OPERATION AND MAINTENANCE MANUAL FOR JABIRU 2200 Gen 4 AIRCRAFT ENGINE JABIRU 3300 Gen 4 AIRCRAFT ENGINE

DOCUMENT No. JEM0005-8

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This Manual has been prepared as a guide to correctly operate, maintain and service Jabiru 2200 Gen 4 & 3300 Gen 4 engines.

IT IS THE OWNER'S RESPONSIBILITY TO REGULARLY CHECK THE JABIRU WEB SITE AT WWW.JABIRU.NET.AU FOR APPLICABLE SERVICE BULLETINS AND HAVE THEM IMPLEMENTED AS SOON AS POSSIBLE. FAILURE TO DO THIS MAY RENDER THE AIRCRAFT UN-AIRWORTHY AND VOID JABIRU'S LIMITED, EXPRESS WARRANTY.

THIS DOCUMENT IS CONTROLLED WHILE IT REMAINS ON THE JABIRU SERVER. ONCE THIS NO LONGER APPLIES THE DOCUMENT BECOMES UNCONTROLLED.

QUESTIONS OR CONCERNS WITH REGARD TO ANY INFORMATION HEREIN, PLEASE CONTACT JABIRU AIRCRAFT PTY LTD.

1.1 TABLE OF FIGURES

2 GENERAL INFORMATION

WARNING:

JABIRU AIRCRAFT PTY LTD HAS DEVOTED SIGNIFICANT RESOURCES AND TESTING TO DEVELOP THE JABIRU 2200 AND 3300 GENERATION 4 AIRCRAFT ENGINES. THE 2200 AND 3300 GEN 4 ENGINE ARE CONSIDERED TO BE LATEST CONFIGURATION OF THE 2200 AND 3300 SERIES ENGINE, HAVING THE SAME RATED PERFORMANCE, GENERAL DESIGN LAYOUT AND INSTALLATION.

THESE ENGINES ARE INTENDED TO BE INSTALLED IN ACCORDANCE WITH THE DETAILS GIVEN IN THE "INSTALLATION MANUAL FOR 4TH GENERATION JABIRU 2200 AND 3300 AIRCRAFT ENGINES", DOCUMENT NO. JEM0008. ANY OTHER USES OR APPLICATIONS MAY BE EXTREMELY HAZARDOUS, LEADING TO PROPERTY DAMAGE, OR INJURY OR DEATH OF PERSONS ON OR IN THE VICINITY OF THE VEHICLE. JABIRU AIRCRAFT PTY LTD DOES NOT SUPPORT THE USE OF THIS ENGINE IN ANY APPLICATIONS WHICH DO NOT MEET THE REQUIREMENTS OF THE APPROPRIATE INSTALLATION MANUAL. ANY NON-COMPLIANT INSTALLATION MAY RENDER THE AIRCRAFT UN-AIRWORTHY AND WILL VOID ANY WARRANTY ISSUED BY JABIRU.

THE JABIRU 2200 AND 3300 GEN 4 AIRCRAFT ENGINES ARE DESIGNED TO BE OPERATED AND MAINTAINED ONLY IN STRICT ACCORDANCE WITH THIS ENGINE MAINTENANCE MANUAL. ANY VARIATION OF ANY KIND, INCLUDING ALTERATION TO ANY COMPONENT AT ALL, WHETHER REPLACEMENT, RELOCATION, MODIFICATION OR OTHERWISE WHICH IS NOT STRICTLY IN ACCORDANCE WITH THIS MANUAL MAY LEAD TO DRAMATIC CHANGES IN THE PERFORMANCE OF THE ENGINE AND MAY CAUSE UNEXPECTED ENGINE STOPPAGE, ENGINE DAMAGE OR HARM TO OTHER PARTS OF THE AIRCRAFT TO WHICH IT MAY BE FITTED AND MAY LEAD TO INJURY OR DEATH. JABIRU AIRCRAFT PTY LTD DOES NOT SUPPORT ANY MODIFICATIONS TO THE ENGINE, ITS PARTS, OR COMPONENTS. ANY SUCH ACTIONS MAY RENDER THE AIRCRAFT UN-AIRWORTHY AND WILL VOID ANY WARRANTY ISSUED BY JABIRU.

MAINTENANCE AND MODIFICATION CANNOT BE SUPERVISED BY THE MANUFACTURER. MAINTENANCE REQUIRES EXTREME CLEANLINESS, EXACT PARTS, PRECISE WORKMANSHIP AND PROPER CONSUMABLES. IT IS YOUR RESPONSIBILITY TO ENSURE ABSOLUTE ATTENTION TO DETAIL NO MATTER WHO MAY BECOME INVOLVED IN WORK ON THIS ENGINE. YOUR SAFETY, YOUR LIFE AND YOUR PASSENGERS' LIVES RELY ON PRECISE AND ACCURATE FOLLOWING OF INSTRUCTIONS IN THIS MANUAL.

IN EXCHANGE FOR THE ENGINE MANUAL PROVIDED BY JABIRU AIRCRAFT PTY. LTD. ("JABIRU") I HEREBY AGREE TO WAIVE, RELEASE, AND HOLD JABIRU HARMLESS FROM ANY INJURY, LOSS, DAMAGE, OR MISHAP THAT I, MY SPOUSE, HEIRS, OR NEXT OF KIN MAY SUFFER AS A RESULT OF MY USE OF ANY JABIRU PRODUCT, EXCEPT TO THE EXTENT DUE TO GROSS NEGLIGENCE OR WILFUL MISCONDUCT BY JABIRU. I UNDERSTAND THAT PROPER SKILLS AND TRAINING ARE ESSENTIAL TO MINIMIZE THE UNAVOIDABLE RISKS OF PROPERTY DAMAGE, SERIOUS BODILY INJURY AND DEATH THAT ARISE FROM THE USE OF JABIRU PRODUCTS. ALL INFORMATION IN THIS MANUAL HAS BEEN CAREFULLY RESEARCHED AND COMPILED. IT IS POSSIBLE THAT THE INFORMATION CONTAINED IN THIS MANUAL HAS CHANGED IN THE INTERVENING TIME. INFORMATION MAY BE MISSING, CONTAIN ERRORS OR BE TRANSLATED INCORRECTLY. AS A RESULT, JABIRU AIRCRAFT PTY LTD DOES NOT PROVIDE ANY GUARANTEE NOT ACCEPT ANY LEGAL LIABILITY FOR THE ACCURACY, COMPLETENESS, CURRENCY OR QUALITY OF THE INFORMATION PROVIDED. WE HEREBY WAIVE LIABILITY FOR ANY DAMAGES, WHETHER DIRECT OR INDIRECT IN NATURE AND WHETHER TANGIBLE OR INTANGIBLE, RESULTING FROM THE USE OR MISUSE OF INFORMATION OR FROM INCOMPLETE OR INCORRECT INFORMATION IN THIS MANUAL. LIKEWISE, WE SHALL NOT BE LIABLE FOR DAMAGE ARISING SHOULD THE OWNER AND/OR MAINTAINER NOT HAVE THE NECESSARY TECHNICAL EXPERTISE, THE REQUIRED KNOWLEDGE OF AND/ OR EXPERIENCE REQUIRED. THE EXTENT TO WHICH THE INFORMATION AND TECHNICAL METHODS DESCRIBED HERE WILL APPLY TO FUTURE GENERATIONS OF JABIRU PRODUCTS CANNOT BE PREDICTED AND MUST BE VERIFIED IN INDIVIDUAL CASES.

2.1 LIST OF EFFECTIVE PAGES

- THIS MANUAL IS REVISED AS A COMPLETE DOCUMENT. ALL PAGES MUST DISPLAY THE SAME REVISION NUMBER. SEE SECTION 15 FOR THE REVISION HISTORY.

2.2 INTRODUCTION

- THIS ENGINE MAINTENANCE MANUAL HAS BEEN WRITTEN FOR ALL 4-CYLINDER 2200 GEN 4 AND 6-CYLINDER 3300 GEN 4 JABIRU ENGINE CONFIGURATIONS. THESE ENGINES ARE A MODULAR DESIGN WHICH SHARE MANY PARTS AND SPECIFICATIONS. CONSEQUENTIALLY THE PROCEDURES IN THIS MANUAL APPLY EQUALLY TO BOTH ENGINES.
- BEFORE ATTEMPTING AN ENGINE INSPECTION THE TECHNICIAN MUST BE FULLY CONVERSANT WITH THE ENGINE MAINTENANCE MANUAL AND ANY RELEVANT SERVICE BULLETINS, SERVICE LETTERS OR OTHER MANUFACTURER'S DATA. CURRENT INFORMATION IS AVAILABLE FROM THE JABIRU AIRCRAFT (AUSTRALIA) WEB SITE – WWW.JABIRU.NET.AU .
- INSPECTIONS, MAINTENANCE, REPAIRS AND OVERHAULS MUST ONLY BE CARRIED OUT BY AN APPROVED PERSON. DEPENDING ON THE COUNTRY AND THE CATEGORY OF THE AIRCRAFT THIS MAY BE A LICENSED AIRCRAFT MAINTENANCE ENGINEER, AN RA-AUS LEVEL 2 OR EQUIVALENT. THE RESPONSIBILITY FOR DETERMINING WHAT QUALIFICATIONS ARE NECESSARY TO CARRY OUT AN OVERHAUL BELONGS TO THE PERSON CARRYING OUT THE WORK.

2.3 APPLICABILITY

- THIS MANUAL IS APPLICABLE TO ALL JABIRU 2200 & 3300 GEN 4 CONFIGURATION ENGINES. THIS INCLUDES ENGINES ORIGINALLY BUILT TO THIS CONFIGURATION AS WELL AS ANY STANDARD 2200 / 3300 ENGINES UPGRADED TO THE 2200 GEN 4 / 3300 GEN 4 CONFIGURATION.

2.4 ADDITIONAL SERVICE INFORMATION

OCCASIONALLY NEW OR EXPANDED SERVICE INFORMATION WILL BE MADE AVAILABLE TO CUSTOMERS IN THE FORM OF JABIRU SERVICE BULLETINS OR JABIRU SERVICE LETTERS. JABIRU DISTRIBUTES THIS INFORMATION TO OWNERS OF CERTAIN TYPES OF JABIRU PRODUCT. HOWEVER, IT IS STRONGLY RECOMMENDED THAT OWNERS AND OPERATORS REGULARLY VISIT THE JABIRU AUSTRALIA WEBSITE – WWW.JABIRU.NET.AU – OR THE WEBSITE OF THEIR LOCAL JABIRU REPRESENTATIVE TO CHECK FOR NEW OR UPDATED ADDITIONAL SERVICE INFORMATION.

2.5 RECORDING

- CAREFUL RECORDS OF ALL MAINTENANCE WORK MUST BE COMPLETED. DETAILS RECORDED IN THE MAINTENANCE LOGBOOKS MUST BE AS COMPLETE AS POSSIBLE.
- TO SIMPLIFY RECORDING A SET OF MAINTENANCE WORKSHEETS HAVE BEEN INCLUDED IN THIS MANUAL IN SECTION 12. THESE SHEETS CAN BE PRINTED, GLUED INTO THE MAINTENANCE LOGBOOK AND FILLED OUT QUICKLY AND EASILY.

2.6 MANUFACTURER

JABIRU AIRCRAFT PTY LTD,
P.O. BOX 5792,
BUNDABERG WEST,
QUEENSLAND 4670

2.7 2200/3300 GEN 4 ENGINE MANUALS

JEM0004 – 2200/3300 GEN 4 ENGINE OVERHAUL AND ASSEMBLY MANUAL WITH INTEGRATED PARTS BOOK
JEM0005 – 2200/3300 GEN 4 ENGINE MAINTENANCE MANUAL
JEM2202 – 2200 ENGINE INSTALLATION MANUAL
JEM3302 – 3300 ENGINE INSTALLATION MANUAL

ALL MANUALS ARE AVAILABLE FREE OF CHARGE ON THE JABIRU WEB SITE WWW.JABIRU.NET.AU

2.8 SOURCE OF PURCHASE PARTS

ALL REPLACEMENT PARTS CAN BE SOURCES FROM JABIRU AIRCRAFT PTY LTD (DETAILS LISTED BELOW) OR AN APPROVED LOCAL AGENT

JABIRU AIRCRAFT P/L
PO BOX 5792
BUNDABERG WEST,
QLD 4670
PHONE: 07 4155 1778
FAX: 07 4155 2669
EMAIL: INFO@JABIRU.NET.AU

2.9 LIST OF DISPOSABLE REPLACEMENT PARTS

Part	Part #
Air Filter	PG10242N
Fuel Filter	PM0009N
Oil Filter	PG10162N
Spark Plug	PI10582N
Spark Plug terminal nut	PI4A000N

2.10 OWNER/OPERATOR RESPONSIBILITES (LSA AIRCRAFT)

The following responsibilities are applicable to owner/operators of LSA's (be they Jabiru Factory built aircraft or other LSA designs) which have a Jabiru Engine fitted. These Responsibilities are prescribed in the ASTM standard F2295:

- Each owner/operator of a LSA shall read and comply with the maintenance and continued airworthiness information and instructions provided by the manufacturer.
- Each owner/operator of a LSA shall be responsible for providing the manufacturer with current contact information where the manufacturer may send the owner/operator supplemental notification bulletins.
- The owner/operator of a LSA shall be responsible for notifying the manufacturer of any safety of flight issue or significant service difficulty upon discovery.
- The owner/operator of a LSA shall be responsible for complying with all manufacturer issued notices of corrective action and for complying with all applicable aviation authority regulations in regard to maintaining the airworthiness of the LSA.
- An owner of a LSA shall ensure that any needed corrective action be completed as specified in a notice, or by the next scheduled annual inspection.
- Should an owner/operator not comply with any mandatory service requirement, the LSA shall be considered not in compliance with applicable ASTM standards and may be subject to regulatory action by the presiding aviation authority.

Section 16 provides forms which may be filled out and submitted for the purposes of fulfilling Owner/Operator COSM (Continued Operating Safety Management) requirements.

3 Specifications

3.1 Design Details

- 4 Stroke
- 4 (2200) or 6 (3300) Cylinder Horizontally Opposed
- 1 Central Camshaft
- Push Rods
- Over Head Valves (OHV)
- Hydraulic lifter with roller followers
- Ram Air Cooled
- Wet Sump Lubrication
- Direct Propeller Drive
- Dual Transistorised Magneto Ignition
- Integrated AC Generator
- Electric Starter
- Mechanical Fuel Pump
- Naturally Aspirated – Pressure Compensating Carburettor
- 6 Bearing Crankshaft for 2200 models, 8 bearing for 3300.

3.2 General Specifications & Equipment

-	Displacement	:	2200: 2200 cc
		:	3300: 3300 cc
-	Bore	:	97.5 mm
-	Stroke	:	74 mm
-	Compression Ratio	:	8 : 1
-	Direction of Rotation	:	Clockwise – Pilot's view – Tractor Applications
-	Dry Weight	:	2200: 61 kg (134 lbs)
		:	3300: 81kg (178lb) Weights include Exhaust, Carburettor, Starter Motor, Alternator & Ignition System.
-	Ignition Unit	:	Jabiru dual ignition - breakerless transistorized. Battery independent Ignition coil / flywheel magnet gap: 0.01" (0.254mm)
-	Ignition Timing	:	2200 and 3300: 23^{o} Before TCD
-	Firing Order	:	2200: 1 – 3 – 2 – 4
		:	3300: 1 – 4 – 5 – 2 – 3 – 6
-	Fuel Consumption	:	2200: 14 - 16 l/hr (3.5 – 4.0 US gal/hr)
	@ 70% Power	:	3300: 24 – 27 l/hr (6.3 – 7.1 US gal/hr)
	(2850rpm & 21" MAP)		
-	Fuel	:	AVGAS 100/130 or 100LL. MOGAS, RON 95+ may be used if AVGAS is not available. **Ref Service Letter JSL007**: S/No. & configuration limits apply
-	Oil	:	W100, W100 Plus, Multigrade 15W-50, or equivalent Lubricant complying with SAE-J-1899, or Lycoming Spec. 301F, or Teledyne – Continental Spec MHF-24B
-	Oil Capacity	:	2200 Gen 4: 2.3 L (2.4 quarts) 3300 Gen 4: 3.5 L (3.7 quarts)
-	Spark Plugs	:	Automotive Type. Electrode Gap: 0.55 - 0.6mm (0.022" - 0.024")
-	Generator	:	Jabiru, permanently excited single phase AC generator with rectifier/regulator
-	DC Output	:	14.5V nominal Maximum continuous current 18A.
-	Battery	:	12V Lead acid min 19Ah min Pulse – 600A
-	Carburettor	:	PD42J constant depression carburettor
-	Air Intake Filter	:	folded paper cartridge type
-	Fuel Filtration	:	0.1 mm (100 Micron) maximum particle size.
-	Fuel Pump	:	Camshaft driven diaphragm type

- Starting System : Electric 12 V / 1.5 kW
- Oil Filter : Spin on automotive type.

3.3 Full Power Static RPM

Table 1 – Full Power Static RPM Recommendations

Model:	2200 Gen 4	3300 Gen 4 Variants
Static RPM	2800 – 2950 RPM	2800 – 2950 RPM

- Full power static RPM (the RPM achieved when full power is applied with the aircraft static on the ground) is an important performance indicator.
- Low Static RPM may indicate reduced engine power or incorrect propeller / propeller settings. Refer to troubleshooting section below & to the engine installation manual for propeller selection criteria.

3.4 Performance

Static sea level ratings under the following conditions:-

- International Standard Atmospheric conditions at sea level.
- Aircraft service equipment drives unloaded. (Vacuum Pump not fitted)
- Full rich fuel/air mixture.
- Maximum cylinder head temperature.
- Standard Jabiru air filter and cold air.
- Standard exhaust muffler.

3.4.1 Engine Ratings

Table 2 – Engine Ratings

Model:	2200 Gen 4
Maximum Power	60 kW (80 hp) @ 3300 RPM - ISO STD Conditions

Table 3 - 3300 Engine Ratings

Model:	3300 Gen 4
Maximum Power	90 kW (120 hp) @ 3300 RPM - ISO STD Conditions

3.5 Fuel

3.5.1 Recommended Fuel Types:

Table 4 – Fuel Types

Fuel:	2200 Gen 4 Applicability	3300 Gen 4 Applicability
- AVGAS 100LL & AVGAS 100/110	All S/No.	All S/No.
- Leaded & Unleaded Automotive Gasoline above 95 Octane RON (AKI 90)	All S/No.	All S/No.

Notes:

1. **Table 4 provides basic information only. Detailed information is available in Jabiru Service Letter JSL007.**
2. **Due to poor control of quality and content Automotive Gasoline (MOGAS) is used at the operator's risk. JSL007 refers.**

WARNING

It is important to realise that due to the lower QA standards, even following best practice it is still possible for a particular tank-full of MOGAS to be unsuitable or unsafe for use in a Jabiru Engine. Jabiru Aircraft may choose to void any warranty for engines which have been damaged due to "bad" MOGAS. Operators use MOGAS at their own risk.

3.5.2 Fuel Consumption:

Table 5 – Fuel Consumption VS RPM

RPM	2200 Gen 4 Models	3300 Gen 4 Models
	Fuel Flow (litre/hr)	Fuel Flow (litre/hr)
2600	13.4	18.5
2700	14.7	20
2800	15.5	23.5
2850	16	25.5
2900	17.4	27.6
3000	24.5	32.1
3100	26.8	35.6
Full Power	28 – 30	38 – 40

Note: Fuel consumption figures are based on a typical installation in a Jabiru Aircraft. Values will differ for other installations or configurations.

3.6 Lubricant

- The following chart is intended to assist in choosing the correct grade of oil and must be considered as a guide only. Multiviscosity grades can also be used.
- Oil should be of SAE standard J-1899

Note: Do not use any type of automotive oil. Aviation oils have been blended specifically for the operating conditions found in an air cooled aero engine operations. Using automotive oils has been found to be detrimental to the operation of the Jabiru Engine.

WARNING

Jabiru has not verified the attributes claimed by oil additive manufacturers and warn against using them as they may have detrimental effects.

