

**INSTRUCTION AND MAINTENANCE MANUAL  
FOR  
JABIRU 5100 AIRCRAFT ENGINE**

**DOCUMENT No. JEM5101-4**



This Manual has been prepared as a guide to correctly operate, maintain and Service the Jabiru 5100 engine.

**It is the owner's responsibility to regularly check the Jabiru web site at [www.jabiru.net.au](http://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.**

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Should you have any questions or doubts about the contents of this manual, please contact Jabiru Aircraft Pty Ltd.

**Applicable to Jabiru 5100 Models from S/No 51001**



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#### Issue Notes:

1	ORIGINAL RELEASE
2	Prop flange fitting detail updated
3	Starter motor overhaul, prop strike details added
4	Reference to JEM0001 and JEM0002 takes precedence over information provided in this manual



## 2 General Information

### 2.1 Model

All Jabiru 5100 Engines from S/No 51001 on.

### 2.2 General

**WARNING:**

Jabiru Aircraft Pty Ltd has devoted significant resources and testing to develop the Jabiru 5100 aircraft engine. This engine is intended to be installed in accordance with the details given in the “INSTALLATION MANUAL FOR JABIRU 5100 AIRCRAFT ENGINE”, document No. JEM5102. 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 “INSTALLATION MANUAL FOR JABIRU 5100 AIRCRAFT ENGINE”. Any non-compliant installation may render the aircraft un-airworthy and will void any warranty issued by Jabiru.

The Jabiru 5100 aircraft engine is designed to be operated and maintained only in strict accordance with this instruction and 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 passenger’s 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 willful 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.



### 2.3 Description

It is said that "aircraft are designed around available engines".

Jabiru believe that the Jabiru range of very light engines offers opportunities for light aircraft designers to develop a new generation of light aircraft.

Jabiru engines are designed to be manufactured in small batch quantities using the very latest Computer Numerically Controlled (CNC) machine tools. All Jabiru engines are manufactured and assembled in a very modern factory in Bundaberg where each engine is run in on a Dynamometer and calibrated before delivery. The crankcase halves, cylinder heads, crankshaft, starter motor housings, gearbox cover (the gearbox powers the distributor rotors) and coil mounts – together with many smaller components are machined from solid. The sump (oil pan) is fabricated from steel sheet. The cylinders are machined from bar 4140 chrome molybdenum alloy steel, with the pistons running directly in the steel bores. The crankshaft is also machined from 4140 chrome molybdenum alloy steel, the journals of which are precision ground prior to being Magnaflux inspected. The camshaft is manufactured from 4140 chrome molybdenum alloy steel and nitride hardened.

The propeller is direct crankshaft driven and does not use a reduction gearbox. This facilitates its light-weight design and keeps maintenance costs to a minimum. The crankshaft features a removable propeller flange, which enables the easy replacement of the front crankshaft seal and provides for a propeller shaft extension to be fitted, should this be required for particular applications. Cylinder heads are machined from solid aluminium billet, thereby providing a substantive quality trail to material source. Connecting rods are machined from 4140 alloy steel and the 55mm big end bearings are of the automotive slipper type.

Many components of the engines are sourced from outside Suppliers. These items include camshaft followers, and the bendix gear in the starter motor. The ignition coils are also sourced from outside Suppliers, and are modified by Jabiru for their own particular application.

An integral alternator using rare earth magnets provides alternating current for battery charging and electrical accessories. The alternator is attached to the flywheel and is driven directly by the crankshaft. The ignition system is a transistorised electronic system; two fixed coils mounted adjacent to the flywheel are energised by rare earth magnets attached to the flywheel. The passing of the coils by the magnets creates the high voltage current which is then transported by high tension leads to the centre post of two automotive type distributors (which are simply rotors and caps) before distribution to automotive spark plugs, two in the top of each cylinder head. The ignition system is fixed timing and, therefore, removes the need for timing adjustment. The ignition system is fully redundant, self-generating and does not depend on battery power.

The crankshaft is designed with a double bearing at the propeller flange end and a main bearing between each big end; it therefore does not have flying webs. 64mm main bearings are also of the automotive slipper type. Thrust bearings are located fore and aft of the front double bearing allowing either tractor or pusher installation.

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Pistons are manufactured to Jabiru specifications with 3 rings, the top rings being cast iron to complement the chrome molybdenum cylinder bores. Valves are 7mm stem diameter, which are purpose manufactured for the Jabiru engine.

The valve gear includes pushrods from the camshaft followers to valve rockers mounted on a shaft through a Teflon bronze-steel bush. Valve guides are manufactured from aluminium/bronze, as is found in larger aero engines and high performance racing engines. Replaceable valve seats are of nickel steel and are shrunk into the aluminium cylinder heads. The valve gear is lubricated from the oil gallery. Engines use solid lifters and require periodic checking of rocker to valve clearance.

