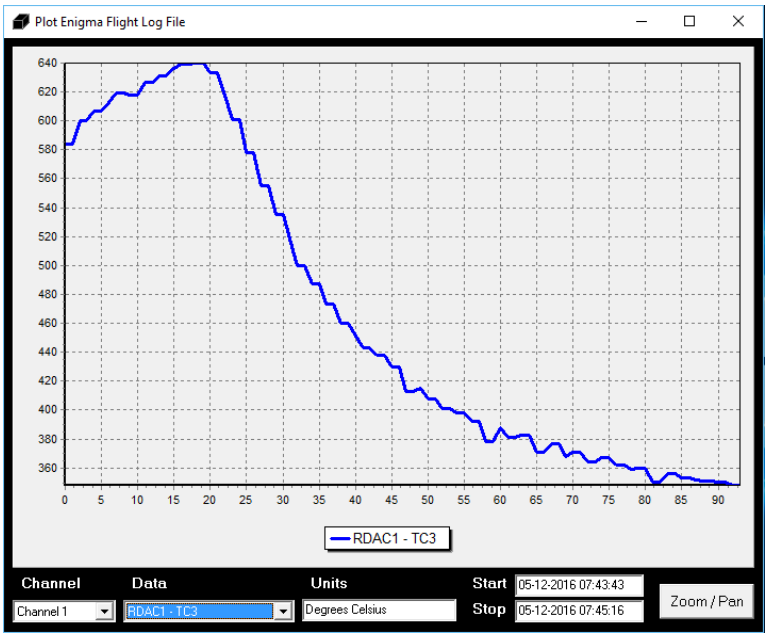


Figure 8 Indication of a drop in EGT on number three cylinder

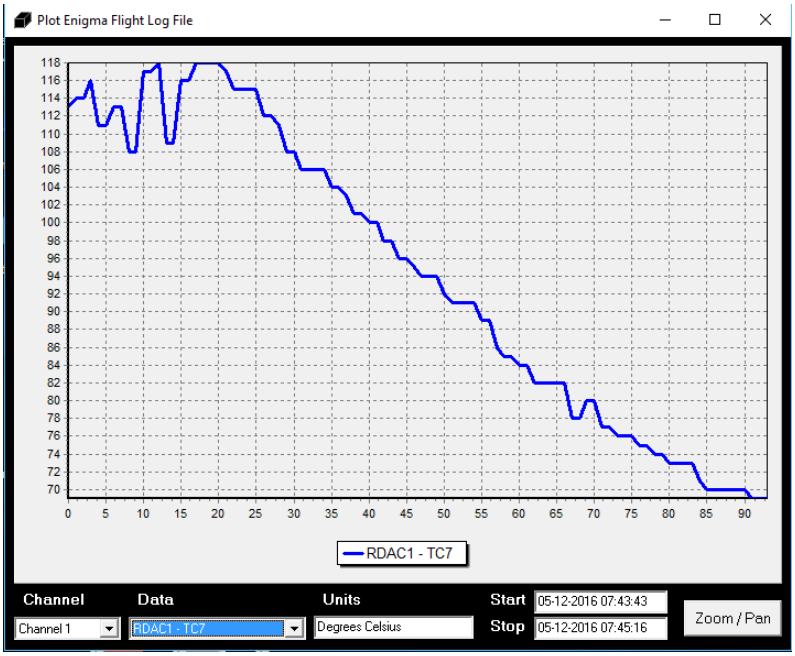


Figure 9 Indication of a drop in CHT on number three cylinder

1.16.3 After the accident, the engine was removed from the airframe and sent to Jabiru Aircraft SA to assist the investigator-in-charge with a teardown inspection of the engine.

As external damages to the engine were minimal, the decision was taken to attempt an engine start to evaluate the engine behaviour. A bypass oil cooler manifold was fitted to the engine as the oil cooler was damaged during the sequence of the accident.

The propeller flange had to be removed and replaced by another flange to allow the standard factory propeller to be fitted to the engine.

An attempt was made to turn the engine by hand, but this was not possible as the right-hand side adjustable ignition coil had moved and made contact with the flywheel. After the coil was reset it was possible to turn the engine by hand.