Table 6 – Recommended Oil Grade VS Ambient Temperature – NORMAL OPERATIONS

Average Ambient Temperature	Mineral Grades	Ashless Dispersant Grades
Above 35° C (95°F)	SAE 60	SAE 60
15° C to 35°C (59° to 95°F)	SAE 50	SAE 50
-17°C to 25°C (1° to 77°F)	SAE 40	SAE 40

Table 7 – Recommended Oil Grade VS Ambient Temperature – RUN-IN PERIOD

Average Ambient Temperature	Mineral Grades
Above 35° C (95°F)	120
15° C to 35°C (59° to 95°F)	100

-17°C to 25°C (1° to 77°F)	80

Table 8 – Oil SAE VS Commercial Designations

Equivalence of SAE and commonly used Commercial Grade designations:					
SAE:	20	30	40	50	60
Commercial:	55	35	80	100	120

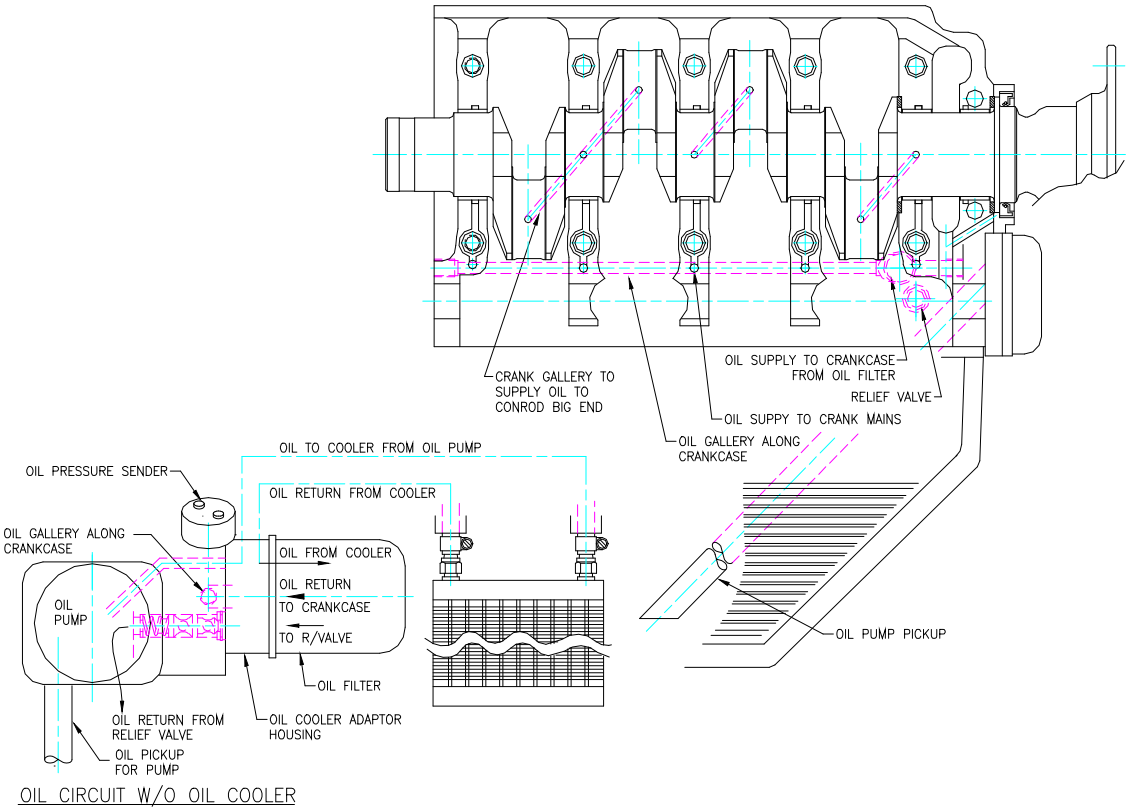


Figure 1 – Oil System Schematic

3.7 Cooling System

Type: Free air cooled.

Pressure: The required pressure drop across the cylinders at 1.3 V_S (clean stall speed) is 4.3 cm (1.7") water gauge, minimum. A minimum of 6cm (2.4") is recommended at cruise speed.

Note: Proper cooling is vital for engine operation. Values given are for a typical Jabiru Aircraft. Values will differ for other installations or configurations; refer to the Jabiru Engine Installation Manual for additional details.

3.8 Operating Speeds and Limits

3.8.1 Ground Operating Limits

Table 9 – Ground Operating Limitations

	All 2200 Variants	All 3300 Variants	Notes
Idle Speed	900 RPM	800-850	set while engine is hot
Oil Pressure – Idle	Min: 80 kPa (11 psi)	Min: 80 kPa (11 psi)	
	Max: 400 kPa (58 psi)	Max: 400 kPa (58 psi)	
	Optimal: 300 kPa (44psi)	Optimal: 300 kPa (44 psi)	
Oil Temperature	Max. 100°C (212°F)	Max. 100°C (212°F)	
Max. CHT	180°C (356°F)	180°C (356°F)	

Note: If ground temperature limits are reached, shut the engine down or cool it by pointing the aircraft into wind.

3.8.2 In-Flight Operating Limits

Model:	All 2200 Gen 4 Variants	All 3300 Gen 4 Models
Maximum Speed	3300 RPM	3300 RPM
Maximum Continuous Speed	3300 RPM	3300 RPM
Recommended Cruise	2800 – 3000 RPM	2800 – 3000 RPM
Oil Pressure – Normal Operations	Min 220 kPa (31 psi)	Min 220 kPa (31 psi)
	Max: 400 kPa (58 psi)	Max: 400 kPa (58 psi)
	Optimal: 300 kPa (44psi)	Optimal: 300 kPa (44 psi)
– Idle	Min 80 kPa (11 psi)	Min 80 kPa (11 psi)
– Starting & Warm up	Max: 400 kPa (58 psi)	Max: 400 kPa (58 psi)
	Optimal: 300 kPa (44psi)	Optimal: 300 kPa (44 psi)
Oil Temperature:	Min 15°C (59°F) Max. 118 °C (244°F)	Min 15°C (59°F) Max. 118°C (244°F)
Oil Continuous Temperature	80 - 100°C (176° - 212°F)	80 - 100°C (176° - 212°F)
Fuel pressure to carburettor	5 – 35 kPa (0.75 – 5.0 psi)	5 – 35 kPa (0.75 - 5.0 psi)
Max. CHT (Climb)	200°C (392°F)	200°C (392°F)
Max Continuous CHT (Cruise)	180°C (356°F)	180°C (356°F)
EGT (Mid-Range / Cruise) From S/N 22A3852 & 33A2836 [1]	600° - 730°C (1112° - 1346°F)	600° - 730°C (1112° - 1346°F)
EGT (Mid-Range / Cruise) (all other engines)	600° - 720°C (1112° - 1328°F)	600° - 720°C (1112° - 1328°F)
EGT (Above 70% Power) From S/N 22A3852 & 33A2836 [1]	600° - 710°C (1112° - 1292°F)	600° - 710°C (1112° - 1292°F)
EGT (Above 70% Power) (all other engines)	600° - 700°C (1112° - 1292°F)	600° - 700°C (1112° - 1292°F)
MAP (Mid-Range / Cruise)	18-13 Hg: Max 730°C EGT	18-13 Hg: Max 730°C EGT
MAP (Full Power)	23” HG between 600° - 705°C	23” HG between 600° - 705°C

[1] Is applicable to earlier engines when they have been upgraded with exhaust valve 4A834A0D in a Jabiru Aircraft.

- Time with CHT at between 180°C and 200°C is not to exceed 5 Minutes

- Cylinder Head Temperature:
    - It is highly recommended that all Cylinder head are monitored (not just one).
    - The cylinder head temperature probe mounts onto a tapped holes located between the two spark plugs.
- Exhaust Gas temperature:
    - It is highly recommended that EGT probes be fitted to all cylinders as means of monitoring mixture distribution between cylinders.
    - Constant monitoring is critical to the continued health and performance of the engine.

3.9 Torque Specifications

For all Torque settings refer to the Gen 4 2200/3300 Engine Overhaul Manual (JEM0004). Always use the latest issue.

3.10 Build Tolerances and Clearances

For all Build Tolerances and Clearances refer to the Gen 4 2200/3300 Engine Overhaul Manual (JEM0004). Always use the latest issue.

3.11 Propeller Selection & Specifications

WARNING:

Correct propeller selection, tuning and maintenance are vital for the safe operation of this engine. The guidance given herein and in the Engine Installation Manual must be adhered to for safe operation.

- Many propeller brands and models **are not approved by Jabiru Aircraft**. In certain categories operators, may choose to use these propellers, **however they do so at their own risk**. For information on which propellers are approved, please contact Jabiru P/L or our local representative.
- Propeller selection is discussed in detail in the Jabiru Engine Installation Manual.
- All propellers must be maintained in accordance to the propeller manufacturer's requirements in conjunction with Jabiru Aircraft P/L requirements.

3.12 Electrical System Specifications

Table 10 – Ignition System

	Honda Coil mk1 (PI0524N)	Jabiru Coil (CPI4A023A0D)	Jabiru Coil (PI4A027N)
Primary Resistance	0.8Ω to 1.2Ω	1.6Ω to 2.5Ω	1.6Ω to 2.5Ω
Secondary Resistance	5.9kΩ to 7.1kΩ	5.0kΩ to 7.0kΩ	5.0kΩ to 7.0kΩ
Ignition Harness Resistance	6-18kΩ per 300mm of length	6-18kΩ per 300mm of length	6-18kΩ per 300mm of length
	Honda Coil mk2 (PI0525N)		
Primary Resistance	1.9Ω to 2.1Ω		
Secondary Resistance	6.0kΩ to 7.0kΩ		
Ignition Harness Resistance	6-18kΩ per 300mm of length		

- Maximum RPM drop when running on 1 ignition: 100 RPM

Table 11 - Alternator

Alternator type	AC output	Maximum rated Load	Resistance
12 pole series wound	35.0 VAC at 3000rpm	18Amp Continuous	0.4Ω to 1.1Ω.

WARNING

Continuous electrical load exceeding the maximum rated load for the alternator will cause the stator windings to overheat and the alternator stator to fail. DO NOT overload the alternator.

3.13 Engine dimensions and layout

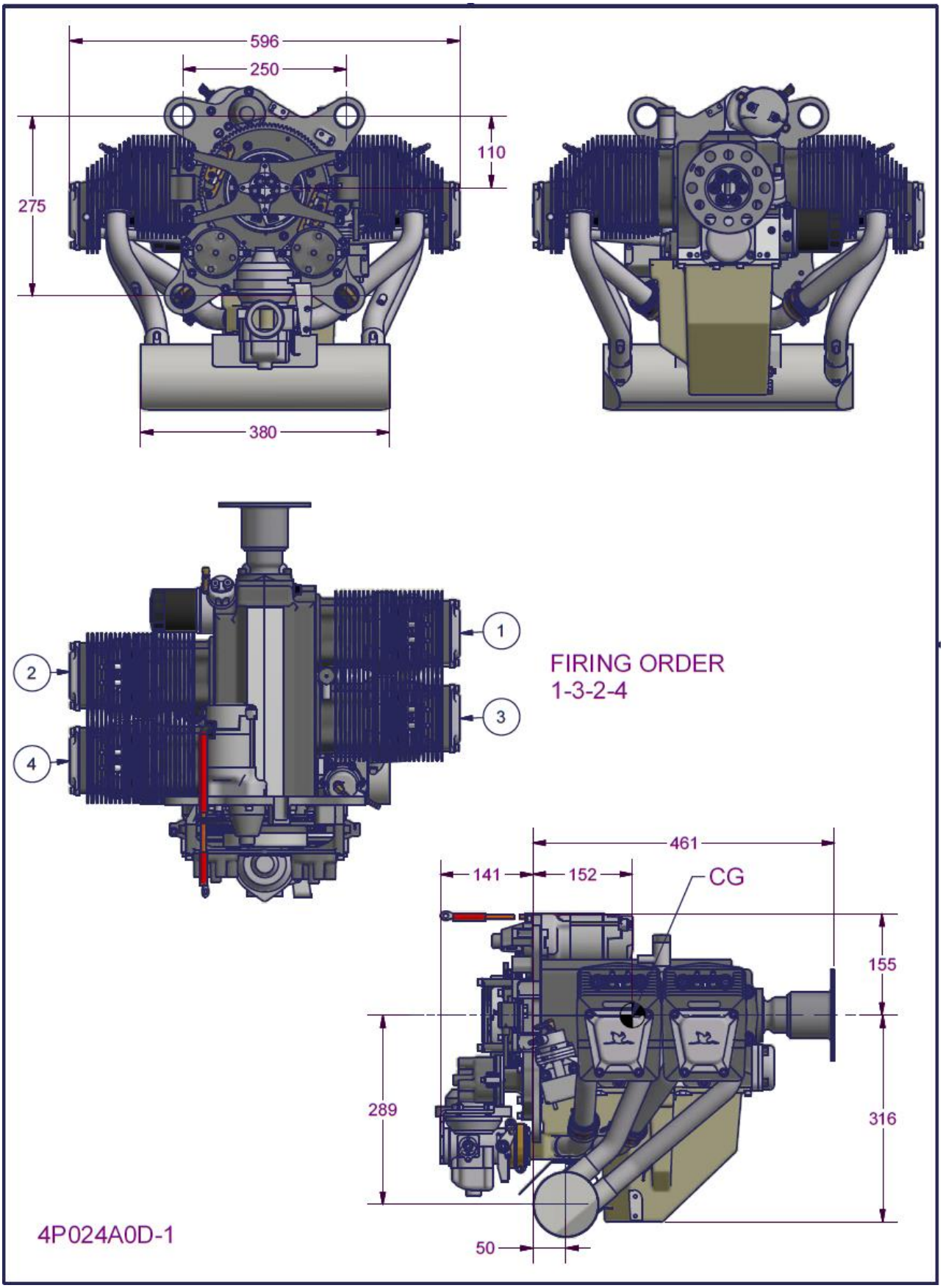


Figure 2 – 2200 Gen 4 Engine dimensions and layout

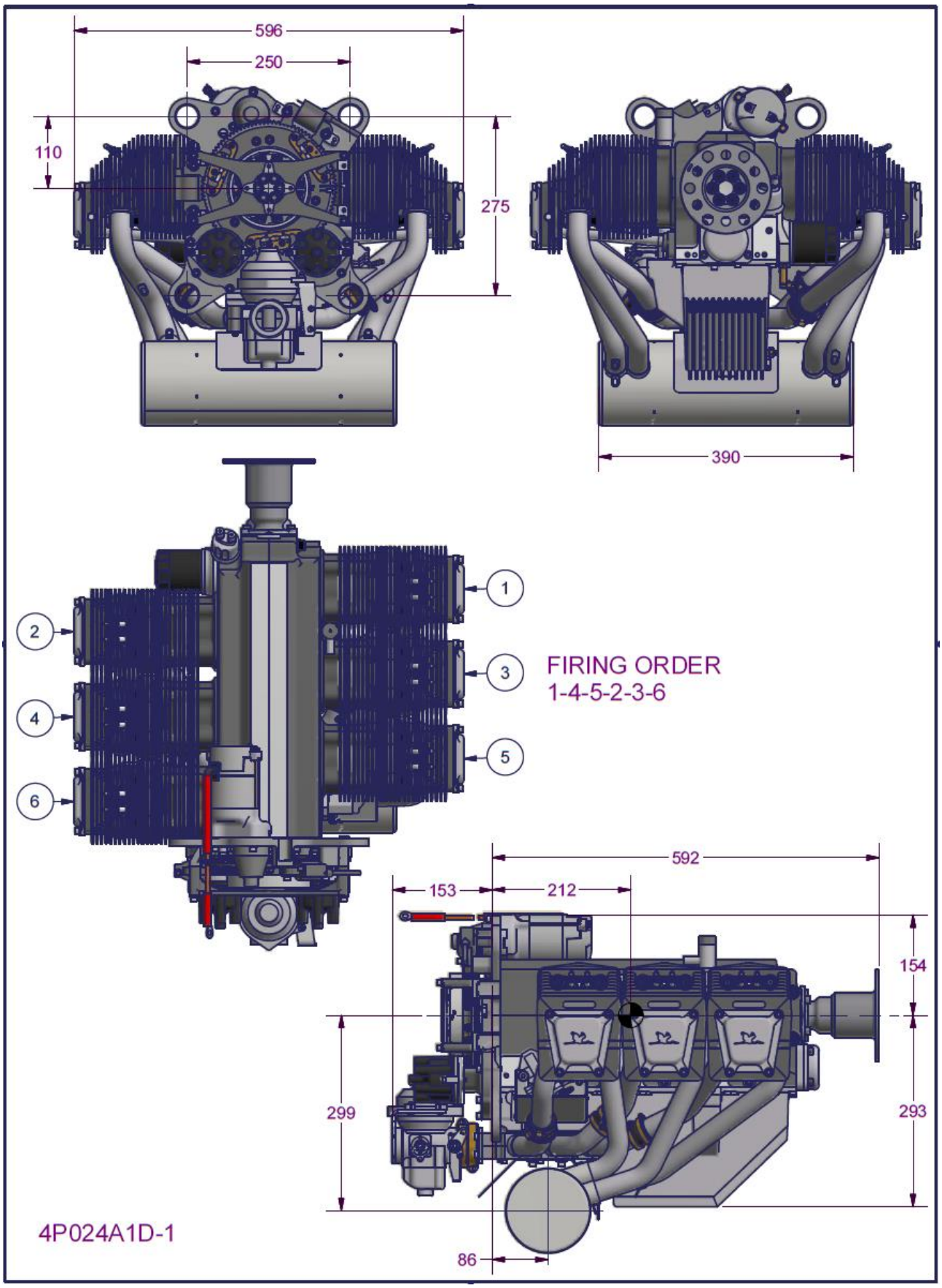


Figure 3 - 3300 Gen 4 Engine dimensions and layout

3.14 Distributor Cylinder Map

For the distributor map refer to the Gen 4 2200/3300 Engine Overhaul Manual (JEM0004). Always use the latest issue.

3.15 2200 Gen 4 – Power Curve

- Multiply Kilowatts (kW) by 1.341 to get Horsepower (hp). i.e. 60 kW x 1.341 = 80 hp.

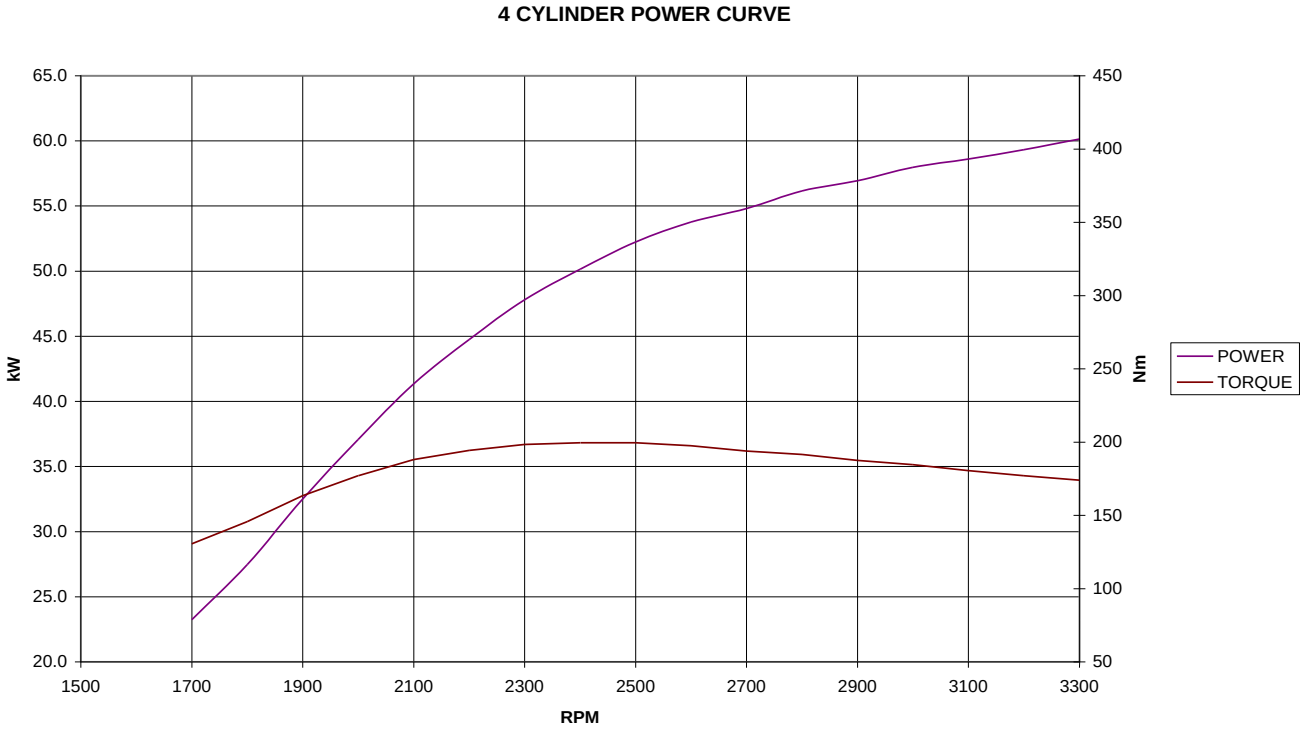


Figure 4 – Power / Torque Curves - Typical 2200 Gen 4 engine

3.16 3300 Gen 4 – Power Curve

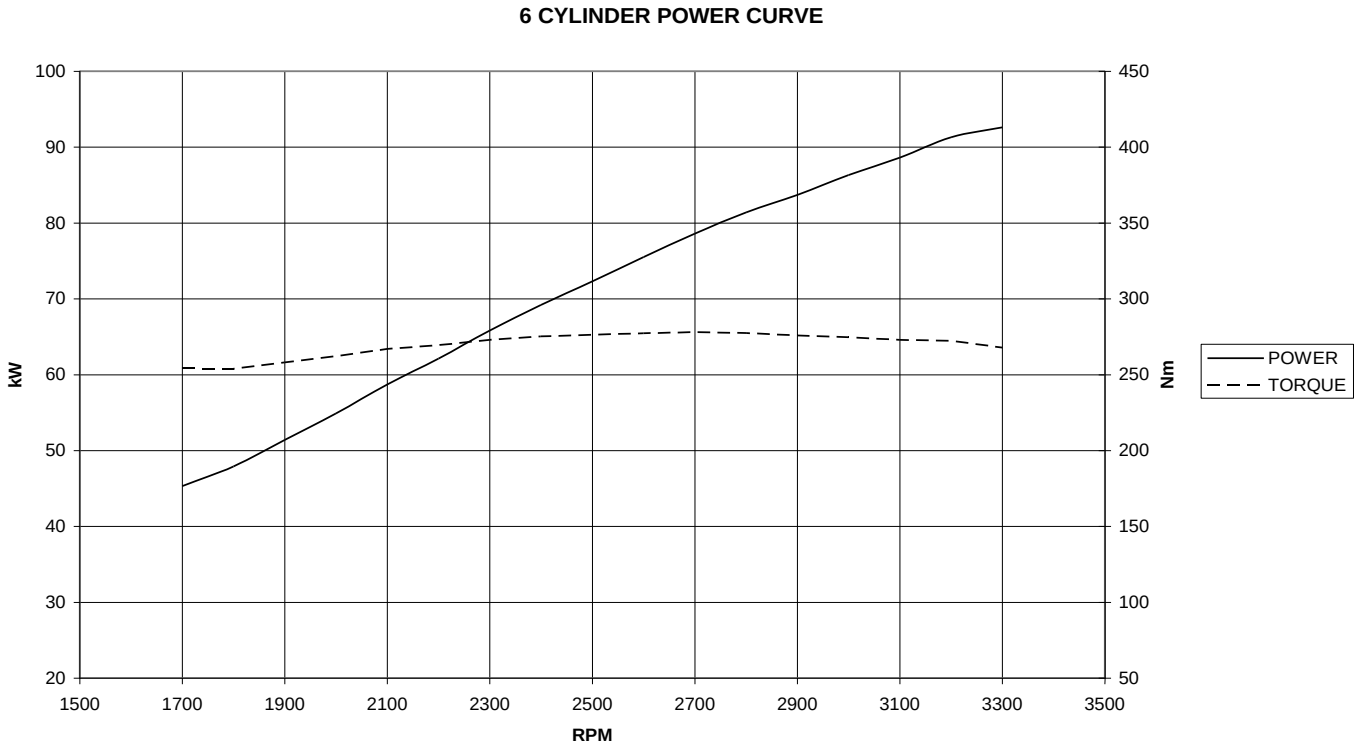


Figure 5 – Power / Torque Curves – Typical 3300 Gen 4 engine

4 OPERATING INSTRUCTIONS

- To ensure that the engine operates reliably, carefully observe all of the operating & maintenance instructions.