The internal gear pump is driven by the camshaft and provides engine lubrication via an oil circuit, which includes an automotive spin-on filter, oil cooler and in-built relief valve.

The standard engines are supplied with two Ram-air cooling ducts, which have been developed by Jabiru to facilitate the cooling of the engine and direct air from the propeller to the critical areas of the engine, particularly the cylinder heads and barrels. The fitment of these ducts is a great bonus for the home builder or engine installer, as they remove the need to design and manufacture baffles and the establishment of a plenum chamber, which is the traditional method of cooling air-cooled aircraft engines. The fact that these baffles and plenum chamber are not required also ensures a "cleaner" engine installation, which in turn facilitates maintenance and inspection of the engine and engine component. So the hard work of engine installation has largely been done for you by the Jabiru design team, with ram air ducts available for tractor configurations. The air pressure drop over the heads and oil cooler must be measured and comply with the required limits in the installation manual.

The engine is fitted with a 1.5 kW starter motor, which is also manufactured by Jabiru and provides very effective starting. The engine has very low vibration levels, as it is supported by four large rubber shock mounts attached to the engine, 2 mounts at the rear and 2 at the front of the engine.

The fuel induction system comprises two Bing pressure-compensating carburetors. Following carburation, the fuel/air mixture is drawn through induction manifolds that are bolted to both sides of the crankcase and into short induction tubes to the head inlet port.

An effective stainless steel exhaust and muffler system is fitted as standard equipment, ensuring quiet operations. The muffler outlet tubes are not fitted to the muffler body, and are to be fitted to suit each specific installation.

For those owners wanting to fit vacuum instruments to their aircraft the Jabiru engine design includes an optional vacuum pump drive, direct mounted through a coupling on the rear of the crankshaft.

The Jabiru engine is manufactured within an Australian Civil Aviation Safety Authority (CASA) approved Quality Assurance System to exacting standards.

Jabiru recommend a TBO of 2000 hours, with a top end overhaul done at 1000 hours, or when engine condition indicates the need for overhaul earlier.

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## 2.4 Reference to JEM0001 and JEM0002

The Jabiru 5100 engine is no longer in production with a total production run of only 50 units. For this reason, this manual (JEM5101) is no longer actively updated or kept contemporary with the latest developments and design changes implemented on the main line Jabiru engine series (2200 and 3300 engines).

This manual may continue to be used for reference only. Alongside this manual, for overhaul procedures, reference must be made to the latest issue of **JEM0001** (overhaul manual for Jabiru 2200 and 3300 engines). In JEM0001 the correct and latest methods used for the overhaul and assembly of Jabiru engines is maintained. Importantly the following information provided by JEM0001 must be referenced in relation to overhaul of the Jabiru 5100 engine.

- Current assembly hardware and parts used (e.g. 12 point through bolt nuts, Nordloc washers used on flywheel attachment screws, double valve spring used in cylinder heads and many others which will not appear in JEM5101).
- Current assembly techniques used (e.g. locking compounds and sealants used, methods for determining part serviceability etc.).
- Current built tolerances, clearances and Torque settings. Where a torque setting presented in JEM0001 differs from that presented in this manual the value given by JEM0001 takes precedence.

Similarly for maintenance schedule and maintenance practices reference must be made to the latest issue of **JEM0002** (maintenance manual for 2200 and 3300 engines). Again the correct and latest maintenance practices used are provided in this manual only.

If confusion exists persons conducting overhaul or maintenance of a Jabiru 5100 engine should contact Jabiru Aircraft Pty Ltd or a registered dealer for clarity.

## 2.5 Details

- 4 Stroke
- 8 Cylinder Horizontally Opposed
- 1 Central Camshaft
- Push Rods
- Over Head Valves (OHV)
- Ram Air Cooled
- Wet Sump Lubrication
- Direct Propeller Drive
- Dual Transistorised Magneto Ignition
- Integrated AC Generator
- Electric Starter
- Mechanical Fuel Pump
- Naturally Aspirated – 2 Bing Pressure Compensating Carburetors
- 10 Bearing Crankshaft



## 2.6 Manufacturer

Jabiru Aircraft Pty Ltd,  
 P.O. Box 5792,  
 Bundaberg West,  
 Queensland 4670

## 2.7 Manuals

JEM5101 - Instruction and Maintenance Manual (no longer maintained, for reference only)

Installation Manual

Parts Catalogue

JEM0001 - 2200 and 3300 Engine overhaul manual (takes precedence over JEM5101)

JEM0002 - 2200 and 3300 Engine maintenance manual (takes precedence over JEM5101)

All manuals are available from the Jabiru web site [www.jabiru.net.au](http://www.jabiru.net.au)

## 2.8 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](http://www.jabiru.net.au) – or the website of their local Jabiru representative to check for new or updated additional service information.