An attempt was made to start the engine. At first the engine had difficulty to start, but once the engine had started, it had a pronounced vibration. The engine was then taken to full throttle where the engine only developed 2500 RPM, whereas it should have developed between 2900-3000 RPM. The engine was then shut down. Exhaust manifold temperature readings were taken. Number three exhaust manifold had a temperature reading of 59°C, whereas the other three exhaust manifolds had readings of between 85.5-96.5°C.

The number three-cylinder rocker cover was then removed and it was observed that the intake tappet adjuster was lying at the bottom of the rocker chamber and not fitted to the rocker arm as it was supposed to be.

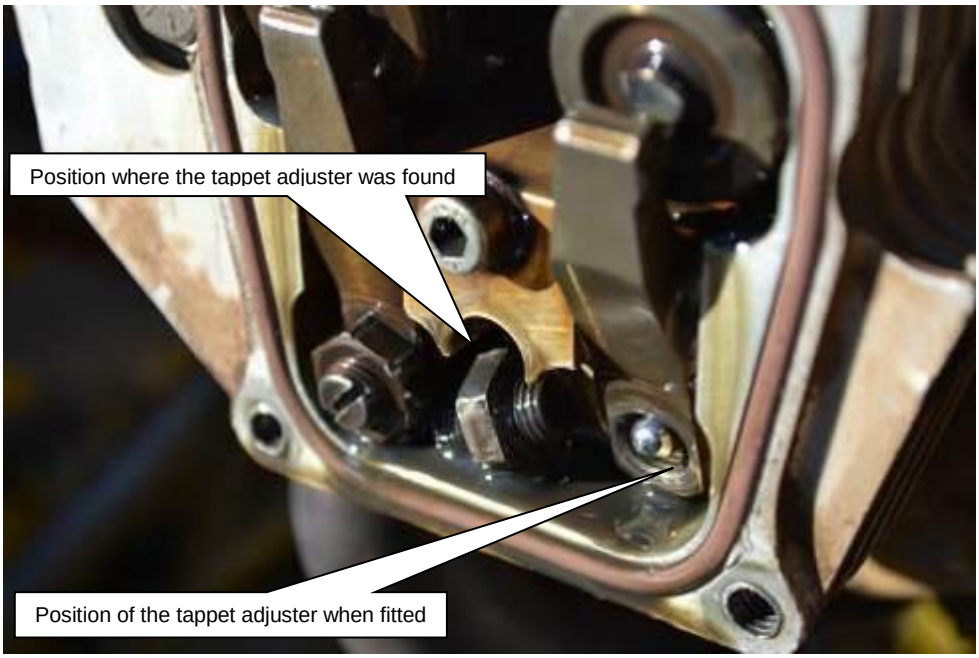


Figure 10 The tappet adjuster at the bottom of the rocker chamber

1.17 Organisational and Management Information

1.17.1 The last annual inspection before the accident was certified was carried out on 9 December 2015 at 2632.0 airframe hours by an RAASA approved person (AP) that was in possession of a valid AP certificate.

1.17.2 According to the aircraft logbook, on 26 November 2013 engine serial number 22A1203 was removed from the aircraft and engine serial number 22A814 was fitted to the aircraft.

1.17.3 The last confirmation of an Annual Inspection that was presented to the Recreation Aviation Administration South Africa (RAASA) was signed by a RAASA Approved Person (AP) on 9 December 2015. According to this confirmation, a Jabiru engine serial number 22A520 was fitted to the aircraft whereas serial number 22A1203 was fitted to the aircraft at the time of the accident.

1.17.4 The latest Authority to Fly that was issued by RAASA on 10 December 2015 indicated engine serial number 22A520 was installed in the aircraft, which was not the same engine that was installed in the aircraft at the time of the accident.

1.17.5 Maintenance records indicate that several Service Bulletins and Service Letters that were prioritised by the manufacturer as Mandatory, Compulsory or Recommended were not incorporated in the accident aircraft.

1.18 Additional Information

1.18.1 An eyewitness who was returning from the runway to the fuel bay in his vehicle reported that during the take-off of ZU-SES, the take-off roll was longer than normal and once the aircraft was in the air, it kept low.

When the aircraft was near the end of the runway, it was still low and shortly thereafter the aircraft disappeared behind the trees. The witness was standing looking in the direction where the aircraft disappeared when he suddenly saw the right-hand wing appearing above the trees. The wing was in a vertical position when it became visible.

Shortly thereafter the witness heard a loud bang and he then realised the aircraft impacted the ground.