4.1 Daily Checks

Note: The checks given below are the basic requirements for safe operation of the engine. Any additional inspections required by the aircraft operating instructions (such as the Pilot Operating Handbook) must also be carried out.

- Ensure free movement of throttle, choke & carburettor heat cables. Return throttle to idle before attempting to start engine.
- Check Oil Level, replenish if necessary.
  - i) Check oil level by screwing in cap fully before withdrawing
  - ii) The Oil dipstick features three holes. The oil level should be between the TOP and BOTTOM holes - and must never be below the bottom of the dipstick.
  - iii) Before long periods of operation, ensure that the level is at least at the MIDDLE hole.
  - iv) Difference in the oil quantity between TOP and BOTTOM mark is 300 mL (0.317 US Quarts). Note: overfilling is detrimental to the engine; it will usually result in elevated engine temperatures and rapid oil use.
  - v) Also see Section 4.10 for special operating procedures for the first 25 hours of operation or after an overhaul.
- Check lubrication & fuel system for leaks.
  - i) Visually inspect for signs of leakage on the ground where the aircraft was parked overnight
  - ii) Inspect the oil cooler for leaks through the cowl opening
  - iii) Visually inspect the underside of the aircraft for fresh oil or fuel residue.
- Check exhaust system for security.
  - i) Wriggle the exhaust tail pipes by hand, checking for excessive movement, rubbing on cowls or unusual noises.
- With Ignition & Master OFF, and throttle closed, turn propeller by hand & observe engine for odd noises or heavy movements. Check for regular compression. If irregular, refer to Trouble Shooting section of this Manual for corrective action.

CAUTION:
Prior to pulling through the propeller by hand, both ignition circuits & the Master Switch must be switched OFF, the brakes applied and the throttle closed.
A common cause of low compression is poorly sealing valves. Continued operation in this condition will result in damage to valves, valve seats, valve guides & overhead gear.

WARNING
A hot engine may fire even with the ignition/s switched OFF.
DO NOT TURN OVER A HOT ENGINE BY HAND

4.2 Starting Procedure

- Activate Starter for a maximum of 20 seconds, followed by a cooling period of 1 minute.
- When engine runs, adjust the throttle to achieve smooth running at approximately 1200 RPM. Deactivate Choke. Check Oil Pressure has risen within 5 seconds - if not, shut down.

4.2.1 Cold Engine

1.	Fuel Tap	OPEN
2.	Choke	ON
3.	Fuel Pump	ON for 10 seconds then off
4.	Throttle	FULLY CLOSED
5.	Master	ON
6.	Ignition	BOTH ON
7.	Starter	PRESS

- Note: Advance throttle to achieve 1000-1200 RPM and remove choke

4.2.2 Warm Engine

- As for cold start, with the following differences:

Choke	OFF
Throttle	Slightly “Cracked” from off position (approx 2%).

4.3 Warming Up Period

- Start the warming up period with the engine running at 1000-1200 RPM for around 1 minute.
- Continue at 2000 RPM depending on ambient temperature, until oil temperature reaches **15°C (59°F)**.
- Check the two ignition circuits at 2000 RPM

Note: Engine RPM should not drop by more than 100 RPM when 1 ignition is turned OFF.

WARNING

DO NOT apply full power until CHT reaches 100 °C (212°F)
DO NOT apply full power until Oil Temperature reaches 40°C (104°F)
DO NOT allow cylinder heads to rise above 180°C (356°F) during ground running.

4.4 Ground Running

- When running the engine on the ground before flight use minimum power settings and minimum time to avoid overheating: the engine is already run-in and further ground running can be detrimental.
- Avoid prolonged ground running at elevated RPM as the engine can easily be over heated during ground operations – remember air ducts are designed for *in flight* cooling.
- Ground running at high power settings for more than a few minutes requires the use of special, oversize air ducts and oil cooler.

WARNING

Prolonged running at full power on the ground can cause engine overheating & damage unless special, oversized air ducts and oil coolers are used.

4.5 Take-Off

- Ensure all temperatures and pressures are within limitations before applying take-off power.
- Climb with the engine at maximum continuous power.
- Observe Oil & Cylinder Head Temperatures & Oil Pressure.
- Max RPM at Full Throttle is 3300 RPM

WARNING

Limits must not be exceeded!

4.6 Engine Stop

- In normal conditions the engine will cool enough during descent & taxiing to permit it to be stopped by switching OFF the ignitions.

4.7 Engine Stop and Start During Flight

- Reduce power to 2000 RPM to cool engine for 30 seconds, then to idle.
- Switch ignitions OFF. At higher speeds (above 90 KIAS) the propeller may windmill – reduce aircraft speed until propeller stops turning.

- Starting procedure is the same as ground starting: without choke for a warm engine & with choke for a cold engine. As the engine cools quickly when stopped in flight the choke will normally be needed to restart.

WARNING
DO NOT apply the starter motor if the propeller is windmilling.

4.8 Operation in Winter

- It is recommended to carry out an engine service prior to the start of the cold season. For selection of oil to suit colder weather consult the table of lubricants given in the Engine Specifications above.
- Refer to Section 11.15 for the Troubleshooting Cold Start Checklist if the engine becomes difficult to start.

4.9 Carburettor Icing

- It is important to distinguish between two kinds of icing:
  i) Icing due to water in fuel, and
  ii) Icing due to high air humidity.

4.9.1 Icing Due to Water in fuel

- Water in fuel will accumulate at the lower parts of the fuel system & can lead to freezing of fuel lines, filters or jets. Remedies are:
  a) Drain, using fuel tank water drain.
  b) Ensure fuelling without traces of water. If in doubt, use a chamois as a filter.
  c) Install a generously sized water separator.
  d) Ensure that fuel lines do not permit the accumulation of water.
  e) Prevent condensation of humidity, i.e. avoid temperature differences between the aircraft & fuel.

CAUTION:
Do not add any form of alcohol (including automotive fuels with Ethanol or similar additives) to a Jabiru Aircraft fiberglass fuel tank unless directed otherwise by the aircraft operating manual. The sealant used in some (older) tanks will be damaged if it comes into contact with alcohol, leading to leaks.

4.9.2 Icing Due to High Air Humidity.

- Carburettor icing due to humidity may occur in the carburettor venturi & leads to performance loss due to changes in the mixture.
- The only effective remedy is to preheat the intake air by use of the Carburettor Heat Control.

4.10 New Engine Operation

- This engine has been dynometer run to a specific run in program and is ready for flight when delivered.
- Before initial start add oil to engine (2.3 litres with cooler for 2200 engine, 3.5L with cooler for 3300 engine).
- The engine has been INHIBITED before dispatch from the factory. It is recommended that this is removed before the first engine start: remove 1 spark plug from each cylinder and apply the starter motor for around 10 seconds: inhibitor oil will be ejected from the cylinders. Re-fit spark plugs & re-assemble engine.
- During storage and transport it is common for some inhibitor oil to run into the carburettor. Remove the carburettor bowl and inspect it for oil before running. Open the throttle butterfly and, using a light, inspect the induction manifold for excess inhibitor oil accumulation. Remove carburettor and clean manifold if required.

WARNING
Failure to remove all inhibitor from carburettor bowl may lead to engine stoppage. Ensure bowl is clean before first flight.

- Remove ALL plastic bungs on engine before starting. Bungs are fitted to the exhaust, carburettor, crankcase oil vent and fuel pump.
- The engine idle speed cannot be set accurately at the factory as the engine is run on a Dynamometer only. Therefore it is necessary to adjust the throttle idle stop(s) to obtain the appropriate RPM (Section 3.8.1) when engine is warm before first flight.

WARNING
Ensure engine does not stall when throttle is set to idle. While cold, test by pulling BOTH throttle levers against the idle stop.

- VARY your RPM when flying with a new engine.
- Do not “Baby” a new engine. The purpose of breaking in an engine correctly is to ensure a long reliable life. All moving parts need freeing up especially piston rings to cylinder walls. This is best accomplished when the greatest B.M.E.P. (Break Mean Effective Pressure) occurs. That is at 75% power and above. Early running of an engine should include periods at high RPM and power settings.
- Failure to operate at realistic power settings could be detrimental to engine condition & long-term performance.
- Always take off using full power – especially when the engine is new.
- Avoid heat build up – monitor CHT and oil temps. Note that Initial temps will be elevated due to the friction of a new engine. Careful monitoring by the pilot is needed during this initial period to ensure long life of the engine and its components.
- CIRCUIT WORK is a good sequence for initial run in work.
  - i) Abbreviate circuits initially
  - ii) Step climbs, climb at shallow angles & higher airspeeds to reduce engine temperatures
  - iii) Do not carry out glide approaches
  - iv) Gradually reduce power
  - v) Avoid sudden heating up and sudden cooling down
- Wherever practical, climb at a higher airspeed to assist engine cooling. For example, an aircraft with a best climb speed of 65 knots can often be climbed at around 80-85 knots with minimum impact on climb rate – although this varies depending on the airframe. At the higher speed setting the engine has much more cooling air available and revs higher. These conditions provide the engine with a significantly improved environment and generally both improve performance and reduce temperatures.
- Note that all engine temperatures can be expected to drop noticeably when the new engine run-in oil is replaced with standard oil.

4.11 Engine Installation

- Air cooled engines require careful design and tuning of the installation in order to operate at their best.
- Ensure that installations are designed in consultation with the Jabiru Engine Installation Manual and that all installation targets (for cooling, EGT, RPM etc) are met.

WARNING

Improper installation can cause severe engine damage and engine stoppage. It is the Operator’s responsibility to ensure that all installation targets are met. Damage to engines caused by installation issues may not be covered by Jabiru’s Limited, Express Warranty.

5 Maintainer Requirements

- The following are recommended as the minimum requirements for someone carrying out maintenance & inspection on Jabiru Engines.

5.1 Facilities

- An enclosed workspace with a sealed (i.e. not dirt) floor, adequate lighting, provision of compressed air & mains electricity.

5.2 Training

- Completion of an approved instruction course specific to Jabiru Engines. Approved courses include those offered by Jabiru Aircraft Australia or by local Jabiru Aircraft representatives when available.

5.3 Rating

- Commercial maintainers must hold suitable ratings as required by their local Airworthiness Authority.

5.4 Experience

- A minimum of 1 years' experience working on Jabiru Engines under supervision is recommended for commercial maintainers before working un-supervised.

5.5 Tool & Gauge Control

- Tool and gauge control is an important part of aviation maintenance systems. Tools and gauges must be accurate enough for the intended use (i.e. a 12" steel ruler is not the appropriate tool to use to measure the cylinder bore diameter) and be accurately calibrated – for example by an approved laboratory.
- Calibrations must be kept up to date. This means a check calibration every year or more frequently for regularly used, critical tooling.
- Even quality equipment will wear over time so items like reams, go / no-go gauges and valve seat cutting tools must periodically be checked to ensure they remain within limits.

5.6 Tools:

Access to the following tools will be required. All tools must be good quality items:

- Allen keys: 1/4", 5/32" 3/16" and 3/16" ball end in regular 3/8" drive and "T" handle
- Circlip pliers (internal)
- Crowsfoot: 2" in regular 3/8" drive: 7/16"
- Hydraulic lifter tool (hydraulic lifter engines only)
- Pliers: long nose, regular square jaw, side cutters
- Ring/open end spanners: 5/16", 3/8", 7/16", 1/2", 9/16", 10mm, 17mm
- Ratchet 3/8" drive, breaker bar, 2" extension bar, 3/8", 7/16", 1/2" sockets, 7/16" tube socket, 18mm spark plug socket
- Screwdrivers: flat blade and Phillips head in various sizes
- Feeler gauges: metric and imperial sizes
- Torque wrench: 3/8" drive, good quality (Snap-On, Warren & Brown etc), recently calibrated

5.7 Equipment:

Access to the following equipment will be required:

- Bench vice with padded jaws
- Calipers: must read up to 180mm
- Degreasing/cleaning system with solvent/solution containment/recycling
- Dial indicator and magnetic stand, vee blocks
- Hand press
- Heat gun or small butane/propane torch with a soft pencil flame
- Micrometer and internal measuring tools, must read up to 100mm
- Multimeter or an ohmmeter
- Spring scale: must read up to 2.5kg in 0.1kg increments
- Thread taps: 1/4", 5/16”, 3/8” UNF and UNC
- Valve seat cutters: 30°, 45° and 60°
- Valve spring compressor, motorcycle type or a ‘G’ clamp with a machined spring cup

5.8 General:

- Brass drifts, punches, rags, soft mallet, hammers
- Greases: molybdenum disulphide, general purpose
- Loctite compounds: 242/243/262 ThreadLocker, 515 Sealant, 620 Retainer, 7471 Cure Accelerator
- Lubricants: engine oil, Nulon L90
- TorqueSeal brand security marking lacquer or similar, such as coloured nail varnish

5.9 Sealants and Compounds

- See JEM0004 for a list of the sealant and compounds used in Jabiru 2200 Gen 4 and 3300 Gen 4 configuration engines.

6 STORAGE & CLEANING

6.1 Parking

- Whenever the engine is not active or being maintained it is strongly recommended that the following points are covered to prevent contamination and pest ingress:
  - Engine air inlet
  - Exhaust outlet

If the engine is not fitted in an airframe then the following must also be sealed:

- Inlets to carburettor and fuel pump
- Engine crankcase vent
- Pipe fittings of oil cooler adaptor (if oil cooler is not currently connected).

CAUTION

Equip all covers with tags or other high-visibility devices to minimise the chance of inadvertent operation with covers still fitted.

6.2 STORAGE

- The following procedures assume that the engine is installed in a Jabiru airframe. For other aircraft types, refer to the manufacturer's service manual. If the engine is not fitted to an airframe, ignore those items referring to the airframe.

Note: Failure to store the engine for a long period of time, in excess of 60 days, without taking the preventative measures as outlined in the manual will affect claims upon Jabiru's Limited, Express Warranty and effect the airworthiness of the engine.

6.2.1 Flyable Storage

- Flyable storage is defined as a maximum of 30 days non-operational storage.
- Ensure that the engine has been stopped by turning off the fuel valve, thereby not leaving any fuel in the carburettor bowl.
- Leave the propeller in the horizontal position to ensure even distribution of liquids in the wood. If left in the vertical position, liquids will drain to the lower tip resulting in an unbalanced propeller.

CAUTION

Ensure that the Master and Ignition Switches are OFF before turning motor!

WARNING

Do not store MOGAS or fuels containing alcohol for longer than 14 days in a Jabiru aircraft. Refer to Service Letter JSL007 for details.

- Store under cover, away from direct sunlight.
- Ensure openings as detailed in Section 6.1 are covered.

6.2.2 Returning Engine to Service from Flyable Storage

- After flyable storage, returning the engine to service is accomplished by performing a thorough pre-flight inspection. Ensure all protective covers are removed.

6.2.3 Temporary or Indefinite Storage

- Temporary storage is defined as engine in non-operational status for a maximum of 60 days.
- Treat as for flyable storage, plus:
  - For temporary storage, fill aircraft fuel tank with AVGAS (to prevent moisture accumulation).
  - For indefinite storage, drain fuel tank, ensure carburettor bowl is empty by running engine with fuel valve off until it stops or by draining bowl.

CAUTION

Do not store MOGAS or fuels containing alcohol for longer than 14 days in a Jabiru aircraft. Refer to Service Letter JSL007 for details.

Then:

1. Clean engine thoroughly.
2. Seal or cover all openings.

3. Remove battery and store in a cool dry place. Service the battery periodically and charge as required.

NOTE: It is recommended that batteries not being used should be charged every 30 days.

4. Remove the rocker covers from each cylinder head and spray corrosion inhibiting oil into the rocker chambers and reinstall rocker covers.

NOTE: Use SHELL Aero fluid 2UN (MIL-C-6529C Type 1) or similar engine corrosion inhibitor.

5. Seal exhaust pipes. Attach a red streamer to each.
6. If the propeller is wooden, position it so that it remains horizontal.
7. The fuel tank breather must be covered but MUST NOT be sealed – the expansion of gases within the tank can severely damage it if there is no escape path.
8. Attach a warning placard to the instrument panel stating that vents and breathers have been sealed and that the engine must not be started with the seals in place.

6.2.4 Inspection During Storage

1. Generally inspect engine and clean as necessary.
2. If, at the end of the **60 day period**, the engine is to be continued in non-operational storage – repeat Steps above (most will only need to be checked).

6.2.5 Returning Engine to Service After Temporary / Indefinite Storage

After temporary storage, the procedures for returning the aircraft to service are as follows:

1. Check battery and install.
2. Check carburettor air filter and service if necessary.
3. Remove warning placard from instrument panel.
4. Remove materials used to cover openings.

CAUTION

Ensure that the Master and Ignition Switches are OFF before turning motor!

5. Check fuel filter – replace if necessary.
6. If returning to service after indefinite storage, fill fuel tanks with correct grade of fuel.
7. Check fuel tank and fuel lines for moisture and sediment. Drain enough fuel to eliminate any moisture and sediment.
8. Check that the fuel tank breathers are clear.
9. Perform a thorough pre-flight inspection.
10. Start and warm engine.

6.2.6 New Engine Storage

- In many cases new or overhauled engines may be stored for some months or years before being installed in an aircraft. All engines are treated with corrosion inhibitor by Jabiru Aircraft Australia before shipping from the factory however this treatment is roughly equivalent to that described in Section 6.2.3 above. It is intended for a maximum life of approximately 60 days – though the exact effective life of the treatment depends on the ambient temperature, humidity etc.
- If an engine is to be stored before use the owner must:
  - i) Install the engine within 60 days (nominally) of the engine leaving the factory, or
  - ii) Repeat the Temporary Storage procedures given in Section 6.2.3 at a suitable interval (60 days nominally, depending on ambient temperature, humidity etc) and periodically inspect the engine in accordance with Section 6.2.4
- When the engine is to be run the storage measures must be reversed as detailed in the appropriate sections above.

6.3 CLEANING ENGINE AND ENGINE COMPARTMENT

- The engine should be kept clean since dirty cooling fins and baffles can cause overheating of the engine. Also, cleaning is essential to minimise any danger of fire and provide easy inspection of components.

CAUTION

Caustic cleaning solutions should not be used.

- Recommended cleaning procedure is lightly spray with degreasing fluid – after sealing coils and starter motor.
- Ensure the inside of the engine cowlings are also cleaned.
- Run engine after cleaning. This will warm it and encourage evaporation of excess moisture while the propeller wash will also blow away residual moisture.
- In some cases it may be necessary to also clean the firewall.