### 3 Specifications

#### 3.1 General Specifications & Equipment

- Displacement : 5077 cc
- Bore : 97.5 mm
- Stroke : 85 mm
- Compression Ratio : 8.5 :1
- Direction of Rotation of Prop Shaft : Clockwise – Pilot’s view – Tractor Applications
- Ramp Weight : 117 kg (258 lbs) Complete including Exhaust, Carburetors, Starter Motor, Alternator & Ignition System.
- Ignition Unit : Jabiru dual ignition - breakerless transistorized, no battery required
- Ignition Timing : 25° BTDC
- Firing Order : 1 - 5 - 8 - 3 - 2 - 6 - 7 - 4
- DC Output : 25 Amps
- Fuel Consumption @ 75% Power 18.5 in HG manifold pressure : 30 l/hr (7.9 US gal/hr)
- Fuel : AVGAS 100/130, Leaded or Unleaded Automotive fuel (MOGAS) with RON 100 or above
- Oil : Aero Oil W100 or Multigrade 15W-50, or equivalent Lubricant complying with MIL-L-22851C, or Lycoming Spec. 301F, or Teledyne – Continental Spec MHF-24B
- Oil Capacity : 5.5 L (5.8 quarts)
- Spark Plugs : NGK D9EA – Automotive  
Electrode Gap: 0.55 - 0.6mm (0.022" - 0.024")
- Generator : Jabiru, permanently excited single phase AC generator with rectifier/regulator  
DC Output: 25 amps (continuous)
- Carburetors : BING constant depression Type 94/40
- 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 : RYCO Z 145A or equivalent

#### 3.2 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.



### 3.3 Engine Ratings

- Takeoff/Max Continuous 180 hp (135 kW) / 3000 RPM
- Oil Consumption 0.1 L/hr (max)

### 3.4 Fuel

Fuel: AVGAS 100 LL & AVGAS 100/130  
 Leaded and Unleaded Automotive Gasoline above 100 Octane RON may be used if AVGAS is not available

**Detailed fuel information is available in Jabiru Service Letter JSL007.**

**Current Jabiru Service Bulletins & Letters available at [www.jabiru.net.au](http://www.jabiru.net.au)**

Oil: 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 as indicated

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

Equivalence of SAE and commonly used Commercial Grade designations:

SAE:	20	30	40	50	60
Commercial:	55	35	80	100	120

### 3.5 Lubricant

#### 3.5.1 Run in Period

Oil Weight:	80	100	120
Outside Air Temperature	-17° C to 25° C (1° to 77° F)	15° C to 35° C (59° to 95° F)	Above 35° C (95° F)

#### 3.5.2 Normal Operations

Oil Weight:	W80	W100	W120
Outside Air Temperature	-17° C to 25° C (1° to 77° F)	15° C to 35° C (59° to 95° F)	Above 35° C (95° F)

### 3.6 Cooling System

Free air cooled. Ensure that Ram-air ducts are correctly fitted & located.



The required pressure drop across the cylinders at 1.3 Vs clean stall speed is 5.0 cm (1.97") water gauge, minimum. A minimum of 6cm (2.4") is recommended at cruise speed.

### 3.7 Operating Speeds and Limits

#### 3.7.1 Ground Operating Limits

Idle Speed	600 RPM (set while engine is hot)
Oil Pressure – Idle	Min 80 kPa (11 psi) Max 525 kPa (76 psi)
Oil Temperature:	Max. 100°C (212°F)
Max. CHT	180°C (356°F)

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

#### 3.7.2 In-Flight Operating Limits

Maximum Speed	3000 RPM
Maximum Continuous Speed	3000 RPM
Idle Speed	600 RPM (set while engine is hot)
Oil Pressure – Idle	Min 80 kPa (11 psi)
– Starting & Warm up	Max 525 kPa (76 psi)
Oil Temperature:	Max. 118 °C (244 °F)
Oil Continuous Temperature	80 - 100°C (176° - 212°F)
Max. CHT (Climb)	200°C (392°F)
Max Continuous CHT (Cruise)	180°C (356°F)

**Notes:**

- Time with CHT at between 180°C and 200°C is not to exceed 5 Minutes
- (Read Cylinder Head Temperature – CHT – under the spark plug nearest to the exhaust on the hottest cylinder).