1.18.2 Information that came available during the investigation indicated that all tappet clearances were set in the week preceding the accident.

1.19 Useful or Effective Investigation Techniques

1.19.1 No new methods were applied.

2. ANALYSIS

2.1 Man

The pilot was the holder of a valid Private Pilot Licence (Aircraft) at the time of the accident and had the aircraft type endorsed on it. The pilot was in possession of a valid medical certificate with corrective lenses and hypertension protocol endorsed on it.

The pilot's total flying hours at the time of the accident was 2498.00 hours of which 892.4 hours were on the Jabiru SP. These hours might not be correct as the last time the pilot logbook was completed was on 30 June 2015. The investigator-in-charge calculated the abovementioned hours from copies of various aircraft Flight Folio Logbooks.

2.2 Machine

Maintenance documents revealed the last annual inspection on this aircraft was done on 2632.0 hours on 9 December 2015 by an approved person (AP) which was in possession of a valid AP certificate.

The aircraft's engine was removed and replaced several times. These procedures were not accurately documented, which resulted in traceability difficulties as to when and where engine changes were made and the duration of fitting certain engines to the aircraft.

Documentation completed by the AP after the last maintenance contained incorrect information. The incorrect information was also submitted to RAASA in the application for a renewal of the Authority to Fly.

Maintenance was done to the aircraft without completion of any documentation as proof of the maintenance that was done in the week preceding the accident.

Maintenance was also done to the aircraft by a person/persons not approved to do maintenance on the aircraft.

Several Service Bulletins and Service Letters that were issued and labelled as Mandatory, Compulsory or Recommended were not implemented in the aircraft.

The aircraft was fuelled to capacity and an additional 16 litres of fuel was placed inside the aircraft with some baggage, which caused the take-off weight to be 44.9 kg more than the maximum approved take-off weight.

During a teardown inspection of the number three cylinder, a tappet adjuster of the inlet valve was found at the bottom of the rocker chamber. The loose tappet adjuster renders the valve operation inoperative, which caused the cylinder not to function and resulted in the engine providing power on only three cylinders.

The pilot experienced a partial loss of engine power during/after take-off, whereby the pilot was forced to do a forced landing at relative low airspeed.

Due to the overweight and increased load factor as a result of the turn back the STALL speed was increased even more.

2.3 Environment

Fine weather conditions prevailed at the time of the accident.

3. CONCLUSION

3.1 Findings

3.1.1 The pilot was properly certified and qualified according to regulations to perform this flight and was in possession of a valid medical certificate.

3.1.2 Technical documentation (Logbook) was not filled in unabridged, which caused engine hours to be incorrect and/or not available.

3.1.3 Maintenance was done to the aircraft from time to time by a person that was not the owner, pilot, AP or Maintenance Engineer, without the completion of technical documents after the maintenance was completed.

3.1.4 The aircraft did not have a valid Authority to Fly as the current certificate contains an engine serial number which was not installed on the aircraft at the time of the accident.

3.1.5 Mandatory, Compulsory or Recommended Service Bulletins/Service Letters were not incorporated during maintenance actions. Also, the quality of the maintenance services was found to be unsatisfactorily.

3.1.6 The take-off weight of the aircraft was higher than the Maximum Certified take-off weight laid down by the manufacturer as it degraded performance of the glider aircraft.

3.1.7 The tappet adjuster on the number three-cylinder inlet valve was found to be not locked in position but on the bottom of the rocker chamber. The most likely reason for the out-of-position tappet adjuster was improper locking or no locking of the tappet adjuster during maintenance. The out of position tappet adjusted caused a partial power loss of the engine during take-off.

3.1.8 A combination of reduced power, overweight and increased load factor on the wing during the final stages of the flight could have resulted in the aircraft stalling before impact.

3.2 Probable Cause/s

Unsuccessful forced landing due to a partial engine power loss.

3.3 Contributing Factor

Partial engine power loss due to a loose tappet adjuster.