7 MAINTENANCE

7.1 Service Interval Tolerance

- A tolerance of plus or minus 3 hours is allowable on all service intervals set within this manual
- Engine life is measured via direct tachometer hour meters or “Hobbs” meters. Air switches or scaled hour readings based on cumulative power output are not to be used.

7.2 Basic Inspection Procedure

- Test run engine: record anomalies.
- Remove the engine cowlings and inspect the engine bay in “dirty” condition.
- Clean the engine bay & propeller
- Carry out the inspections listed in section 8.
- Test and re-assemble the aircraft. Test fly if required.

7.3 Work Sheets

- Work sheets designed to suit the inspections below are included in Section 12. These sheets are designed to be fast to fill out and to give all required detail from a particular inspection when affixed in the log book.
- The use of these worksheets by maintainers is mandatory.

7.4 Mandatory Inspections & Lifed Items.

- Engine life is as noted in Section 10.
- Lifed components of the engine are detailed in the Engine Overhaul Manual (JEM0004).

7.4.1 Flexible Hoses

- All flexible hoses in the engine compartment should be replaced at engine overhaul or every 2 years whichever comes first. Hoses which show visible deterioration (cracking, excessive hardening) should be replaced immediately, irrespective of age.

Note: If oil cooler hoses are installed with oil on the hose fittings or, with oil on the inside of the hose in the vicinity of the fittings, hose security may be adversely affected.

7.4.2 Carburettor rubber mount

- The rubber connector attaching the carburettor to the plenum chamber must be replaced at overhaul or every 5 years whichever comes first. Connectors which show deterioration (cracking, splitting etc) must be replaced irrespective of age.

7.5 Engine Inspection Chart

- The chart below shows the recommended intervals at which items are to be inspected.
- Additional detail of the maintenance required for each point is given in the sections below the inspection chart.
- The worksheets provided in section 12 also dictate the tasks required at each inspection interval.
- 2200 Gen 4 and 3300 Gen 4 configuration engine have the following inspection intervals:
    - **Inspection after the first 5 hours** TIS (for newly factory built aircraft or factory installations this inspection would typically be conducted at the factory itself after all test flying had been conducted.
    - **25 hourly** – limited to an Oil and filter change only.
    - **50 hourly** – Basic maintenance inspections
    - **100 hourly** – More extensive than a 50 hourly, replacement of several disposable parts
    - **Annual** – Similar in scope to a 100 hourly inspection

8 Standard engine maintenance tasks

This section details maintenance tasks which are conducted on the Jabiru 2200 Gen 4 and 3300 Gen 4 configuration engines. In general only the 'Standard' maintenance tasks need be conducted. If during these inspections certain conditions are encountered, reference is made to 'Special' inspections. For more extensive corrective action reference should be made to the most current issue of the Gen 4 2200/3300 engine overhaul, assembly and parts book (JEM0004).

The worksheets provided in section 12 list the intervals at which standard maintenance tasks should be conducted.

WARNING

Before starting work on the engine it is recommended that the engine starter be disabled (via disconnecting the starter solenoid or similar) to reduce the risk of injury from inadvertent engine start.

8.1 Propeller maintenance

- For propellers manufactured by Jabiru aircraft the specific maintenance schedules specified in the relevant propeller technical manuals must be adhered to.
- For non-approved propeller installations there are additional maintenance tasks required for the engine itself as specified in section 9.8.

8.2 Engine ground test run

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)

- Before beginning the step-by-step inspection, start, run-up and shut-down the engine in accordance with instructions in the Flight Manual.
- Before starting, ensure the aircraft is suitably positioned. Aircraft must be:
  - Oriented into wind
  - Positioned where there is no long grass, loose gravel, sticks or dirt under the propeller.
  - Positioned where the wash from the propeller will not blow into hangars, at aircraft or personnel etc.
  - Positioned where there is sufficient space to regain control of the aircraft in the event of brake failure.
  - Positioned with consideration to other personnel – i.e. where noise impacts are minimised.
- During the run-up, observe the following, making note of any discrepancies or abnormalities:
  - Engine temperatures and pressures.
  - Static RPM within limits of Section 3.3.
  - Magneto drop within limits of Section 3.12.
  - Engine response to changes in power.
  - Any unusual engine noises.
  - Fuel shut-off valve; operate engine in ON position and in OFF position long enough to ensure shut-off functions properly.
  - Idling speed within limits of Section 3.8.1.
- After the inspection has been completed, an engine run-up should again be performed to determine that any discrepancies or abnormalities have been corrected.

WARNING

Engine runs on the ground must be short to avoid over-heating engine. Monitor engine temperatures carefully during ground test runs.

Test runs are to be carried out by appropriately trained, authorised personnel only

8.3 Engine cowlings

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)

- Remove camloc fittings, countersunk screws and hinge pins, remove top and bottom cowls
- Inspect cowls for damage or wear. In particular inspect the attachment holes checking for excessive elongation
- Inspect the inside of the cowl for signs of rubbing from the engine. Rubbing will cause excess vibrations transmitted into the airframe
- Inspect the cowl attachment hardware and replace any as needed.

8.4 Inspection of engine – Before cleaning

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- The engine should be inspected before cleaning the engine compartment.
- Inspect engine for oil leaks:

8.5 Cleaning the Engine

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Refer to Section 6.3

8.6 Inspection of engine – After Cleaning

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- With the engine clean further inspections can be made without dirt build-up obscuring the engine.
- Thoroughly inspect the engine for missing or loose bolts, nuts, pins etc.

8.7 Induction air filter

Required Tools:	Screwdrivers Air compressor with airgun
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Remove the hot air mixer box cover.
- Remove air filter and insect checking for tears or holes.
- Clean air filter (at the service interval specified) by tapping gently to remove large particles.
- If the air filter is exceptionally dusty, replace regardless of the service interval.
- At the intervals specified the air filter must be replaced regardless of apparent condition.
- Reinstall air filter with cover, ensuring the cover seals correctly on the filter.
- For operation in heavy dust conditions, replace air filter at shorter intervals than recommended for normal conditions.

8.8 Induction air SCAT hose

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Check the condition of the scat hoses both into and out of the hot air mixer box
- Check the SCAT hose retaining hose clamps are secure
- Check the installation of the SCAT hose running into the carburettor; make sure it does not bunch up before the carburettor inlet pipe.

8.9 Carburettor heat system

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Check the smooth function of the carburettor heat system by cycling the carburettor heat pull cable in and out a few times.
- Check the flap seals on the cold air and warm air inlets.
- Check the condition and security of the warm air muff around the exhaust muffler
- Check the condition and security of the warm air SCAT hose

8.10 Ram air cooling ducts

Required Tools:	3/16” Allen wrench
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Remove the ram air cooling ducts from on top the cylinder heads (it is not necessary to remove the ignition leads from the duct
- Inspect the ram air duct check the condition of the baffles and rubber skirting,
- Check that the steel attachment tags are secure to the duct
- Check for signs of abrasion between ducts and engine or ducts and cowl.

8.11 Ignition lead inspection

Required Tools:	Screw drivers
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect the length of each lead, checking for cracked or damaged insulation. Particularly check areas where the lead may have been rubbing against other items in the engine bay.
- Check the fit of the high-tension lead caps onto the distributor and spark plugs.
- If the fit is loose or if the contact is visibly damaged as shown in Figure 6 then a screwdriver or similar must be used to re-shape the contact (it should be round) and to re-size it for a better fit – for a spark plug the diameter of the contact needs to be reduced to tighten while for a distributor cap it needs to be expanded. Each cap should fit with a clear “click” as it connects to the distributor cap or spark plug. Take care not to over-bend and contact and replace any which are damaged.

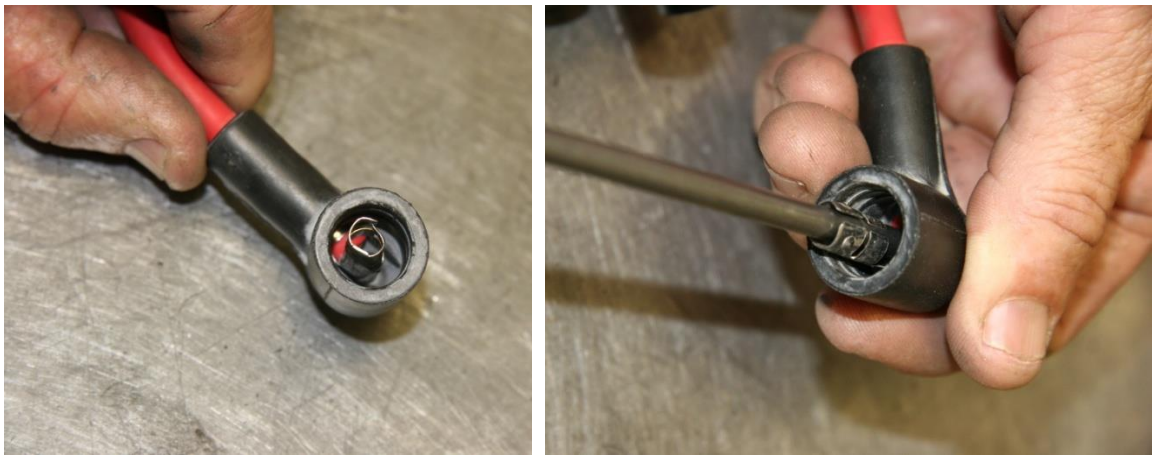


Figure 6 – Adjusting High Tension Lead Caps

8.12 Pressure differential (leak-down) test

Required Tools:	Leak-down Tester
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- Pressure differential (Leak down) tests are a very good test of the condition of rings, bore, head sealing and valves. This is the normal test used in aviation and is a requirement during scheduled maintenance. It requires specific test equipment.
- All leak-down tests must be conducted whilst the engine remains hot (i.e. shortly after running the engine).
- Remove 1 spark plug from the cylinder to be tested and fit the leak-down tester in its place.
- Pressure input is set to 80 PSI; a second gauge reads the differential. This is done with piston on TDC on the compression stroke. Maximum allowable pressure loss is 25% - therefore a differential of lower than 60/80 indicates a problem which must be addressed and corrected before an aircraft can be brought back into service.

CAUTION

The propeller must be restrained by a second person as the air pressure applied will tend to rotate the crank. Ensure this person has firm hold of the propeller. Injury can occur if the propeller is allowed to go loose.

- Poor compression can be an indication of a serious problem. For example, continued operation with poor compression due to a poorly-sealing valve can lead to valve failure and heavy damage to the rest of the engine
- After testing, note the results in the maintenance worksheet.

8.12.1 Identifying Compression Leaks

- Problems can be better identified using the leak down:
  - i) Remove the dipstick and listen at the opening. Air leaking through here can indicate worn pistons rings or a worn cylinder bore
  - ii) Listen at the opening of the air mixer box. Air leaking from here indicates a poor intake valve seal.
  - iii) Listen at the exhaust outlets – air leaking from exhaust indicates a poor exhaust valve seal.
  - iv) Apply a small amount of soapy water to the base of the head, where it mounts to the cylinder. A head seal leak will be indicated by blowing bubbles in the soap mixture. (in this case the head barrel assembly must be replaced)
- Alternative to listening, a rubber glove or similar can be stretched over the opening being checked (Air mixer box inlet, exhaust outlet, crankcase vent); if the glove inflates this indicates the location and rate of the leak.
- With the problem narrowed down, correction work can more easily be carried out.

8.13 Spark Plugs

Required Tools:	Plastic Brush Fine nosed pliers Torque wrench, Spark plug spanner
Parts and Material:	Solvent Anti-seize compound Replacement spark plugs
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- After conducting a leak down test remove the remaining spark plugs
- Do not use steel or brass brushes for cleaning & never sandblast plugs.
- Clean with plastic brush in a solvent.
- Check the terminal nuts are securely fitted to the spark plugs
- Check electrode gap & if necessary, adjust the gap to the limits required. Refer to JEM0004 for gap tolerances.
- Reinstall spark plugs, refer to JEM0004 from installation procedure.
- At the intervals prescribed the spark plugs must be replaced regardless of apparent condition. The spark plug terminal nuts may be reused on new spark plugs.

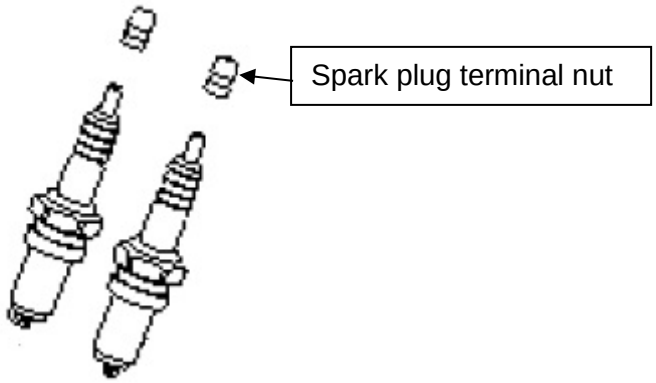


Figure 7 – Spark Plug Terminal Nut

8.14 Cylinder inspection

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect the base of each cylinder, checking for oil leaks or signs of fretting (cylinder base fretting would normally also be indicated by loss of through bolt tension.
- Inspect the cylinder head to cylinder barrel connection, checking for signs of combustion gas leakage.

8.15 Inspect through bolts / stud bolts

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect the through bolt and stud bolt nuts, checking the torque seal anti-tamper compound is present and intact.
    - Missing or broken torque seal can indicate a loss of tension or it may simply have occurred due to vibrations. If broken torque seal is found a through bolt torque check must be conducted (see section 9.3).

- If all through bolt torque seals are found intact no torque check is necessary.

8.16 Crankcase seals

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect the front crankcase seal, checking the general condition and inspect for any oil leaking around the seal.
    - Leaks in the front crankcase seal can be an indicator of propeller imbalance or excessive propeller vibration (particularly is a non-approved propeller is installed on the engine).
- Inspect the rear seal using a torch, again checking the overall condition and inspecting for signs of leakage.

8.17 Flywheel screw visual inspection

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Using a torch to inspect the flywheel screws from the back of the engine
    - The flywheel screws can be inspected through the hole in the alternator stator mount. The alternator does not need to be removed
- Visually inspect the condition of the flywheel screws:
    - They should all be intact and appear tight
    - Check the torque seal on the flywheel screws is intact
    - Broken torque seal can indicate loss of flywheel screw tension. If this is the case a flywheel screw torque check should be conducted (see section 9.1).
    - If all flywheel screw torque seals are found intact, no torque check is necessary.

8.18 Induction and exhaust system

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect the induction pipe connection to the cylinder head, checking for signs of leaks
- Inspect the induction pipe rubber joining hoses, checking for security and condition of the hose clamps
- Inspect the induction pipe connection in to the plenum chamber. Check the gasket sealant is intact and providing an adequate seal.
- Inspect the exhaust extractor pipe connections to the cylinder head for signs of leaking.
    - Some small amounts of black soot around the perimeter is not uncommon and is acceptable.
    - Excessive black soot and evidence of combustion gas indicates a leak which must be corrected.
- Inspect the muffler attachment to the exhaust extractor pipes, checking the condition of the attachment springs.
- Check the security of the induction / exhaust pipe retaining clamp turtles.

8.19 Rocker chamber inspection

Required Tools:	3/16” Allen wrench
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- Remove rocker covers and visually check the rocker covers
- Check the rocker chamber has been sufficiently lubricated (i.e. is oil in the chamber)

- Visually check the condition of the valves, top and bottom valve spring retaining washers and the valve springs themselves.
    - In particular check for signs of corrosion on the valve springs. Corrosion pitting can lead to valve spring failure.
- The condition of the bushes fitted to the valve rockers must be monitored. This can be done by a visual inspection with the rocker cover removed – check for visible movement of the rocker on the shaft, visible degradation of the bush material etc.

8.20 Hydraulic Lifter Maintenance

Required Tools:	A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- With the rocker covers removed check that each lifter has not collapsed.
    - Turning the crankshaft so that the valve is fully closed
    - Press down on the pushrod end of the rocker – the lifter should feel firm, with minimal movement possible under thumb pressure.
    - Note that the correct method for finding the fully closed position point is to turn the crankshaft until the valve is fully open (as visible through the rocker chamber, then turn the crankshaft through one complete revolution to rotate the cam lobe away from the lifter.
- Removal of lifter is not required as standard and must only be conducted if a problem with lifters is suspected. The removal of hydraulic lifters from 2200 Gen 4 / 3300 Gen 4 configuration engines requires the removal of the entire cylinder head barrel.
- After inspection reinstall rocker covers (refer to JEM0004 for the torque setting).

8.21 Oil and filter change

Required Tools:	Side cutters or similar Spanners / Socket wrench Lock wire pliers
Parts and Material:	Replacement Oil Filter Replacement Oil meeting specifications in Section 3.6. Lock wire (aircraft grade stainless steel 0.025” typical)
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)

- Carry out a visual inspection for leaks around the oil cooler adapter.
- Cut the safety wire on sump plug, remove it & drain the oil
    - This is most conveniently done while the engine is warm (but not hot)
- Remove the old oil filter while the sump is draining. Ensure the oil seal of the old filter comes away from the engine with the filter.
- DO NOT drain the oil cooler during a normal oil change. The cooler holds only a small amount of old oil which has negligible effect on the new oil. Taking the hoses on & off the cooler can prematurely age the oil lines and lead to hoses slipping off the cooler.
- Inspect the sump plug seal & replace if worn or damaged.
- Re-fit the sump plug with seal, tighten to the prescribed torque setting and lock wire (refer to JEM0004)
- Take a new oil filter and fill with new oil. Lubricate the seal on the base of the filter with new engine oil and fit the filter to the engine. Tighten until seal touches the engine and then turn it an additional ¾ - 1 full turn. DO NOT apply excess torque to the filter. The filter should be installed by hand to prevent damage.

CAUTION

Jabiru Aircraft recommend that the oil filter is not safety wired. Experience has shown that the filter will not move if installed correctly and that using safety wire, hose clamps etc. can damage the filter and lead to failure.

- Remove dipstick and fill the engine with oil. (approx. 2.3 litres for 2200 Gen 4 engine, 3.5 litres for 3300 Gen 4 engine)
- Check the oil level using the dipstick. It should lie within the minimum and maximum marks.
- Clean any oil residue from the oil / filter change before returning to service.

NOTE
Use only registered brand oils meeting the specification detailed in Section 3.6.
(NEVER USE AUTOMOTIVE OIL!)

WARNING
Jabiru has not verified the attributes claimed by oil additive manufacturers and warn against using them as they may have detrimental effects.

8.22 Empty oil collection bottle

Required Tools:	Screw drivers Volumetric measuring flask or similar
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)

- The oil collection bottle should always be emptied when the oil is changed
- Disconnect and remove the oil collection bottle from the firewall.
- Measure the quantity of oil in the collection bottle, record this measurement in the engine maintenance worksheet and discard the oil.
- Replace the oil collection bottle on the firewall and reconnect the engine vent hose.

8.23 Flexible oil lines

Required Tools:	N/A
Parts and Material:	Replacement oil hoses (if required)
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect flexible oil lines running between the engine and oil cooler, check for fraying, cracking or general degradation. Replace on condition if required.
- Replace flexible oil lines at the mandatory replacement intervals regardless of apparent condition.

8.24 Distributor inspection

Required Tools:	Allen wrench
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- Remove the distributor cap clamps. Remove the distributor cap.
- Inspect inside the distributor cap, checking the condition of the electrodes.
- Inspect the rotor button, check the rotor is secure on the shaft and the brass contact is in serviceable condition.
- Inspect the rotor shaft seal for oil leaks.
- Reinstall the distributor cap (refer to JEM0004).
- Reinstall the distributor leads on caps and spark plugs (again refer to JEM0004).
- Reinstall ram air ducts (refer to JEM0004 for the rocker cover screw torque setting).

8.25 Electric boost pump fuel flow

Required Tools:	Screwdrivers Container with accurate volume marks Clock or stopwatch

Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Disconnect the fuel line from the mechanical fuel pump in the engine compartment.
- Have a second person stand by to catch any fuel that flows out of the line in a container with accurate volume marks. Ensure the free end of the fuel hose is held level with the carburettor fuel inlet.
- Turn electric fuel pump on and pump fuel through the lines into container. The fuel flow rate should be 50 – 60 litres per hour. A significant deficit from this target may indicate a worn pump or kinked fuel lines.
- Re-connect the fuel line to the mechanical fuel pump.

8.26 Mechanical fuel pump

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect the mechanical fuel pump, checking for signs of oil leaks around the gaskets and retaining bolt security.
- Check for fuel leaks around the fuel pump and in the fuel pump drip tray.
- Check the condition of the fuel pump drip tube outlet and drip tray outlet hoses.
- Check the security of the inlet and outlet brass fuel fitting by tugging firmly on each, any movement in these connections must be corrected.

8.27 Flexible fuel lines, fittings and fuel filter

Required Tools:	Screwdrivers
Parts and Material:	Replacement flexible lines (if required) Replacement fuel filter
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect the condition and security of the fuel lines running forward of the firewall. Check for fraying, cracking and other degradation. Replace on condition as required.
- Replace flexible fuel lines at the mandatory replacement intervals regardless of apparent condition.
- Inspect the condition of the fireproof sleeves. Check the security of the sleeves over the fuel hoses.
- Check the security of fit of fuel lines into and out of the firewall, carburettor and mechanical fuel pump.
- Check condition of fuel taps and all fuel fittings.
- Replace the fuel filter at the required interval.