The overweight condition resulted in degraded performance of the glider

4. SAFETY RECOMMENDATIONS

4.1.1 None.

5. APPENDICES

5.1 Appendix A Engine bench run and inspection report

Appendix A

AMO 909 Report: Date: 21 June 2016
Make: Jabiru Model: SP
Aircraft reg: ZU - SES Airframe Serial Number: 461
Engine Model: Jabiru 2200 Engine Serial Number: 22A1203

Prepared By: Mr. Len Alford
SACAA accident Investigator present for Bench Run: Mr Chris Williams

This Report

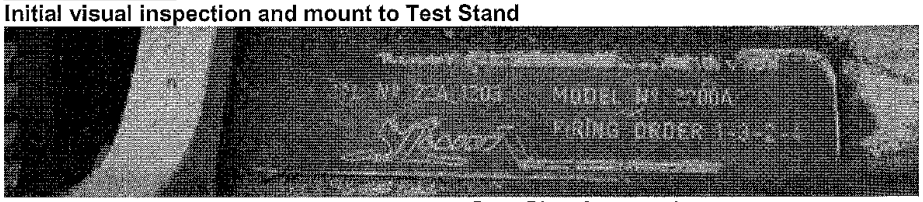
In an effort to fully explain the investigative findings this report contains photographs which may contain imbedded notes with explanations. Attached to this report will be more comprehensive copies of documents referred to.

INTRODUCTION:

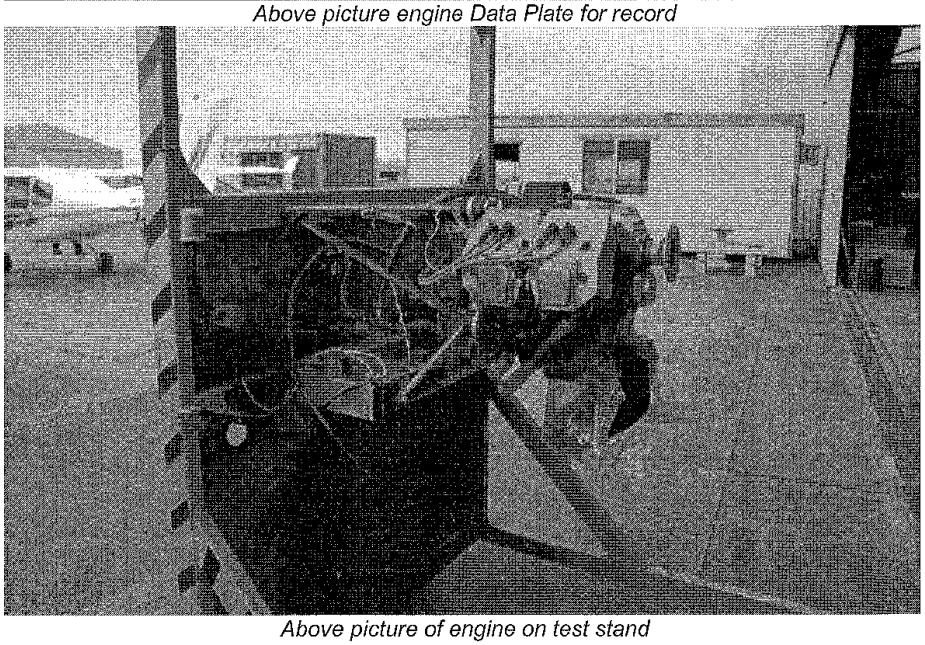
The engine was transported to Jabiru Aircraft SA for investigation. The engine was mounted on a test stand.

OBSERVATION:

Initial visual inspection and mount to Test Stand

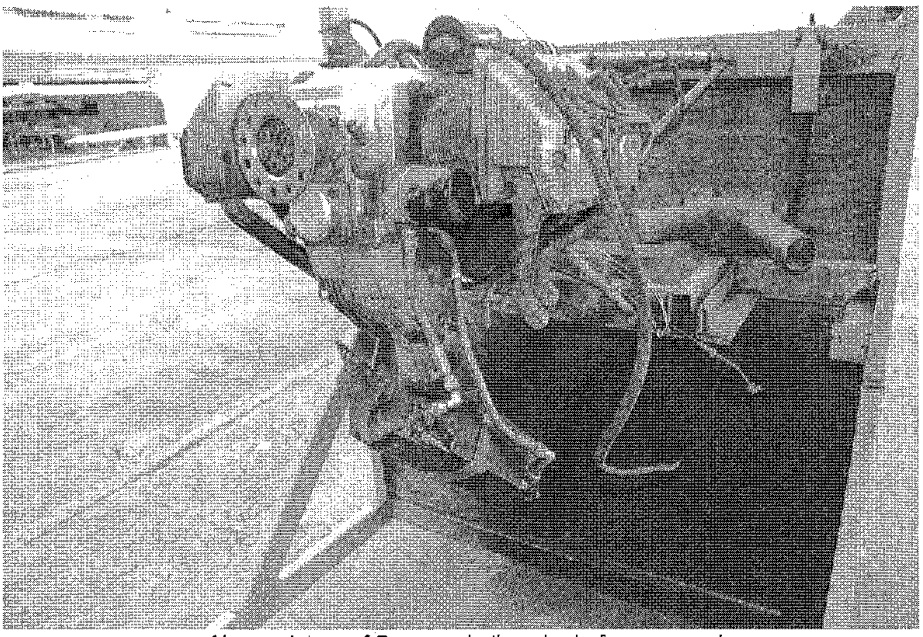


Above picture engine Data Plate for record

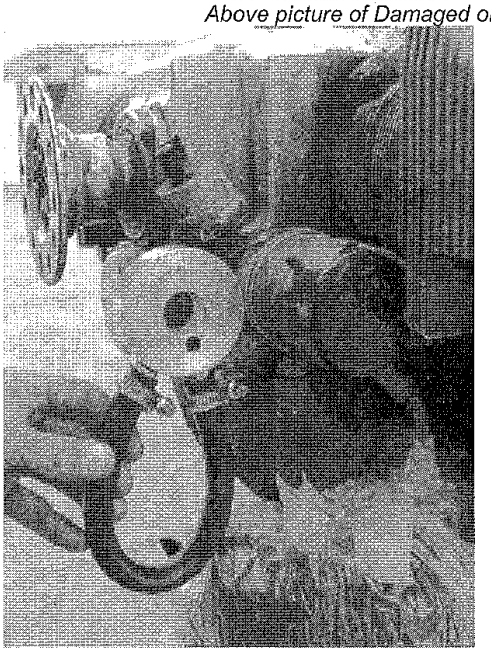


Above picture of engine on test stand

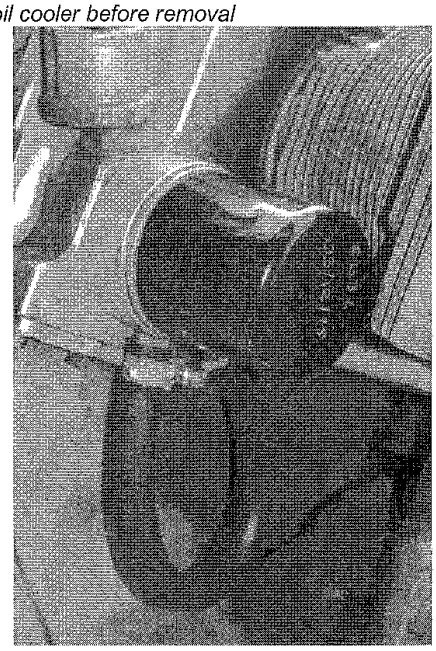
First observation was that the oil cooler was damage from impact. The oil cooler was then removed and a bypass manifold was fitted with the original oil filter.