8.28 Engine control linkages

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Check for the correct function of the throttle control.
    - Cycle the throttle from idle to full power several times, feeling for roughness or excessive resistance.
    - Inspect the carburettor while cycling the throttle linkage to check the carburettor throttle. linkage arm rotates smoothly about the throttle cable link without jamming.
    - Check the full range from the idle stop to full power stop is accessed by the throttle.
- Check for the correct function of the choke control.
    - Cycle the choke control several times, feeling for excessive resistance.
    - Check the fully open and fully closed choke positions are accessed by the choke control.

8.29 Carburettor

Required Tools:	N/A
Parts and Material:	Replacement carburettor rubber mount
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Carburettor: Inspect for damage or wear. Remove the bowl and check for contamination. Inspect the carburettor mount / coupling to check for cracking or degradation.
- Inspect rubber carburettor mount, checking for cracks or rubber perishing. Replace if required.
    - Replace the carburettor mount rubber at the mandatory replacement intervals, regardless of apparent condition.
- **Rubber mount must be clean dry. DO NOT LUBRICATE.**

8.29.1 Fuel Shut off Valve Test

- Position the shut off valve (SOV) lever in the cabin to the off position, remove the carburettor bowl and place a container below to collect any fuel or have another person assist.
- Move the SOV lever to open and ensure fuel flows at the carburettor.
- Close the SOV lever and ensure that fuel flow ceases
- Ensure placards are in place

8.30 Engine mount points

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect the engine mount points on the engine back plate:
    - Check for fastener security and condition
    - Inspect the condition of the mount rubbers, check for cracks or degradation of the rubber, check the mount rubbers are not relaxed causing the engine to sag.
- Inspect the engine mount:
    - Check for corrosion dents or other damage
    - Check fastener security on the firewall mount points
    - Check welded intersections for cracks

8.31 Electrical wiring

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Check wires for damage and wear, including chaffing, burning, dirty or loose connections.
- In particular, the connectors for the voltage regulator and the alternator must be inspected for corrosion, loose connections or damage.
- Ensure electrical wiring is mounted on the engine mount using insulating spacers (i.e. not mounted directly onto the steel engine mount). In the event of a wire becoming chaffed, contact with the bare engine mount can cause and electrical short circuit.

8.32 Starter motor and solenoid

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- Inspect the general condition of the starter motor. Checking for discoloration which may indicate overheating.
- Check security of the starter motor retaining screws.
- Check the condition of the high tension leads (both the live and earth leads going to the starter motor).
- Inspect the start Bendix with aid of a torch checking the condition of the gear teeth.
- Inspect the flywheel starter ring gear, checking for chipped or broken teeth.
- Inspect the start solenoid. Check the high tension leads and electrical connectors are in good condition

WARNING

Be mindful when working around the starter solenoid, that hands or tools do not bridge the two contacts completing the circuit. Electrical shock will result and the starter motor will be activated.

8.33 Ignition Coil

Required Tools:	Multimeter, feeler gauge
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

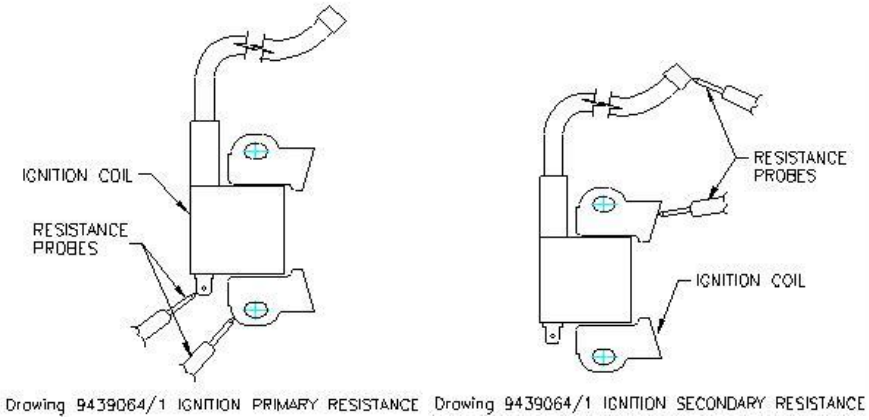


Figure 8 – Ignition coil electrical tests

- Use a multimeter to measure the primary resistance (from the earth terminal to the iron core as shown above). Refer to section 3.12 for the allowable range.
- Use a multimeter to measure the secondary resistance (from the high tension lead to the iron core as shown above) Refer to section 3.12 for the allowable range.

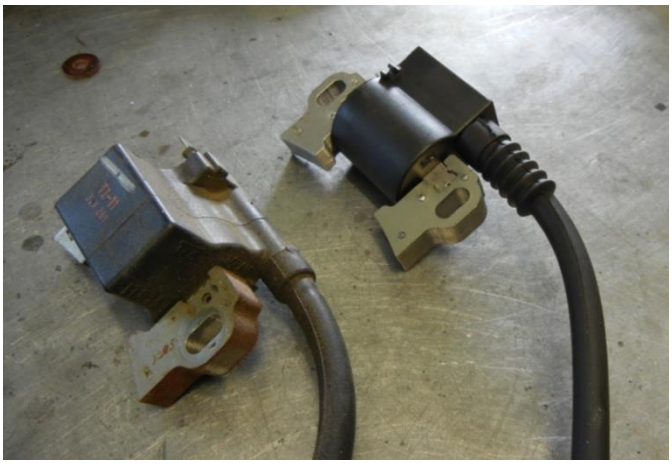


Figure 9 – Different Ignition Coil Models (Honda on Left, Jabiru on Right).

- For best performance the gap between the ignition coil and the flywheel magnets must be set to the specified gap (refer to JEM0004)
- Follow the procedure described in below for setting ignition coil gaps.

CAUTION
When working at the rear of the engine care must be taken to ensure no metallic materials are captured by the ignition or alternator magnets.

8.34 Ignition Coil Gap Adjustment

Required Tools:	Metal gauge of correction thickness (see Section 3.2) Screwdriver
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L1,L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (A&P or LSA Repairman / Maintenance)

- For best performance the gap between the ignition coil and the flywheel magnets must be set to the specification given in JEM0004.
- To set gap, use a piece of gauge material the correct thickness. A metal gauge can be used, as can alternatives made from plastic etc.
- Loosen the screws holding the coil in place, move it away from the flywheel and then re-tighten. This is to increase the size of the gap and allow the gauge to be inserted.
- Rotate the crank until a magnet pole plate aligns with the coil being adjusted.
- Place the gauge material between the coil and the flywheel magnet. Loosen the screws holding the coil and allow the magnets to suck it against the gauge.
- Tighten the screws, locking the coil in place.
- Rotate the crank to draw the gauge material from between the coil and the flywheel.
- When both coils are adjusted check that the gap is the same for both coils and all magnet pole plates.

CAUTION
When working at the rear of the engine care must be taken to ensure no metallic materials are captured by the ignition or alternator magnets.

8.35 Alternator inspection

Required Tools:	N/A
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- Visually inspect the alternator stator from the rear of the engine (generally there is no need to remove the alternator stator for this inspection.
    - Visually check the colour of the stator windings and for signs of burning of overheating.
- Use a multimeter to measure the resistance of the windings, refer to section 3.12 for the allowable range. Resistance to ground should be infinite.

9 Special maintenance tasks

The following section describes some of the special inspection conducted during maintenance of the engine. These special inspections are only to be conducted whereby previous inspections indicate that it is necessary. Any special inspections conducted and corrective action taken as a result must be recorded in the engine maintenance log.

9.1 Flywheel screw torque check

Required Tools:	Torque wrench
Parts and Material:	
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- A flywheel torque check is only required if the visual inspection conducted in section 8.17 indicated the need for further investigation.
- The alternator stator need not be removed since the access hole through the stator mount provided is sufficient for tool access.
- All 2200 Gen 4 / 3300 Gen 4 engine use Nordloc washers under the retaining capscrews. Set a torque wrench to the installation torque setting for flywheel capscrews (refer to JEM0004).
- ‘Click’ each screw off at the prescribed torque setting (in the tightening direction).
- If any screws rotate at this torque setting then ALL flywheel screws and washers must be removed and replaced with new, approved, screws. The procedure for replacing these screws must be followed precisely (see Section 9.2 below) .

WARNING
Ensure the torque wrench used is serviceable and calibrated. An uncalibrated torque wrench may give false indication of flywheel screw torque

Figure 10 – Flywheel fitted with Nordloc washers

9.2 Flywheel Screw Replace (Nordloc only)

Required Tools:	Screwdrivers Spanners / Socket Wrench Torque wrench
Parts and Material:	Replacement Flywheel Screws and Nordloc washers.
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- Check Service Bulletin JSB012 to see if any changes are needed.
- Remove the alternator stator to allow access to the flywheel. (see Overhaul manual for procedure). Where equipped the vacuum pump must also be removed.
- Remove one flywheel screw and discard.
- Check the crankshaft thread is clean and dry (not oily). If a thread tap is used to clean the thread use only hand tools – do not fit the tap in an electric drill or similar as this reduces control and makes damage to the thread much more likely. Blow out the hole using compressed air.

- Using a new flywheel screw, hand insert it into the crankshaft thread for three turns, then wriggle it. The screw should be a firm fit with minimal movement. If the tip of the screw moves by more than 1.5mm then the hole in the flywheel has been elongated and must be repaired. Refer to the overhaul manual JEM0004 for removal and repair details.
- If the new flywheel screw moves less than 1.5mm fit it with a new Nordloc washer and screw fully in. Next smoothly torque it to the appropriate value from JEM0004. Note that only new “Unbrako” or “Brighton Best 1960-Series” screws are to be used.
- Re-install the alternator stator. Set the gaps between the ignition coils and the flywheel magnet plates in accordance with the details given in Section 8.34.

Figure 11: Flywheel bolts installed with Nordlocs and steel wear plate.

9.3 Through bolt and stud bolt torque check

Required Tools:	Torque wrench
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- A through bolt torque check is only required if the previous visual inspection conducted in section 8.15 indicated that they may have moved or lost tension.
- Set a torque wrench to the prescribed through bolt / stud bolt installation torque setting (refer to JEM0004).
- Click off each through bolt nut at this torque setting in the tightening direction.
- If through bolts click off at the required torque setting without movement it indicates no loss of bolt tension, renew any broken or missing torque seal to these bolts.
    - Some though bolts may relax slightly, particularly during the initial life of the engine (within the first 100 hours or so) as the cylinder heads, and barrels settle slightly. This would be indicated by slight movement of the nut no more than 1/8th of a turn. This is not abnormal.
    - The location and degree of movement of any through bolts should be noted in the maintenance log. At the next scheduled maintenance interval a through bolt torque check should be repeated on all bolts to verify that the bolts have stabilised or if a further issue exists.
    - If bolt movement is excessive and occurs on most bolts in the engine it may indicate that the crankcase is fretting (or it may indicate the torque wrench being used is not calibrated correctly). If fretting is suspected a crankshaft friction test should be conducted (refer to JEM0004).

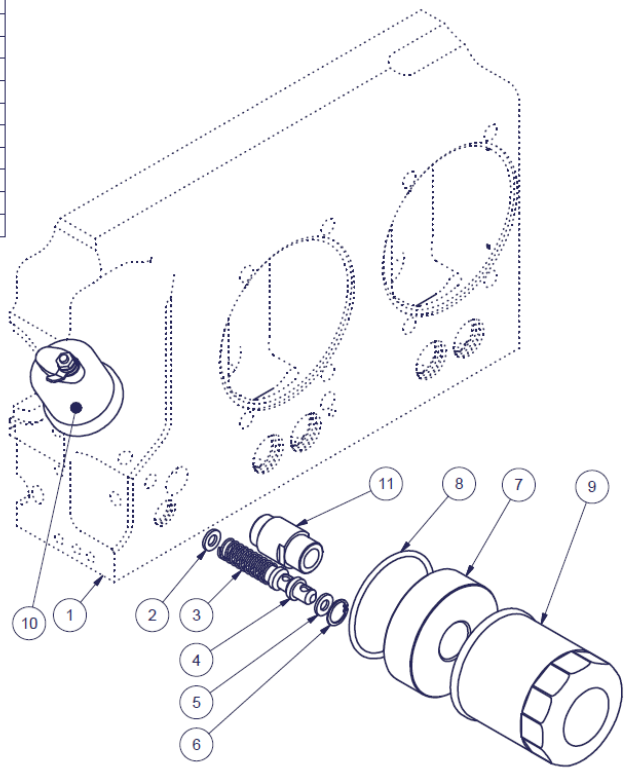
9.4 Oil Pressure Relief Valve Adjustment

Required Tools:	Circlip pliers
Parts and Material:	Replacement relief valve plunger (if required) Additional ¼" flat washers (if required)
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- If during engine running the oil pressure is found to be non-optimal the oil pressure can be adjusted by adjusting the oil pressure relief valve using the following procedure.
- Remove the oil filter.
- Remove the oil cooler adaptor. Note that to gain sufficient slack in the oil lines it may be necessary to remove the oil cooler from its mounting.
- Remove the circlip and draw the valve assembly out of the case.
- Inspect the sealing face of the relief valve plunger. If there are visible nicks or damage then it must be replaced. If a new plunger is to be installed it must be lapped to the front restraining washer.
- If the pressure of the engine needs to be increased another washer can be added behind the spring (item 2 in Figure 12 below). If the pressure needs to be reduced then a washer can be removed.
- Re-assemble the valve, a new circlip must be used.
- Ensure that the spring is not coil-bound: press on the tip of the oil valve plunger and ensure there is a minimum of 1mm movement.

ITEM	PART No.	DESCRIPTION	QTY
1	REF ONLY	CRANKCASE LS	1
2	AN960-416	1/4" FLAT WASHER	1
3	PX4A002D-2	SPRING OIL PRESSURE RELIEF 3.5 BAR	1
4	4536064-7	PLUNGER OIL PUMP RELIEF VALVE (2.2L)	1
5	PH06864-2	WASHER OIL PUMP RELIEF	1
6	PH10142N	CIRCLIP. INT DIA 16	1
7	4581064-13	OIL COOLER ADAPTOR	1
8	PG4A038N	ORING BS229 (NOTE: NOT VITON)	1
9	PG10162N	FILTER	1
10	PI10182N	OIL PRESSURE SENDER	1
11	4A490A0D-1	THREADED ADAPTOR M/M OIL FILTER-OIL COOLER	1

ISS 4: OIL PRESSURE RELIEF SPRING CHANGED



OIL RELIEF VALVE FILTER & ADAPTOR 4A163A0D-4

Figure 12 – Oil Pressure Relief Valve Assembly

9.5 Tachometer and Sender

Required Tools:	Calibrated tachometer instrument Thickness gauge
Parts and Material:	N/A
Type of Maintenance:	Line Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

- Many apparent engine problems can be caused through inaccurate tachometers. Where engine performance is observed to be outside limits, the tachometer should be checked against a calibrated instrument before other troubleshooting is attempted.
- Inductive Sender - the gap between the tip of the inductive sender and the tags on the flywheel is 0.4mm (0.016"). The sender must have at least 60% covered by the tags fitted to the gearbox side of the flywheel. Ensure both tags are equal distance from sender.

CAUTION

The tip of the sender is delicate and easily damaged. Care must be taken when adjusting the sender gap to ensure the tag does not hit the sender.

- Hall effect sender – check that the sender is adjusted correctly (2 threads showing through nut).

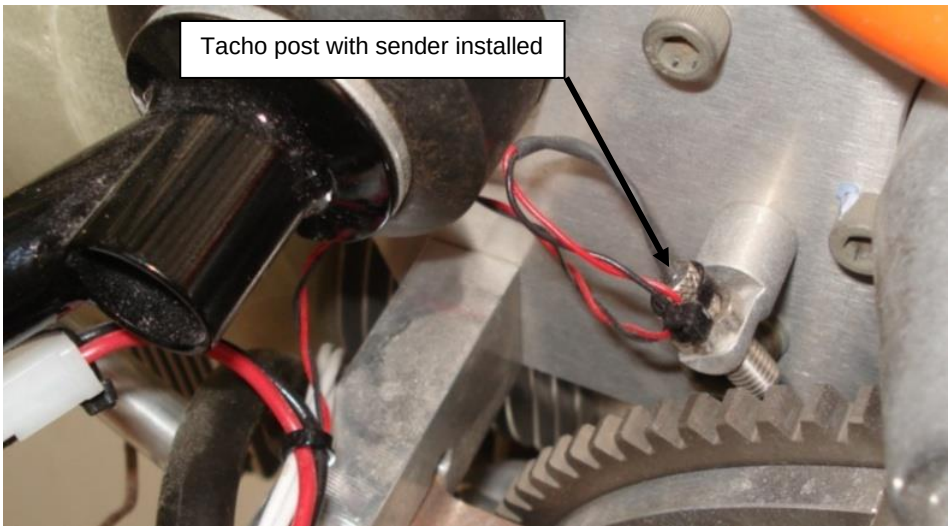


Figure 13 – Inductive Tacho Sender

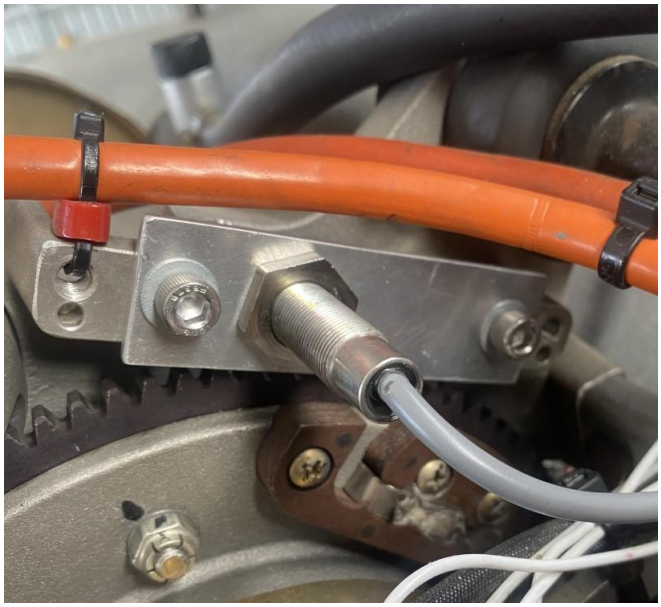


Figure 14: Hall effect type sender

9.6 Carburettor Adjustment

Required Tools:	Screwdrivers Ruler or other measuring instrument
Parts and Material:	N/A
Type of Maintenance:	Heavy Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

9.6.1 Bing Carburettor

- This section provides additional details on the carburettor installation in addition to the standard maintenance inspection prescribed in 8.29.
- The carburettor automatically adjusts the mixture to account for altitude – there is no provision for in-flight mixture adjustment as standard.
- Ensure that the carburettor sense tube is connected from the carburettor to a fitting on the filtered side of the hot air mixer box.
- Idle stop screw is a 7mm screw against throttle lever. Adjust its position to adjust engine idle speed. Note that the throttle idle stops inside the cabin may also need to be adjusted.

- Standard idle mixture screw position is 1-1/4 turns out. Fine adjustment may be necessary to give a smooth idle.
- Remove the spring clip and detach the bowl from the carburettor. Measure the distance from the fuel surface to the top of the bowl – it should be approximately 12mm.
- Inspect the bowl for dirt or contamination and clean if required. Inspect the visible jets of the carburettor and clean if required.
- Gently lift the floats of the carburettor with the bowl removed until the float needle touches its seat. The floats should be approximately level when the needle touches the seat. If necessary the float assembly can be removed by pressing out the pivot pin and the float height adjusted by gently bending the arm which connects to the float needle.
- Inspect the condition of the seal between carburettor and bowl.
- Re-fit the bowl and snap the clip back in place.

CAUTION
Ensure clip is properly on: pressed up against the stopper cast into the bowl.

9.6.2 PD42J carburettor

- This section provides additional details on the carburettor installation in addition to the standard maintenance inspection prescribed in 8.29.
- The carburettor automatically adjusts the mixture to account for altitude – there is no provision for in-flight mixture adjustment as standard.
- Ensure that the carburettor diaphragm vent is connected to the cobra head or for some 2200 engines to the filter side of the induction.
- Idle stop screw is a M4 screw against throttle lever. Adjust its position to adjust engine idle speed. Note that the throttle idle stops inside the cabin may also need to be adjusted.
- Standard idle mixture screw position is 1 turn out. Fine adjustment may be necessary to give a smooth idle.
- Inspect the bowl for dirt or contamination and clean if required. Inspect the visible jets of the carburettor and clean if required.
- Inspect the condition of the seal between carburettor and bowl.
- Re-fit the bowl, taking care that the bowl seal is seated in its groove.

9.6.3 Tuning

- The mixture is set by selecting jet sizes. As supplied, the engine has jets to suit a majority of installations. However, the mixture may be affected by many variables and in some cases adjustment will be necessary.
- It is strongly recommended that for any new installation a thorough assessment of the engine's fuel/air mixture is carried out. This may be done by EGT sensors.

CAUTION
Do not change carburettor settings without consulting with Jabiru Aircraft or our local authorised representative. If EGT readings fall outside the range given above, contact Jabiru Aircraft or our local authorised representative.