Above picture of Damaged oil cooler before removal

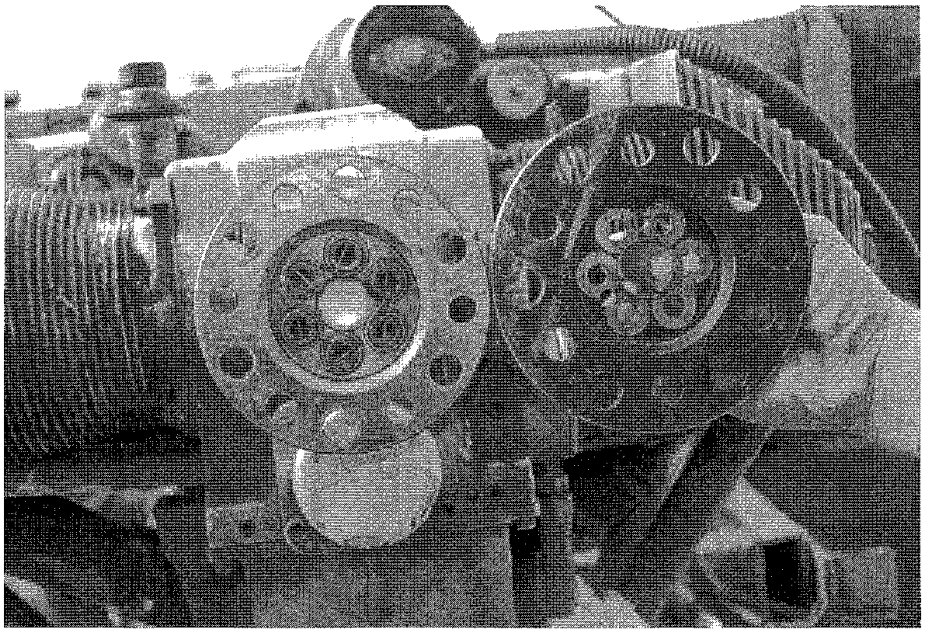


Above picture of Bypass manifold

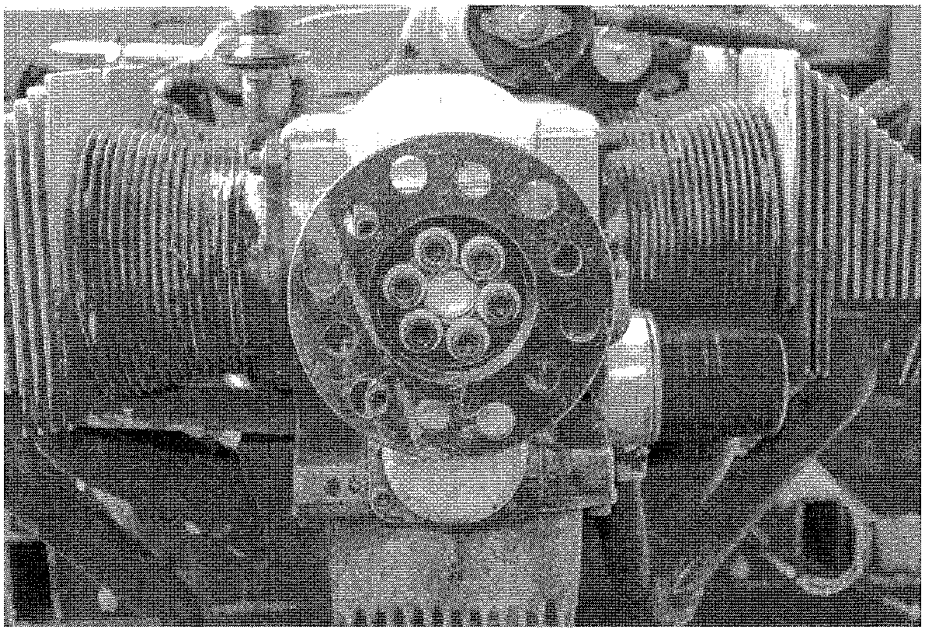


Above picture of bypass manifold installed

Secondly to fit the factory standard propeller to the prop flange had to be change to allow the propeller to be fitted.



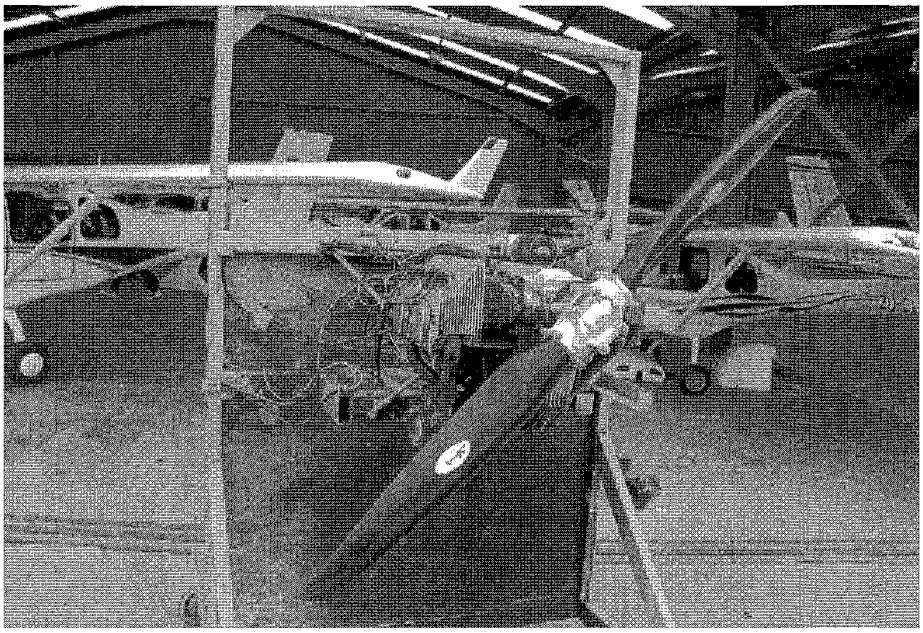
Above picture of original prop flange and the replacement prop flange