- Spark plug colour can be used as an indicator of the health the suitability of the fuel/air mixture:
  a. *Brown to Dark Brown* :- Plug & calibration is correct.
  b. *Velvet Black*:- Mixture too rich. Check choke. Insufficient air intake. Check for clogged air filter.
  c. *Oily, Glossy Coating:- Misfiring. Too much oil in combustion chamber. Worn cylinder piston rings.*
  d. *Whitish with Melt Droplets*:- Mixture too lean. Leaking valves.

CAUTION
This guide is only relevant when running the engine on AVGAS. Unleaded fuels give different plug colours which are generally unsuitable for use in evaluating engine tuning.
The plug colour reflects the most recent running of the engine – if the engine has run at idle for some time the plug colour will reflect the mixture at idle.

WARNING

Spark plug colour is a very general guide only. Tuning adjustments must ONLY be made on the basis of EGT.
DO NOT ADJUST ENGINE TUNING BASED ON SPARK PLUG COLOURS ALONE

9.6.4 Fuel bowl level

This can be checked by connecting a clear tube to the bowl drain and form it into a U with the outlet higher than the carburettor.
It is possible to adjust this level by bending the tab that pushes on the float valve needle. However, it is very sensitive and difficult to adjust, thus not recommended. It is also rare for it to need adjusting, usually the problem lies elsewhere.

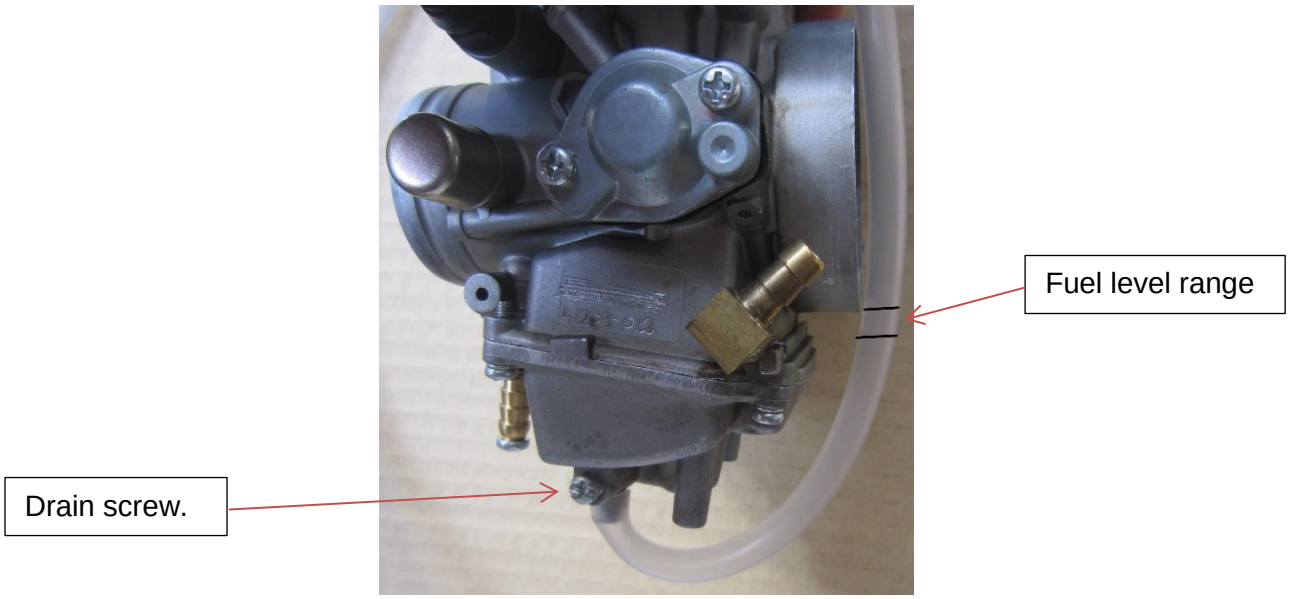


Figure 15:Fuel bowl level.

Connect the clear hose in place of the normal drain hose. Bend the clear hose up past the inlet. Loosen the drain screw. The fuel tap on and gravity feed or electric pump should be turned on so the bowl can replenish. The level in the fuel bowl should be up to within 5mm of the bottom of the inlet. See Figure 15. Make sure there is no bubbles in the hose.

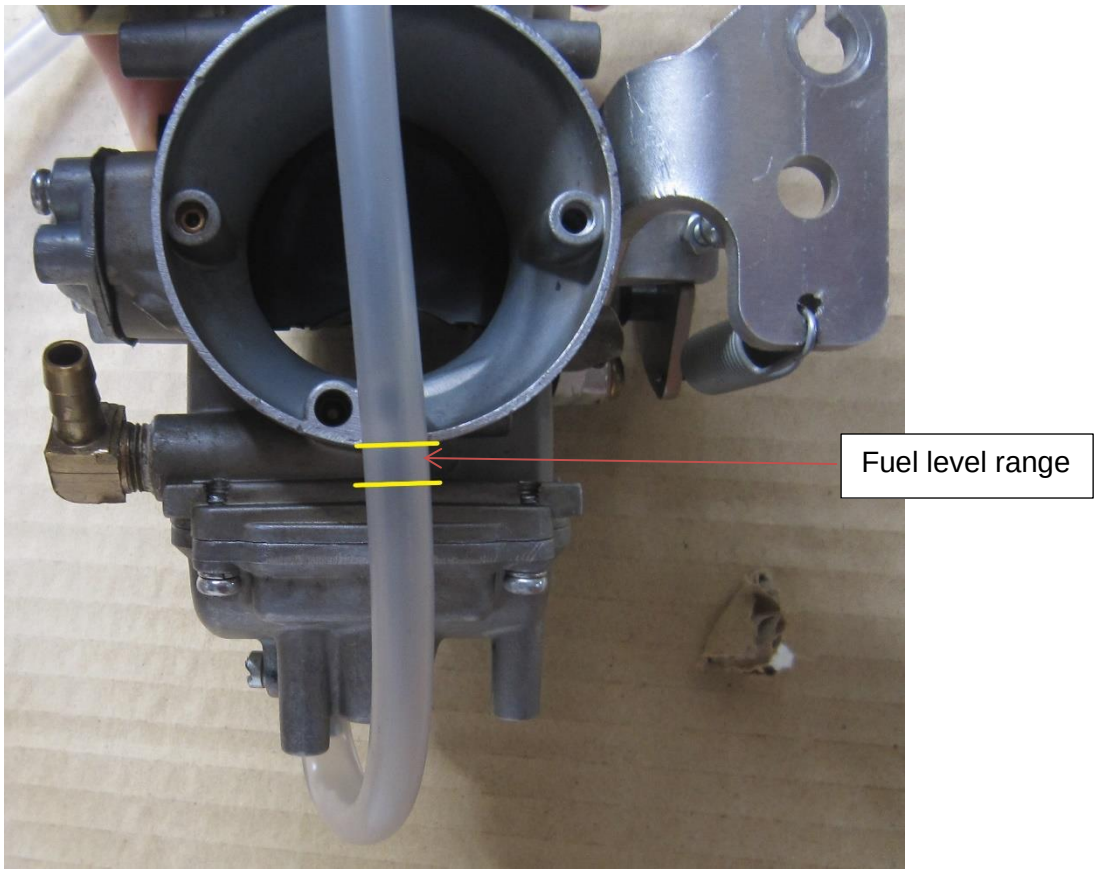


Figure 16: Fuel bowl level.

9.7 Use of Safety Wire

Required Tools:	Lock wire pliers
Parts and Material:	Stainless Steel Safety wire
Type of Maintenance:	Line Maintenance
Level of Certification:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)
Return to Service:	L1, L2 or LAME (Owner, A&P or LSA Repairman / Maintenance)

- Only stainless steel safety wire is used on the Jabiru Aircraft Engine.
- There are two methods of safety wiring; the double-twist method that is most commonly used, and the single-wire method used on screws, bolts, and/or nuts in a closely-spaced or closed-geometrical pattern such as a triangle, square, rectangle, or circle. The single-wire method may also be used on parts in electrical systems and in places that are difficult to reach. Single-wire safe tying is not used on the Jabiru Aircraft Engine.
- When using double-twist method of safety wiring, 0.032 inch minimum diameter wire should be used on parts that have a hole diameter larger than 0.045 inch (1.1mm). When using the single-wire method, the largest size wire that the hole will accommodate should be used.

CAUTION

Care must be taken not to confuse steel with Aluminium wire.

- There are many combinations of safety wiring with certain basic rules common to all applications. These rules are as follows.
  a. When bolts, screws, or other parts are closely grouped, it is more convenient to safety wire them in series. The number of bolts, nuts, screws, etc., that may be wired together depends on the application.
  b. Drilled boltheads and screws need not be safety wired if installed with self-locking nuts.
  c. To prevent failure due to rubbing or vibration, safety wire must be tight after installation.
  d. Safety wire must be installed in a manner that will prevent the tendency of the part to loosen.
  e. Safety wire must never be over-stressed. Safety wire will break under vibrations if twisted too tightly. Safety wire must be pulled taut when being twisted, and maintain a light tension when secured (Figure 18).

f. Safety-wire ends must be bent under and inward toward the part to avoid sharp or projecting ends, which might present a safety hazard.
g. Safety wire inside a duct or tube must not cross over or obstruct a flow passage when an alternate routing can be used.
h. Check the units to be safety wired to make sure that they have been correctly torqued, and that the wiring holes are properly aligned to each other. When there are two or more units, it is desirable that the holes in the units be aligned to each other. Never over-torque or loosen to obtain proper alignment of the holes. It should be possible to align the wiring holes when the bolts are torqued within the specified limits. However, if it is impossible to obtain a proper alignment of the holes without under-torquing or over-torquing, try another bolt which will permit proper alignment within the specified torque limits.
i. To prevent mutilation of the twisted section of wire, when using pliers, grasp the wires at the ends. Safety wire must not be nicked, kinked, or mutilated. Never twist the wire ends off with pliers; and, when cutting off ends, leave at least four to six complete turns (1/2 to 5/8 inch long) after the loop. When removing safety wire, never twist the wire off with pliers. Cut the safety wire close to the hole, exercising caution.
j. Install safety wire where practicable with the wire positioned around the head of the bolt, screw, or nut, and twisted in such a manner that the loop of the wire fits closely to the contour of the unit being safety wired.

- When using a wire twister (safety wire pliers), grip the wire in the jaws of the wire twister and slide the outer sleeve down with your thumb to lock the handles or lock the spring-loaded pin.
- Pull the knob, and the spiral rod spins and twists the wire.
- Squeeze handles together to release wire.

CAUTION

When using wire twisters, and the wire extends 3 inches beyond the jaws of the twisters, loosely wrap the wire around the pliers to prevent whipping and possible personal injury. Excessive twisting of the wire will weaken the wire.

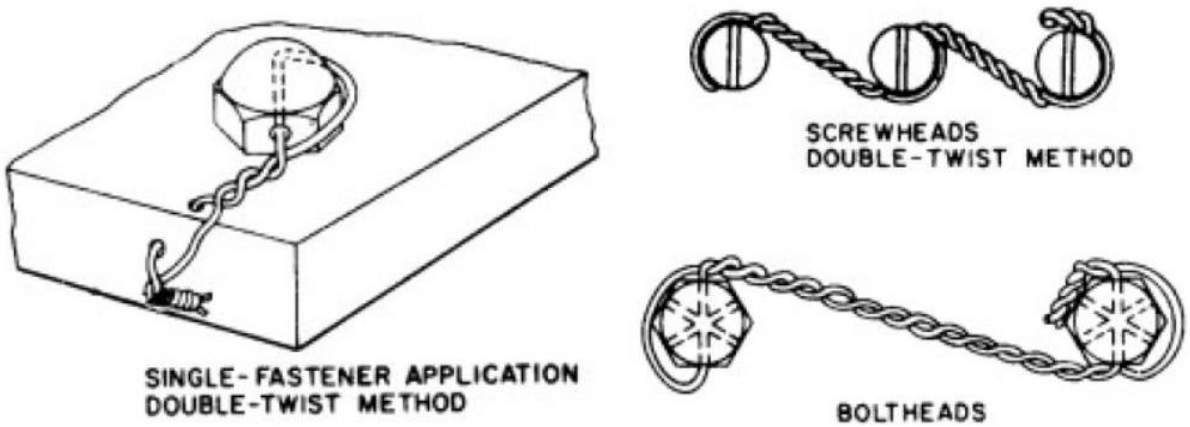


Figure 17 – Safety Wire Details

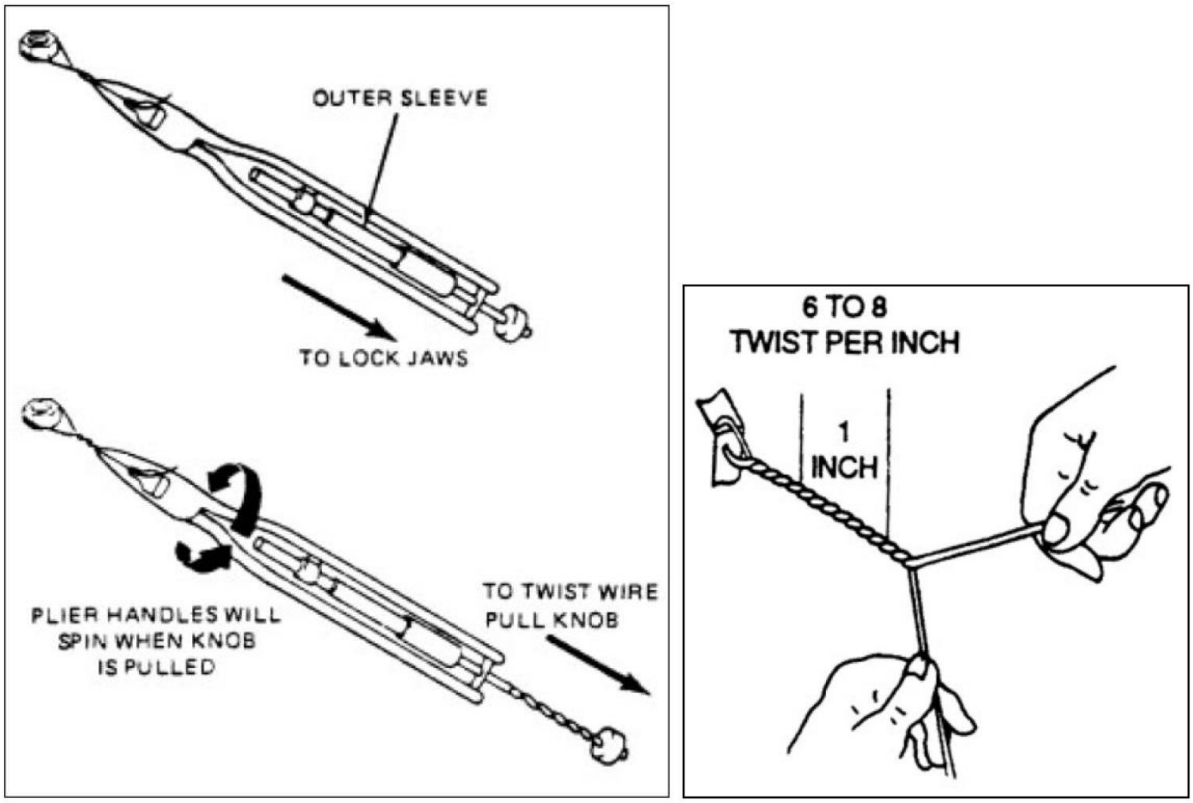


Figure 18 – Safety Wire Installation Using a Twister/Pliers & By Hand

9.8 Non-approved Propellers

- As noted, operators who choose to fit a non-approved propeller to their Jabiru engine do so at their own risk and a system of additional maintenance is recommended to monitor the engine for possible detrimental effects.
- This section has been added to the manual to help guide such maintenance. However, as Jabiru cannot anticipate every combination of engine, airframe and propeller this is strictly of an informational basis. It is not a complete or inclusive maintenance schedule, rather an overall guide directing which areas are likely to need additional attention.

WARNING

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

- The following are recommended IN ADDITION to the normal engine maintenance program.
- Where the maintenance requirements listed below differ from those of a third-party propeller supplier the lesser time interval should be used. i.e. if the table below calls for the propeller to be re-balanced annually

but the propeller manufacturer recommends balancing every 100 hours or 6 months then the propeller manufacturer's recommendations should be used.

- Visual inspections of the propeller and propeller flange installation should check for excess metal oxide (appears as rust) or black chaffing dust originating from the flange. This is often an early indication of movement between the parts and potential failure. Oil leaks etc in this area and around the flywheel must be addressed quickly as they can both cause and mask other problems.
- Oil leaks from the front crankshaft seal have also been found to be an indicator of unacceptable propeller vibrations in some cases.

Table 12 – Special Maintenance Recommendations – Non-Approved Propellers

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

10 Engine Overhaul Intervals

- These are carried out only by the manufacturer, Jabiru Aircraft Pty Ltd or by a specifically approved Jabiru Engine Service Centre (contact Jabiru for details).
- The engine must be sent in a complete state, with logbook, to Jabiru (or the Approved Service Centre) after reaching the TBO limit. In some cases a questionnaire may be supplied regarding the service life of the engine so far. In these cases the questionnaire must be filled out as completely as possible & returned with the engine.
- Changes to TBO due to operational experience will be advised by Jabiru via Service Bulletin
- The Jabiru 2200 Gen 4 / 3300 Gen 4 configuration engine use the following basic overhaul intervals
    - Top end overhaul conducted at 1000 hours total time in service (hobbs time)
    - Full overhaul conducted at 2000 hours total time in service (hobbs time)

10.1 Full Overhaul

- Full overhauls must be carried out as detailed in the latest approved revision of the 2200 Gen 4 / 3300 Gen 4 Engine Overhaul assembly and Parts book (JEM0004).
- During a full overhaul all parts are cleaned, measured, inspected and recorded in the prescribed build sheets in the manual. JEM0004 details the parts which are mandatorily replaced and those considered serviceable upon inspection.
- JEM0004 also details the procedure for running in overhauled engines in order to make them flight ready.

10.2 Top End Overhaul

- Top End Overhauls must be carried out as detailed in the latest approved revision of the 2200 Gen 4 / 3300 Gen 4 Engine Overhaul assembly and Parts book (JEM0004).
- During a top end overhaul all parts are cleaned, measured, inspected and recorded in the prescribed build sheets in the manual. JEM0004 details the parts which are mandatorily replaced and those considered serviceable upon inspection.
- JEM0004 also details the procedure for running in overhauled engines in order to make them flight ready.

10.3 Operating engines “On Condition”

- Under no circumstances is it deemed acceptable to operate any model Jabiru Engine in aircraft of any certification type (be it type certified, LSA or experimental categories) beyond the previously stated top end and full overhaul intervals without the appropriate overhaul being conducted on the engine.
- Jabiru engines MUST NOT be operated “on condition” beyond the engine overhaul intervals prescribed.