Above picture of the replacement propeller flange installed

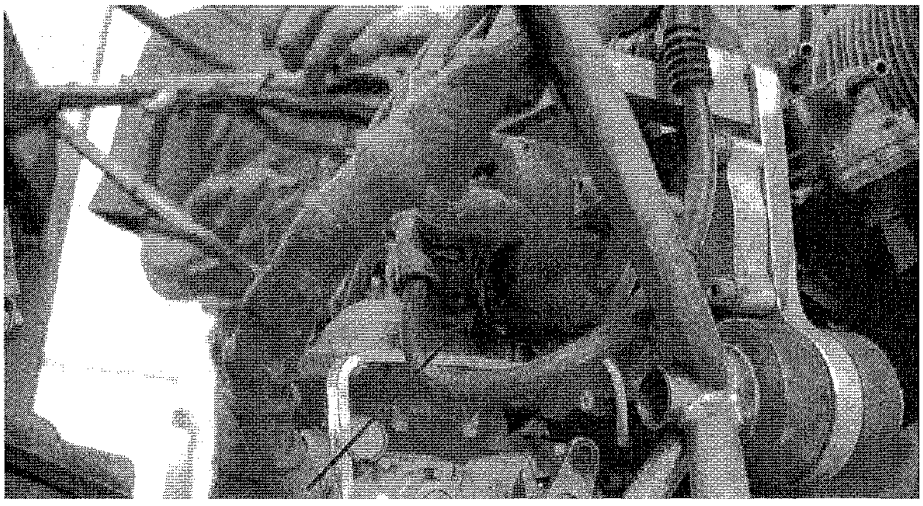
The engine was unable to be turned by hand, closer inspection revealed that the adjustable ignition coil RHS had moved into the flywheel.

- The force and direction of the impact would have caused the coil to move. The coils were then reset to the correct gap.
- Oil was then added to the engine
- Propeller was installed



Above picture of the propeller installed on the engine

Other minor observation that were noted was that the right hand distributor cap was cracked it was left as is for the test.



Above picture of Distributor cap with crack

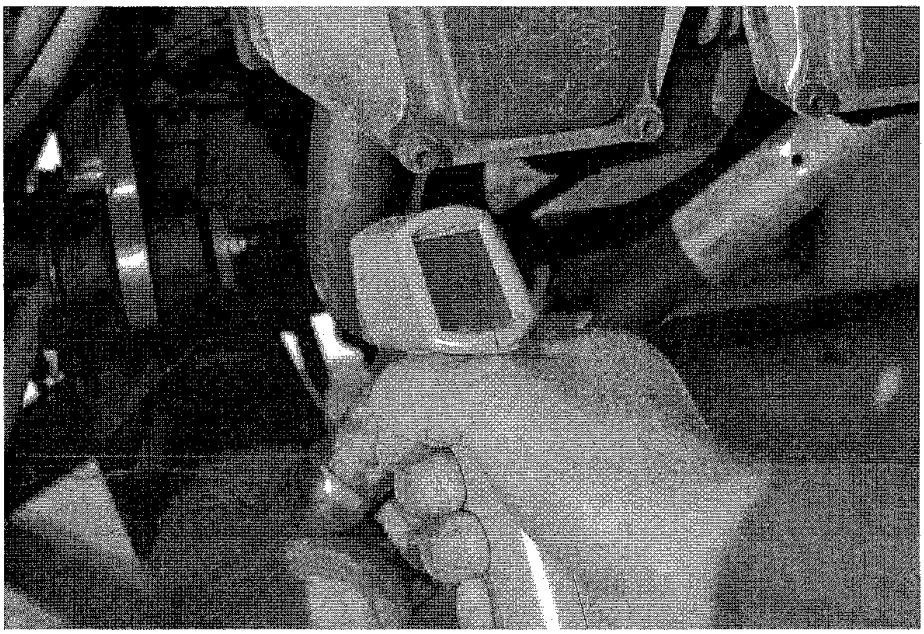
ENGINE START UP:

On the 15th June 2016, Accident Investigator Mr Chris Williams arrived at Jabiru Aircraft SA premises.