10.4 Engine Removal Procedure

Type of Maintenance:	Heavy Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

Table 13 – Engine Removal

No.	Operation	Tools Required
1	Remove Spinner and Propeller	Phillips Screwdriver 7/16" Socket 7/16" Spanner
2	Remove Carby Heat hose from hot-air muff on muffler	Flat-bladed Screwdriver
3	Remove Air Inlet Hose from Carburettor and blank off Carburettor and Air Cleaner	Flat-bladed Screwdriver 2 Plugs
4	Disconnect Throttle Cable	Long Nose Pliers
5	Disconnect Choke Lever	Long Nose Pliers
6	Remove Oil Breather Line	Flat-bladed Screwdriver
7	Remove Fuel Line from Fuel Pump and plug Fuel Line and Fuel Pump	Flat-bladed Screwdriver 1/4" Plugs
8	Remove starter Motor Cable from Solenoid	7/16" R/OE spanner
9	Disconnect Earth at Battery	10mm R/OE
10	Remove Oil Pressure Gauge Lead	-
11	Remove Oil Temperature Gauge Lead	-
12	Remove Hourmeter Lead (if fitted)	Screwdriver
13	Remove Cylinder Head Temperature Gauge Lead	- (disconnect at cold junction)
14	Remove Exhaust Gas temperature Gauge Lead	-
15	Remove Tacho Lead	-
16	Remove Left and Right Ignition Coil Leads	-
17	Remove Muffler Assy	3/16" Ball End Allen Key
18	Undo Engine Mount Bolts	7/16" Tube Socket 7/16" Spanner
19	Remove Engine from Engine Mount Frame	-

10.5 Engine Installation

Type of Maintenance:	Heavy Maintenance
Level of Certification:	L2 or LAME (A&P or LSA Repairman / Maintenance)
Return to Service:	L2 or LAME (A&P or LSA Repairman / Maintenance)

Table 14 – Engine Installation

No.	Operation	Tools Required
1	Fit engine to engine mount	-
2	Torque engine mount bolts	7/16 Tube Socket 7/16 Ring Open End Spanner
3	Fit muffler (if not already fitted) and fit carburettor heat muff and hose	3/16 Ball End Allen Key
4	Connect left and right ignition coils leads	-
5	Connect Tacho sender	-
6	Connect exhaust gas temp (if fitted)	-
7	Connect cylinder head sender	18mm Spark Plug socket
8	Connect hourmeter	Screw Driver
9	Connect oil temp gauge sender	
10	Connect oil pressure gauge sender	
11	Connect starter	7/16 Ring Open End Spanner
12	Connect Battery (Earth lead first)	10mm Ring Open End Spanner
13	Connect fuel line	Screw Driver
14	Connect Oil Breather	Screw Driver
15	Connect Choke Cable	Long Nose Pliers
16	Connect Throttle Cable	Long Nose Pliers
17	Connect Air Inlet	Screw Driver
18	Fit Propeller and spinner	7/16 Ring Open End Spanner 7/16 Torque Wrench Phillips Screw Driver
19	Fit Cooling Ducts	3/16 Allen Key
20	Prime Fuel system with electric pump and inspect for leaks	-
21	Check for oil. Fill if needed.	2200: 2.3L oil (2.43 US quarts) 3300: 3.5L oil (3.7 US quarts)
22	Wind over to get oil pressure	-
23	Start and inspect for leaks	-
24	Test Fly *Note: First flight is a test flight: fly conservatively!*	-
25	Remove Cowls and inspect for anything loose, rubbing or leaking.	-
27	Carry out checks for first 5, 10 & 25 hours as noted above (Section 7)	-
28	If oil consumption is stable fill with W100 (W80 in cold conditions and W120 in very hot conditions). If still using oil remain on run in oil or seek advice from Jabiru Aircraft or local authorized representative	-

11 Trouble Shooting

11.1 Engine Won't Start

	Possible Cause	Remedy
1)	Ignition OFF	Switch ON (Note spark will be produced when the primary coil is **NOT** earthed – i.e. ignitions are ON when switches are OPEN).
2)	Spark plug gap too large	Adjust gap and/or or renew plugs
3)	Closed fuel tap or clogged filter	Open tap, renew filter, check fuel system for leaks
4)	No fuel in tank	Refuel
5)	Wrongly connected high tension leads	Connect as shown on leads
6)	Starting Speed too low, faulty or discharged battery	Recharge or replace battery
7)	Coil to Magnet gap too wide	Adjust
8)	High tension leads loose or damaged	Check or renew connections
9)	Dampness in distributors	Thoroughly dry internally
10)	Spark plugs damp due to condensation	Thoroughly dry both inside and outside of plugs
11)	Plug face wet by fuel due to excessive actuation of choke or overflow of carb	Dry spark plugs, trace possible faults in fuel system or over flow of carb.
12)	Float valve dirty or jammed	Clean or renew float valve
13)	Jets in carb. clogged	Clean jets
14)	Water in carb.	Drain & clean carb.,fuel line & filter. Water drain fuel tank
15)	Insufficient compression	Trace pressure loss & repair if necessary
16)	Engine damage	Inspect oil strainer filter & oil filter for metallic particles. If present, an engine overhaul may be necessary.

11.2 Engine Idles Unsteadily After Warm-Up Period: Smoky Exhaust

	Possible Cause	Remedy
1)	Choke activated	Close choke
2)	Float valve dirty, jammed or worn	Clean or renew float valve
3)	Intake manifold leak	Tighten all connections, renew faulty items

11.3 Engine Runs Erratically or Misfires Occasionally

	Possible Cause	Remedy
1)	Spark plug failure	Check plugs, clean inside & outside, adjust electrode gap. If necessary, renew plugs
2)	Faulty HT leads	Dry damp leads, renew damaged leads
3)	Faulty ignition unit	Renew ignition unit
4)	Clogged fuel filter	Renew fuel filter
5)	Carburettor sense tube not connected	The Bing carburettor has a sense port which helps it control the fuel mixture. This is a small nipple on the carburettor which must be connected via a small tube to a fitting in the filtered side of the carburettor heat box.

11.4 Full Power Static RPM Below Specifications

	Possible Cause	Remedy
1)	Low engine power	See Section 11.7
2)	Unsatisfactory propeller	Refer to engine installation manual for prop requirements
3)		

11.5 Engine Runs Too Hot - Oil Temperature Above 110°C (230°F)

	Possible Cause	Remedy
1)	Too much oil in crankcase	Check oil level & adjust if necessary
2)	Low oil level	Check oil level & add oil if necessary
3)	Poor quality oil	Oil change, use specified oil
4)	Clogged oil filter	Change filter
5)	Excessive piston blow by	Common reason: worn or sticking piston rings, complete engine overhaul necessary
6)	Faulty bearings	If metallic particles are present in oil, complete engine overhaul necessary
7)	Faulty oil temperature gauge	Exchange gauge

11.6 CHT Reading Error

	Possible Cause	Remedy
1)	Faulty gauge, sender or connection	Check gauge & sender – replace with known good items if possible. Reverse polarity between gauge and sender & re-test.
2)	Improper temperatures	Verify original reading using a second thermometer – such as a hand-held infrared thermometer.
3)	Cold junction temperature	The standard gauges used in Jabiru Aircraft assume that the cold junction (where the thick thermocouple wire connects to the standard wire leading to the instrument) is at around 25°C. Ensure the junction is not exposed to excessively hot or cold air for best results.

11.7 Unsatisfactory Power Output

	Possible Cause	Remedy
1)	Ignition failure	Check ignition circuits; check wiring and pick-ups; replace ignition units.
2)	Too much oil in crankcase	Check oil level & adjust if necessary
3)	Insufficient fuel supply	Check fuel supply system
4)	Fuel not according to specifications	Re-fuel with specified fuel
5)	Incorrect throttle adjustment	Re-adjust throttle fitting
6)	Leak in air intake	Check and tighten all connections, check carby sockets.
7)	Carburettor diaphragm damage	renew diaphragm
8)	Hydraulic Lifter stuck / collapsed	Replace lifter(s)
9)	Tachometer Reading Error	Check RPM with calibrated gauge (such as hand-held optical gauge).
10)	Carburettor heat not turning off	Check / adjust carburettor heat mechanism
11)	Choke not turning fully off	Check / adjust choke mechanism.
12)	Unsatisfactory induction system	Check induction system for sharp edges, rough corners etc. Refer to engine installation manual.

11.8 Low Oil Pressure

	Possible Cause	Remedy
1)	Insufficient oil in sump	Check oil level & replenish as necessary
2)	High oil temperature	Check engine is not over-full with oil Check installation: improper gaps or insufficient pressure head produce low airflow which can lead to elevated temperatures.
3)	Faulty pressure gauge, sender or wiring	Check gauge, sender & wiring. Renew as necessary.
4)	Faulty crankshaft bearings	Engine overhaul
5)	Relief valve not sealing	Inspect, replace back after cleaning. Foreign matter stuck in the valve will produce low pressure.

11.9 Oil Pressure Varying

	Possible Cause	Remedy
1)	Low oil level	Check oil level & replenish as necessary
2)	Sender, gauge or connection fault	Check continuity of sender wire. Check sender body is earthed to engine Check gauge – replace with known good gauge if possible. Adjust oil pressure relief valve

11.10 Engine Keeps Running with Ignition Off

	Possible Cause	Remedy
1)	Idle speed too high	Adjust to proper idle speed (900 RPM)
2)	Faulty ignition switch	Check switch & cables. Repair/replace as necessary
3)	Overheated engine	Conduct cooling run at 900 RPM

11.11 Excessive Oil Consumption

	Possible Cause	Remedy
1)	Worn, broken or wrongly fitted piston rings	Repair/engine overhaul necessary
2)	Poor oil quality	Oil change, use specified oil
3)	Worn valve guides	Repair of cylinder head necessary
4)	Oil leaks	Seal leaks

11.12 Oil Collector Bottle on Firewall Fills Quickly

	Possible Cause	Remedy
4)	Worn, broken or wrongly fitted piston rings	Repair/engine overhaul necessary
5)	Incorrect oil grade	Oil change, use specified oil
6)	Worn or distorted cylinders	Repair/engine overhaul necessary
7)	Over-filling sump	Reduce oil level in sump
8)	Negative-g	The Jabiru Engine is not approved for deliberate negative G operations. Strong turbulence in flight can have a similar effect: reduced RPM /speed is recommended when operating in strong turbulence.

11.13 Excessive Vibration

	Possible Cause	Remedy
1)	Propeller out of balance	Balance to propeller manufacturer's instructions
2)	Propeller tip tracking out of tolerance	Check / adjust tracking
3)	Uneven propeller blade pitch	Check / adjust blade pitch
4)	Spinner out of balance	Check / adjust spinner balance
5)	Unsuitable propeller	Replace propeller. Quality 2-bladed fixed pitch wooden types recommended.
6)	Incorrect Tuning	Check / adjust carburettor
7)	Engine rubbing	Check engine, air ducts, exhaust, oil cooler etc are not rubbing on cowls, fuselage etc.

11.14 Knocking Under Load

	Possible Cause	Remedy
1)	Octane rating too low. Fuel old or stale.	Use fuel with higher octane rating
2)	Spark plug fitted without sealing washer	Ensure one sealing washer on each plug
3)	Heavy carbon deposits	Remove cylinder heads & in combustion chamber remove deposits. Determine oil consumption.

Notes:

- Running this engine on low octane fuel will cause piston damage and in extreme cases failure of the top ring gland or holed piston due to detonation.
- Changing the engine tuning to a leaner air fuel mix can cause piston damage.

11.15 Engine Hard to Start at Low Temperature – Cold Start Checklist

	Possible Cause	Remedy
1)	Starter motor condition	Check that the bushes in the starter motor bendix drive housing are in good condition. Ensure the brushes are not worn out, that the commutator is clean and all electrical connections are clean. This may require removing the heat shrink from the soldered connection on the starter motor and checking for corrosion.
2)	Spark plugs	Spark plugs must be within the set life and be gapped correctly. In winter spark plug gaps can be reduced as low as 0.020" to allow the plugs to fire more easily
3)	High tension leads	High tension leads must be in good condition. Ensure all end terminals are tight and fitting to the distributor & spark plugs correctly. If necessary adjust per Section 8.11. Don't forget to check the plug where the ignition coils connect to the distributor cap. Note that running the engine at night with the cowls removed will make the bright arcs caused by faulty insulation, bad connections etc much more visible.
4)	Distributor assembly	Check that the distributor & rotor are in good condition. Check that there is no moisture inside the cap and that all the electrical terminals are clean
5)	Ignition coil gaps	Check that the coils have been set with the correct air gap from the flywheel magnets.
6)	Air filter	Check that the air filter is clean
7)	Fuel filter	Check that the fuel filter is clean
8)	Carburettor	Check that the carburettor float level is set correctly and that the carburettor is clean and in good condition. Ensure there is no debris blocking jets (including the choke jet) etc
9)	Low battery charge	Fit fully charged battery. The life of a Battery varies but is generally less than 4 years.
10)	Operation	Minimise the time spent at low RPM with high-powered devices running. At low RPM the alternator produce virtually no power – certainly not enough to run landing lights, strobe lights and avionics suites. The deficit between the power draw of these systems and the alternator output must be drawn from the battery. Excessive operation like this will drain the battery and significantly reduce the output available for cold starting the next day
11)	Fly regularly	Any vehicle will be harder to start if it goes a long time between outings. If the aircraft has not been flown for a few weeks then charging the battery before attempting a start is recommended. Standing also affects the quality of the fuel in the carburettor and fuel system – volatile elements in the fuel can evaporate, making it harder for the carburettor to atomise it properly
12)	Starting method	The recommended procedure is to hold the choke fully ON and the throttle fully OFF. The Bing carburettor uses an enrichment-type choke system (as opposed to a butterfly-type choke) which will only work properly if the throttle is fully closed. When the throttle butterfly is closed it creates a vacuum which is then used to suck fuel through the choke jet – if the throttle is not closed there is less vacuum and the choke does not work as designed. Also note that there is a tendency for the choke to spring back slightly from the ON position if the knob is released – operators are recommended to hold the knob fully ON when starting to make sure it stays properly on.
13)	Idle speed	Ensure that the idle RPM is set correctly. If the idle is too high the throttle butterfly will be open slightly – which will prevent the choke from working properly, as described above. Idle RPM limits are given in the engine manuals
14)	Choke Jet	The choke jet needs to have a bore of about 1.2mm. This gives the engine more fuel when the choke is applied, making it easier to start. New engines and aircraft have been set at this size since around February 2011, however older units will need to be checked and, if necessary, enlarged. See Figure 19

	Possible Cause	Remedy
15)	High oil pressure	At very low temperatures, a pressure reading of up to around 500 kpa doesn't necessarily indicate a malfunction.
16)	Starting speed too low	Preheat engine

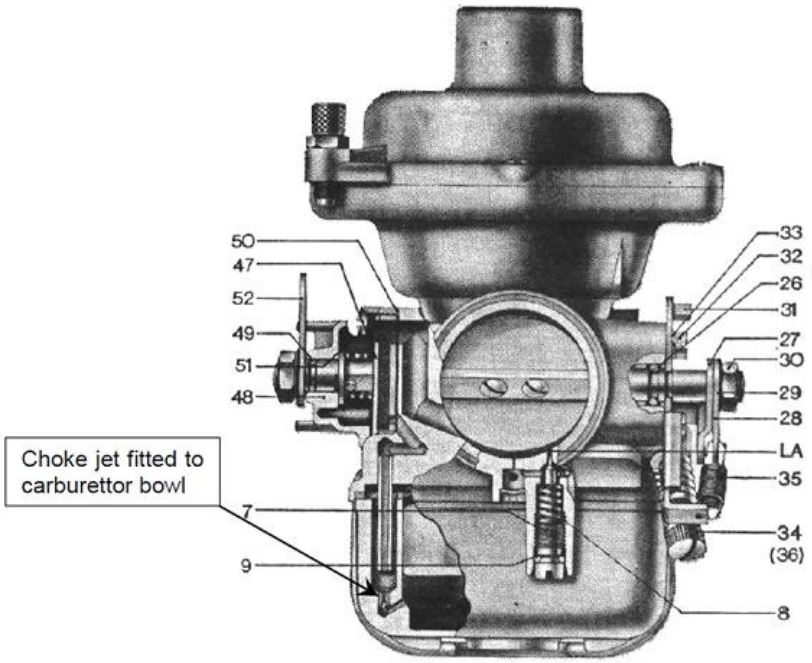


Figure 19 – Bing Carburettor Choke Schematic

11.16 Irregular / Low Compressions

	Symptoms	Possible Cause	Remedy
1)	Compression on 1 or more cylinders low	Debris on valve seat	Blow debris off seat
		Hydraulic lifters locked	Excess oil pressure can cause lifters to hold valves partially open. Adjust engine oil pressure. Jammed or defective hydraulic lifter: replace.
		Worn cylinder / piston / rings.	Overhaul engine.
		Burnt or worn valve or seat	Replace Valve &/or Cylinder. Refer to Engine Overhaul Manual.

11.17 Hydraulic Valve Lifters

	Symptoms	Possible Cause	Remedy
1)	Engine noisy, “tapping” at idle	“Soft” lifter(s) due to lifter fault	Replace lifter(s)
		“Soft” lifter(s) due to low oil pressure	See Low Oil Pressure section above.
		“Soft” lifter(s) due to air in lifter	Run engine. Up to 15 minutes running may be required to completely expel air from the lifter. **OR** Remove lifter and manually fill with oil.
2)	Reduced engine power	Soft or stuck hydraulic lifter(s)	Replace lifter(s)
		“Soft” lifter(s) due to low oil pressure	See Low Oil Pressure section above.
		Lifters “pumping up” holding valves open	Reduce operating oil pressure (within limits)
			Replace lifter(s)
3)	Excess metal in oil filter	Cam / Lifter damage	Inspect lifter and cam working surfaces. Replace if damaged.

12 Engine Maintenance Worksheets

12.1 Initial 5 hours inspection

This worksheet provided covers all inspection tasks required after the first 5 hours' time in service inspections and servicing. 'P' indicates pass, 'F' indicates fail, the 'Comments' column should be used to note condition, parts replaced, corrective action etc.

IMPORTANT:
READ ALL INSPECTION AND MAINTAINANCE REQUIREMENTS IN THIS MANUAL (JEM0005) BEFORE USING THESE CHARTS / WORKSHEETS

OWNER NAME……..
AIRCRAFT MAKE/MODEL.....REGO.....S/N.....
ENGINE MAKE/MODEL.....S/N.....
TT AIRFRAME.....TT ENGINE.....
CARRIED OUT BY (print name).....(signature).....(date).....

1) Remove and inspect engine cowls (refer to section 8.3)

P	F	Comments:	First 5 hours

2) Inspect engine mount attachment points (refer to section 8.30)

P	F	Comments:	First 5 hours

3) Thoroughly check engine for missing or loose bolts, nut, pins etc.

P	F	Comments:	First 5 hours

4) Check the fit of ram air cooling ducts (refer to section 8.10)

P	F	Comments:	First 5 hours

5) Perform visual inspection of flywheel screws (refer to section 8.17)

P	F	Comments:	First 5 hours

6) Perform visual inspection of through bolt / stud bolt torque seal (refer to section 8.15)

P	F	Comments:	First 5 hours

7) Check induction and exhaust pipes attachments (refer to section 8.18)

P	F	Comments:	First 5 hours

8) Check mechanical fuel pump and fuel system for leaks (refer to section 8.26 and 8.27)

P	F	Comments:	First 5 hours

9) Check security of ignition leads and ignition coil wiring

P	F	Comments:	First 5 hours

10) Perform general electrical wiring inspection (refer to section 8.31)

P	F	Comments:	First 5 hours

11) Check the security of safety wiring on the sump plug

P	F	Comments:	First 5 hours

12.2 25-Hour Oil and filter change

This worksheet covers all inspection tasks required for 25 hourly engine inspections and servicing. 'P' indicates pass, 'F' indicates fail, the 'Comments' column should be used to note conditions, parts replaced, etc.

IMPORTANT:
READ ALL INSPECTION AND MAINTAINANCE REQUIREMENTS IN THIS MANUAL (JEM0005) BEFORE USING THESE CHARTS / WORKSHEETS

OWNER NAME……..
AIRCRAFT MAKE/MODEL.....REGO.....S/N.....
ENGINE MAKE/MODEL.....S/N.....
TT AIRFRAME.....TT ENGINE.....
CARRIED OUT BY (print name).....(signature).....(date).....

1) Remove engine cowlings (refer to section 8.3)

P	F	Comments:	25 hourly

2) Change oil and oil filter, note oil type used (refer to section 8.21)

P	F	Comments:	25 hourly

3) Empty oil collection bottle, note amount emptied (refer to section 8.22)

P	F	Comments:	25 hourly

12.3 50 hour, 100 hour and Annual Inspection Worksheet

This worksheet provided covers all inspection tasks required for 50 hour, 100 hour and Annual inspections. A '●' in the box indicates a task should be conducted at the relevant inspection interval 'P' indicates pass, 'F' indicates fail, the 'Comments' column should be used to note condition, parts replaced, etc.

IMPORTANT:
READ ALL INSPECTION AND MAINTAINANCE REQUIREMENTS IN THIS MANUAL (JEM0005) BEFORE USING THESE CHARTS / WORKSHEETS

OWNER NAME……..
AIRCRAFT MAKE/MODEL.....REGO.....S/N.....
ENGINE MAKE/MODEL.....S/N.....
TT AIRFRAME.....TT ENGINE.....
INSPECTION TYPE (circle).....50 hourly.....100 hourly.....Annual
CARRIED OUT BY (print name)..... (Signature)..... (Date).....

1) Remove and inspect engine cowling (refer to section 8.3)

P	F	Comments:	50 hrly	100 hrly	Annual
			●	●	●

2) Basic inspection before cleaning (refer to section 8.4)

P	F	Comments:	50 hrly	100 hrly	Annual
			●	●	●

3) Clean engine (refer to section 6.3)

P	F	Comments:	50 hrly	100 hrly	Annual
				●	●

4) Basic inspection after cleaning (refer to section 8.6)

P	F	Comments:	50 hrly	100 hrly	Annual
				●	●

5) Induction air filter clean and reinstall (refer to section 8.7)

P	F	Comments:	50 hrly	100 hrly	Annual
			●		

6) **Replace** induction air filter (refer to section 8.7)

P	F	Comments:	50 hrly	100 hrly	Annual
				●	●

7) Induction air SCAT hose inspection (refer to section 8.8)

P	F	Comments:	50 hrly	100 hrly	Annual
			●	●	●

8) Carburetor heat system (refer to section 8.9)

P	F	Comments:	50 hrly	100 hrly	Annual
			●	●	●

9) Ram air cooling ducts (refer to section 8.10)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

10) Ignition lead inspection (refer to section 8.11)

P	F	Comments:	50 hrly	100 hrly	Annual
				•	•

11) Pressure differential leak-down test, record leak-down results (refer to section 8.12)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

#1	#2	#3	#4	#5	#6
80	80	80	80	80	80

12) Spark plugs inspection and cleaning (refer to section 8.13)

P	F	Comments:	50 hrly	100 hrly	Annual
			•		

13) Replace spark plugs (refer to section 8.13)

P	F	Comments:	50 hrly	100 hrly	Annual
				•	•

14) Cylinder inspection (refer to section 8.14)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

15) Through bolt and stud bolt visual inspection (refer to section 8.15)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

16) Inspect crankcase seals (refer to section 8.16)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

17) Flywheel screw visual inspection (refer to section 8.17)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

18) Induction and exhaust system inspection (refer to section 8.18)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

19) Rocker chamber inspection (refer to section 8.19)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

20) Hydraulic lifter maintenance (refer to section 8.20)

P	F	Comments:	50 hrly	100 hrly	Annual
				•	•

21) Oil and filter change (refer to section 8.21)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

22) Empty oil collection bottle, record volume (refer to section 8.22)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

23) Inspect flexible oil lines (refer to section 8.23)
If replaced, double sign in the boxes below.