Firstly the logbook was examined and various inconsistencies found. There after we proceeded to the engine stand to attempt the start. After rerouting the battery wire and battery, the starting of the engine was carried out.

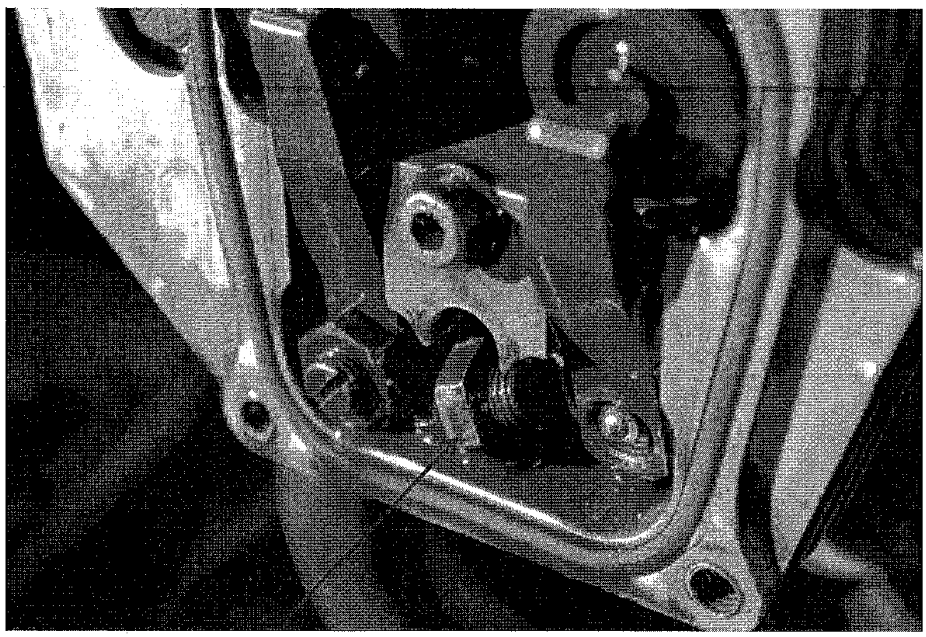
Once the engine had started it had a pronounced vibration. The engine was then taken to full throttle. The engine developed only **2500 rpm** where it should rev to **2900 – 3000rpm.**

The engine was then shut down. After taking the temperature readings of the exhaust manifolds, it was noted that **no 3 cylinder** was notably cooler than the rest.



Above picture of the No3 Cylinder showing temperature

After removing no 3 cylinder rocker cover, it was observed that the intake tappet adjuster was lying at the bottom of the rocker chamber. This caused intake valve not to function causing the engine to run on 3 cylinders, thus the engine could not achieve full power.



Above picture of the tappet adjuster lying at the bottom of the Rocker Chamber

These valve adjusters are to be checked every 50 hours of flight and the necessary adjustments to be made to keep the correct clearance. (See **appendix A** extract from Jabiru Engine Maintenance Manual JEM0002-6 dated 1st October 2015 to see how this is carried out and described for Maintenance personnel)

The procedure of setting the valve is to have that cylinder in the "Rocking" position. The locknut on the adjusting screw is loosened there after using a screwdriver the correct clearance is set with a feeler gauge.

While holding the adjustment screw with a screwdriver the locknut is tightened with a spanner. Failing to lock the adjustment screw with the locknut will allow the adjusting screw to loosen and eventually fall out.

After all the **adjusting screws** were set the engine was started again. This time the engine ran smoothly and easily attained full power of **3000rpm.**

The cause of the loss of power would be that the rocker adjusting screw had not been locked in place with the locking nut, allowing it to loosen up and fall out of the rocker arm.

End of report

Attached to this report – supporting documentation referred to in this report

Appendix A – Page 69 & 70 section 9.17 Valve clearance Adjustment (solid lifter Engines only) from JEM0002-6 Jabiru Engine Maintenance Manual date 1-10-2015

...END...