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

24) Distributor inspection (refer to section 8.24)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

25) Mechanical fuel pump inspection (refer to section 8.26)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

26) Flexible fuel lines and fittings (refer to section 8.27)
If replaced, double sign in the boxes below.

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

27) Fire sleeves – Check condition and length of fire sleeves

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

28) Replace fuel filter

P	F	Comments:	50 hrly	100 hrly	Annual
				•	•

29) Engine control linkages (refer to section 8.28)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

30) Carburettor inspection (refer to section 8.29)
Fuel SOV check (refer to section 8.29.1)
Fuel flow test (refer to section 8.25)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

31) Engine mount points (refer to section 8.30)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

32) Electrical wiring (refer to section 8.31)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

33) Starter motor and solenoid (refer to section 8.32)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

34) Ignition coils (refer to section 8.33)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

35) Alternator inspection (refer to section 8.35)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

36) Engine ground test run (refer to section 8.2)

P	F	Comments:	50 hrly	100 hrly	Annual
			•	•	•

13 New Engine – Jabiru's Limited, Express Warranty

Jabiru Aircraft Pty Ltd

New Jabiru Aircraft Engines ("the engine") are covered by Jabiru's Limited, Express Warranty ("the Warranty") as set forth below.

I. Parties to Whom this Warranty is Given

This Limited, Express Warranty is given to the person who is entitled to possession of the engine whether as owner, lessee or otherwise ("owner"). This Warranty is given in addition to all rights conferred on that person by law of the governing state, and/or in place of any laws or regulations on the terms set forth below.

II. Scope of the Warranty

Jabiru Aircraft Pty Ltd. ("JABIRU") warrants that its new and unused engine has no defects in material and/or workmanship for the period and under the conditions described in this Warranty. The owner of the engine agrees that the terms and conditions of this Warranty are exclusive and expressly disclosed, and that the owner accepted them at the time of purchase of the engine.

III. Coverage Period and Conditions of Coverage

JABIRU warrants that it will make good without charge, any defect (except as provided for in Section IV, Exclusions, below), which appears in the engine, provided that:

1. Notice of the defect has been provided in writing to JABIRU:
   (a) Before the engine has operated a total of 200 hours, or
   (b) Within twelve (12) months of the date of delivery of the engine to the first retail purchaser.
   Whichever comes first; and,
2. The engine has been delivered to JABIRU, its authorized Distributor/Dealer, or such other service facility as advised in writing by JABIRU; and,
3. The engine has been installed in an aircraft type in accordance with a JABIRU approved installation system; and,
4. The engine has been updated in accordance with JABIRU Service Bulletins before operation;
5. The engine has been stored in accordance with the Engine Preservation instructions in the JABIRU Engine Maintenance manual; and,
6. For any and all engines installed in airframes other than the airframes manufactured by JABIRU, the owner has provided JABIRU with: a) evidence that the cooling system of the cowling produces pressure deferential test results consistent with the requirements of the JABIRU installation manual; and, b) delivery of the log book that reflects engine parameters during any and all initial flights.

This Warranty applies only to engines which have been inspected and maintained in accordance with the instructions for continued airworthiness, including compliance with all applicable service documents issued by JABIRU. Performance of required inspections and maintenance must be documented by appropriate logbook entries and the logbook must accompany any engine being submitted for warranty consideration. JABIRU reserves the right to make warranty coverage contingent upon proof of proper inspection and maintenance.
Warranty repairs do not extend the original Limited, Express Warranty.
The duration and any other terms of this Warranty are subject to the governing law of the owner's state. JABIRU reserves the right to improve or modify its engines from time to time without assuming any obligation to modify its engines manufactured previously.
The owner must comply fully with all conditions of this Section III for the Warranty coverage to have full force and effect. Non-compliance with the conditions of this Section III constitutes a waiver of any and all benefits of this Limited, Express Warranty.

IV. Exclusions

The Warranty is applicable as long as JABIRU has determined that the alleged defect complained of is one of workmanship and is not caused by:

1. Normal wear and tear or service items (such as spark plugs, filters, hoses, etc.);
2. Alteration, modification, removal, service or repair performed by anyone party not authorized in writing by JABIRU, or any modification of the engine from its original configuration;
3. Any misuse or abuse of engine, such as storage, installation, operation, usage or maintenance outside the approved JABIRU Flight Manual, or Maintenance and Operation Manual, service documents, airworthiness directives, bulletins, instructions, and recommendations, or by neglect;
4. Improper installation, including overheating;
5. Operation of the engine after it is known to be defective;
6. Installation and/or fitting of accessories, parts, components. or other items not marketed by JABIRU;
7. Cold seizures, piston scuffing, and any damage resulting from lack of lubrication;
8. Ingestion of foreign objects, dirt inside or outside of the engine, corrosion, electrolysis, sulphidation, ingestion of water, ice or any other damage due to the operating environment;
9. Atmospheric fallout or flood, hail, salt, wind;
10. Failure to carry out proper maintenance service;
11. Use of incorrect types and/or grade of fuel, oil, or lubricants;
12. The use of parts of the engine having exceeded any limitation or recommended limitation established by the manufacturer;
13. The use of the engine or spare parts from which the part number or serial number has been removed or modified;
14. Fire, lightning strike, neglect, negligence, accident, incident, deliberate act, misuse, theft, casualty or any other factor beyond JABIRU's control; or,
15. The use of any engine oil or fuel additives or oil stabilizers.

This Warranty does not cover normal maintenance service such as tune-ups, adjustments, inspections, engine or component overhaul, replacement of air and oil filters, spark plugs, etc. Further, this Warranty applies only to the engines that are manufactured or supplied by JABIRU. JABIRU has no responsibility for the failure of any engine or part which it does not manufacture or supply, or for any damage resulting from any such failure.

V. DISCLAIMERS

THIS LIMITED, EXPRESS WARRANTY IS EXCLUSIVE, EXPRESSLY GIVEN, AND ACCEPTED IN LIEU OF ANY AND OTHER GUARANTIES OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR OTHER WARRANTIES IMPLIED IN LAW. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THAT WHICH IS DESCRIBED IN JABIRU'S LIMITED, EXPRESS WARRANTY. FOR ANY OTHER OBLIGATION AND/OR LIABILTIY OF JABIRU AND/OR ITS AFFILIATES, WHETHER FOR NEGLIGENCE, STRICT LIABILITY, OR BREACH OF WARRANTY, THE OWNER'S REMEDIES SHALL BE LIMITED TO THE REMEDIES PROVIDED FOR IN THIS WARRANTY. TO THE EXTENT THAT THE IMPLIED WARRANTIES CANNOT BE DISCLAIMED, THEY ARE LIMITED IN DURATION TO THE LIFE OF THIS LIMITED EXRESS WARRANTY.

THIS LIMITED EXPRESS WARRANTY IS A WARRANTY TO REPAIR OR REPLACE AND NOT A WARRANTY OF THE CONDITION OR FUTURE PERFORMANCE OF THE ENGINE OR ITS PARTS.

IN ADDITION, THIS WARRANTY DOES NOT COVER INCIDENTAL OR CONSEQUENTIAL DAMAGES, SUCH AS LOSS OF REVENUE, RENTAL COSTS, OR MISSED OPPORTUNITIES, NO MATTER HOW ARISING, INCLUDING, BUT NOT LIMITED TO, THOSE ARISING OUT OF ANY DEFECT IN ANY ENGINE OR ITS COMPONENT, ARISING OUT OF THE FAILURE OF ANY ENGINE OR ITS COMPONENT TO OPERATE PROPERLY, OR ARISING OUT OF ANY BREACH OF THIS LIMITED WARRANTY.

JABIRU MAKES NO REPRESENTATION THAT THIS ENGINE IS SUITABLE FOR INSTALLATION IN ANY PARTICULAR AIRCRAFT, OTHER THAN AIRCRAFT MANUFACTURED BY JABIRU, AND THE RESPONSIBILITY TO DETERMINE SUITABILITY RESTS WITH THE OWNER.

SOME STATES DO NOT ALLOW THE DISCLAIMERS AND/OR LIMITATIONS IDENTIFIED IN THIS WARRANTY. THEREFORE, THE ABOVE-STATED DISCLAIMERS AND/OR LIMITATIONS MAY BE INAPPLICABLE. THIS WARRANTY GIVES THE OWNER SPECIFIC LEGAL RIGHTS, AND THE OWNER MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

If the governing law of a state disallows the disclaimers, limitations and exclusions set forth in this Warranty, then only those specific disclaimers that are not allowed will be disregarded and deemed to be stricken, and all other provisions and limitations of this warranty will remain effective and enforceable.

No JABIRU Distributor/Dealer or any other person or entity is authorised or permitted to give or make any statement assertion or undertaking in relation to the quality, performance, characteristics, descriptions or fitness for any purpose of any JABIRU product or in connection with the supply of any JABIRU product, which is at variance with any written statement assertion or undertaking on any of these subjects given or made by JABIRU in its published sales literature, and the company does not accept any such unauthorised action.

SPECIAL NOTE TO AUSTRALIAN OWNERS:

The above-stated disclaimer of liability for consequential damages does not apply to owners who both: 1) fall within the definition of a "consumer" under the Australian Consumer Law; and, 2) acquire the engine in Australia, provided that the acquired engine also falls within the definition of "goods" covered under the Australian Consumer Law, and provided that all other conditions of the applicability of the Australian Consumer Law are satisfied.

In addition, for any such engines defined in this Special Note, this Warranty does not exclude and/or affect the warranties and/or guarantees that are set forth in the Australian Consumer Law.

VI. Available Remedy

JABIRU (or as otherwise decided by JABIRU) will make the defect good by repair or, at the option of JABIRU, by replacement. The repair or replacement (if opted by JABIRU) shall be the sole and exclusive remedy available under this Warranty, and will be the absolute limit on JABIRU's or any of its authorized representatives' liability whether based upon equity, contract or tort (including, but not limited to, negligence, strict liability, breach of contract, or breach of warranty) arising out of: (1) this Warranty; (2) the design, manufacture, delivery, sale, repair, replacement or any use of the engine and/or its parts; or, (3) the furnishing of any such service.
Unless specifically required by the law of a governing state, JABIRU does not cover the costs of freight, removal, and reinstallation of the engine. If the law of a governing state specifically requires that the costs of freight, removal, and reinstallation be covered, then under the conditions set forth in Sections VIII, IX, and X below, JABIRU will cover said costs should repairs be required during the warranty period, provided, however, that the repairs are not due to the conditions described in Section IV, Exclusions, above.

SOME STATES MAY PROVIDE OWNERS WITH REMEDIES IN ADDITION TO THOSE SPECIFIED IN THIS SECTION. THIS WARRANTY GIVES THE OWNER SPECIFIC LEGAL RIGHTS AND REMEDIES, AND THE OWNER MAY ALSO HAVE ADDITIONAL REMEDIES WHICH MAY VARY FROM STATE TO STATE.

VII. Repair or Replacement of Parts

As a part of its Limited, Express Warranty, JABIRU warrants in respect of JABIRU parts and accessories required as replacement parts, that it will make good by repair or at its option by replacement any defect occurring in any such JABIRU parts and accessories within twelve (12) months from the date of acquisition. Normal wear and tear is excluded. This Limited, Express Warranty does not cover those parts listed in Section IV, Exclusions, above and is subject to the same general exclusions.

VIII. Labour Costs

For any coverage period specified in Section III above, JABIRU will absorb certain labor costs incurred in connection with the repair or replacement of parts covered by this Warranty, provided, however, that said parts must be delivered directly to JABIRU (Airport Drive, Hinkler Airport, Bundaberg West, Queensland, Australia) and JABIRU itself performs the repairs. For JABIRU to cover labor costs in connection with the repair or

replacement of parts that belong to non-Australian international owners, said parts must be delivered to JABIRU official Dealers/Distributors as directed in writing by JABIRU. JABIRU will compensate International JABIRU Dealers/Distributors for the allowed labor costs at the rate that JABIRU charges for any similar job.

IX. Troubleshooting Costs

For the first TWELVE (12) CONSECUTIVE MONTHS of the coverage or the coverage period set forth in Section III of this Warranty above, whichever is shorter, JABIRU will pay for certain troubleshooting costs in connection with determining the need for any repair or replacement covered by this Warranty, when performed by, or coordinated through, JABIRU or an authorized JABIRU Distributor/Dealer, and where a defect is identified that results in a warranty claim. The amount of troubleshooting costs allowed will be in accordance with the latest revision of JABIRU's limited warranty labor allowance for any applicable part or component, which is made available to JABIRU or its authorized Distributor/Dealer. In no event will the Trouble Shooting Costs exceed fifteen percent (15%) of the Labor Costs allowed by JABIRU for such repairs or replacements. No Troubleshooting Costs will be covered where the need for repair or replacement under warranty is identified in the course of overhaul, routine maintenance, or on the basis of an obvious nonconformity, or if the damage is not one covered by this limited Warranty. No Troubleshooting Costs will be reimbursed if the need for a repair covered by this warranty was identified by someone other than a person or entity approved in writing by JABIRU.

For any engine to be delivered to JABIRU (Australia), it is the owner's sole responsibility to clean the engine from including, but not limited to, soil, debris, sand, gravel, plant matter, seeds, and/or any other foreign matter. It is also the owner's sole responsibility to completely drain the engine from oil, fuel, and/or any other liquids. Further, for any engine to be delivered to JABIRU (Australia), it is the owner's sole responsibility to comply with any and all cleaning requirements imposed by Australian Customs and Border Protection Services ("Australian Customs") and Australian Quarantine and Inspection

Services ("AQIS"). JABIRU will not be responsible for costs of cleaning the engine, any other related fines, penalties, and/or any other costs that result from the owner's failure to comply with the requirements imposed by the Australian Customs and/or AQIS. It is the owner's sole responsibility to pay any such costs, fines, and/or penalties imposed by the Australian Customs and/or AQIS.

For any engine to be delivered to a JABIRU Dealer/Distributor located outside Australia, it is the owner's sole responsibility to clean the engine from including, but not limited to, soil, debris, sand, gravel, plant matter, seeds, and/or any other foreign matter. It is also the owner's sole responsibility to completely drain the engine from oil, fuel, and/or any other liquids. Further, for any engine to be delivered to a JABIRU Dealer/Distributor located outside Australia, it is the owner's sole responsibility to comply with any and all cleaning requirements imposed by Customs, Border Protection, Quarantine and Inspection Authorities of the state where the JABIRU Dealer/Distributor is located. Neither JABIRU nor its Dealer/Distributor will be responsible for costs of cleaning the engine, any other related fines, penalties, and/or any other costs that result from the owner's failure to comply with the requirements imposed by Customs, Border Protection, Quarantine and Inspection Authorities of the state where the JABIRU Dealer/Distributor is located. It is the owner's sole responsibility to pay any such costs, fines, and/or penalties.

X. Additional Conditions – Owners' Actions to Obtain Coverage

The Owner must notify JABIRU or its authorized Distributor/Dealer, in writing, within fourteen (14) days from discovery of a condition that the owner believes is resulting from a defect in material or workmanship. Any defects which are not reported within fourteen (14) days shall not qualify for any claims under this Warranty. Failure to do so will result in denial of coverage under this Warranty. Note that the notification period is subject to the applicable national or local legislation.

The owner must provide reasonable access to the engine, its parts and accessories, and a reasonable opportunity for JABIRU or its authorized Distributor/Dealer to repair it. Also, if requested, the owner must also present proof of purchase.

If you cannot locate a JABIRU Distributor/Dealer or if you have any additional questions regarding this Warranty, please visit our website at http://www.jabiru.net.au/.

XI. No Defect Found

If a duly reported alleged defect cannot be confirmed as such by JABIRU or its authorized distributors and/or dealers and therefore no repair or replacement will be necessary, the owner shall bear all costs accrued in connection with the examination and transportation of the alleged defective item.

XII. Availability of Service and Parts after Warranty

JABIRU maintains a substantial stock of spare parts and operates a Service Exchange Programme in respect to some components. Every endeavour is made to ensure that JABIRU carries adequate stocks of service parts and is equipped to provide satisfactory service, but JABIRU does not make any promise that after the expiration of the Limited, Express Warranty such parts or service will be available, or available at any specific location or at any particular time.

XIII. Changes and modification of this Warranty

JABIRU reserves the right to modify this warranty at any time in writing. However, any such modification will not change the terms of the warranty applicable to the engines sold while this warranty is in effect.

XIV. Engine Transfer

If the ownership of the engine is transferred during the warranty coverage period, this Warranty and limitations of liability and disclaimers shall also be transferred and will be valid for the remaining coverage period, provided that: a) JABIRU or its authorized Distributor/Dealer promptly receives proof that the former owner agreed to the ownership transfer; b) JABIRU or its authorized Distributor/Dealer promptly receives the new owner's name and contact details; and, c) the conditions set forth in Section III above have been fully complied with.

Signed By: _____Date:_____

Name (Printed): _____

Address (Printed): _____

14 Jabiru's Limited, Express Warranty: Claim Form

FROM:_____DATE:_____

ENGINE PARTS: **AIRFRAME PARTS:**

ENGINE NUMBER:_____ AIRFRAME KIT NUMBER:_____

PART NUMBER:_____TOTAL HOURS:_____

OWNER:_____PREVIOUS OWNER:_____

PART DESCRIPTION:_____

_____

CLAIM:_____

_____

FAULTY GOODS RETURNED: YES COURIER Co. REF NO:_____

NO

ALL GOODS THAT ARE BOXED AND HAVE TO PASS THROUGH CUSTOMS HAVE TO BE CLEANED AND FREE FROM CONTAMINATION WITH A STATEMENT ATTACHED SPECIFING HOW THEY WERE CLEANED AND THAT THEY ARE FREE OF DIRT AND GRASS SEEDS. IF THEY ARE NOT CLEANED TO CUSTOMS SATISFACTION AN EXTRA CLEANING CHARGE WILL APPLY.

IF THIS CLAIM FORM IS NOT COMPLETELY AND CORRECTLY COMPLETED WARRANTY MAY BE REFUSED.

OFFICE USE ONLY

APPROVED
NOT APPROVED

REASON _____

_____

PRINTED NAME:_____

SIGNED:_____ DATED:_____

15 Revisions

Issue	List of Changes	Issued By	Date
1	Initial Issue	AS	16/10/17
2	Corrections to specifications (section 3) Corrections to maintenance tasks (section 8)	AS	25/09/18
3	Add Warning re oil additives section 8.21 Task 23, 26 & 27 on Worksheet 12.3	SW	6/6/2019
4	Add “On condition” statement (section 10.3)	AS	8/11/2019
5	Adjust Fuel pressure limits consistent with other manuals (section 3.8.2) Manual renamed “Operations and Maintenance Manual” Remove reference to non-existent JEM0008 (Add JEM2202 and JEM 3302 Add new 6 cylinder distributor (SRBH73)	SW AS	25/3/2020 29/5/2020
6	Make flywheel bolt procedure consistent with other manuals and other small edits. Add details for PD42J carburettor Updated performance details. 5.2 Training – when available added	DM SW	7/9/2021 4/5/2022
7	9.6.4 Additional notes on fuel bowl level	DW	24/1/2023
8	8.29.1 Fuel SOV functional check added Sect 12.3 item 30 fuel flow rate & fuel SOV test added	PC	7/08/2024

16 Feedback and Reporting

Any issues or corrections required of Jabiru publications are requested to be passed on to Jabiru in writing for incorporation in subsequent revisions. Emails to info@jabiru.net.au are recommended.

The following form template may be used if desired.

Name of Reporter:	
Date:	
Email:	
Phone:	
Issue / Correction(s) (please list and provide details e.g. section numbers, page numbers, nature of concern)	

16.1.1 Continued Operational Safety Reporting

The owner/operator of a LSA is responsible for notifying the manufacturer of any safety of flight issue or significant service difficulty upon discovery. The following proforma may be used:

Date:	
Aircraft Model	
Aircraft Registration	
Aircraft S/No.	
Propeller Model:	
Propeller S/No.	
Engine Model:	
Engine S/No	
Details of item:	
Name of Reporter:	
Preferred Contact Details of Reporter	

16.1.2 Owner Change of Address Notice

Each owner/operator of a LSA is responsible for providing the manufacturer with current contact information where the manufacturer may send the owner/operator supplemental notification bulletins. The following proforma may be used & sent to Jabiru Aircraft at info@jabiru.net.au or the contact details given in Section 2.6

Aircraft Model	
Aircraft Registration	
Propeller Model:	
Propeller S/No.	
Aircraft S/No	

Engine Model:	
Engine S/No	
Previous Owner:	
New Owner:	
Contact Details of New Owner	