EGT Continuous Limits:

EGT (Mid-Range / Cruise):	Min 680° - 720°C (1256° - 1328°F)
EGT (Above 70% Power):	Min 640° - 680°C (1184° - 1256°F)

**Note:** An EGT gauge is not included as standard equipment on the Jabiru 5100 engine, though a system can be supplied as an option.

### 3.8 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.**

- Propeller selection is discussed in detail in the Jabiru 5100 Engine Installation Manual.
- Many propeller brands and models are not approved by Jabiru Aircraft. 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.
- 2-bladed, fixed-pitch wooden propellers manufactured by reputable companies are recommended by Jabiru Aircraft.

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- All propellers must be maintained in accordance to the propeller manufacturer's requirements in conjunction with Jabiru Aircraft P/L requirements.

### 3.9 Dimensions

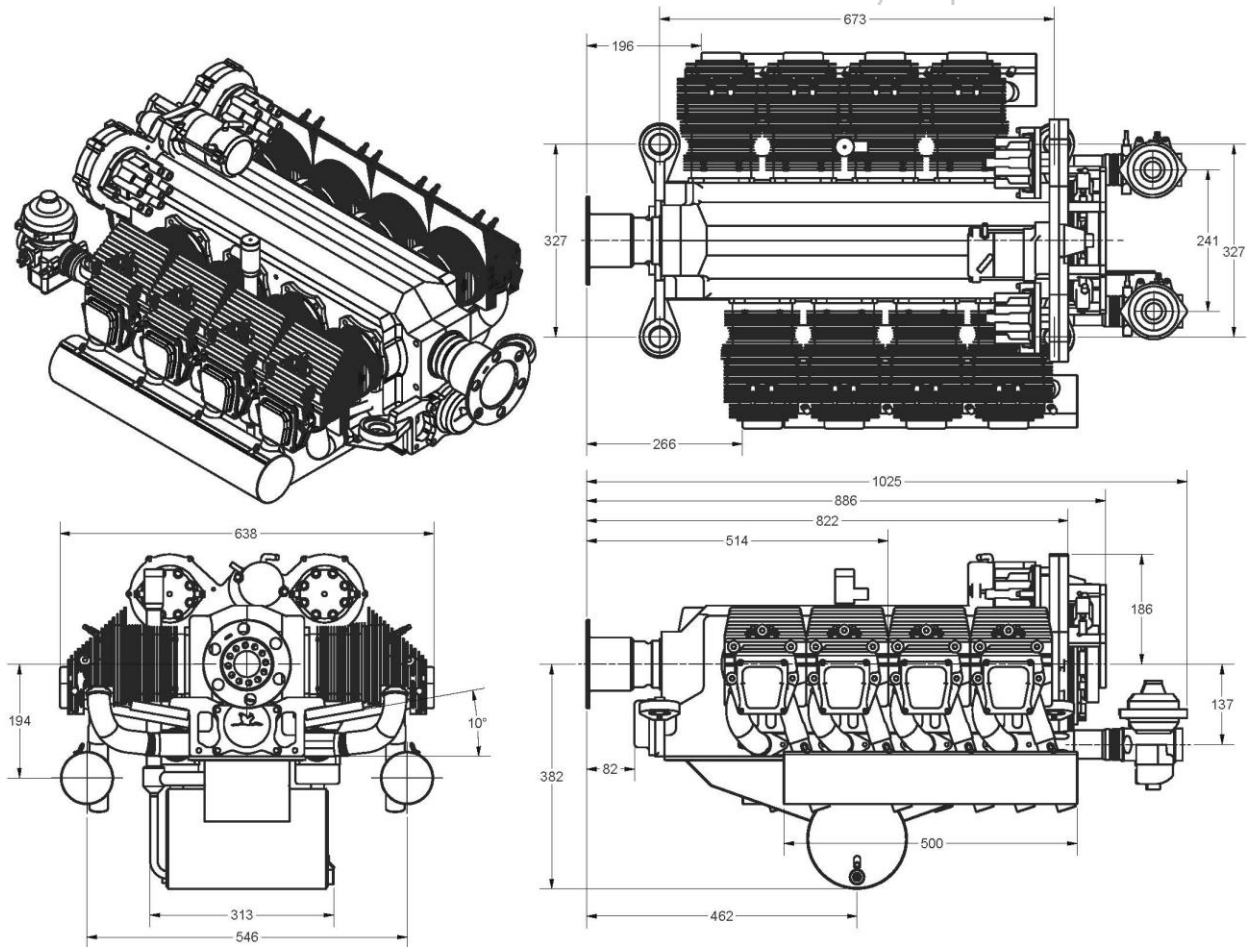
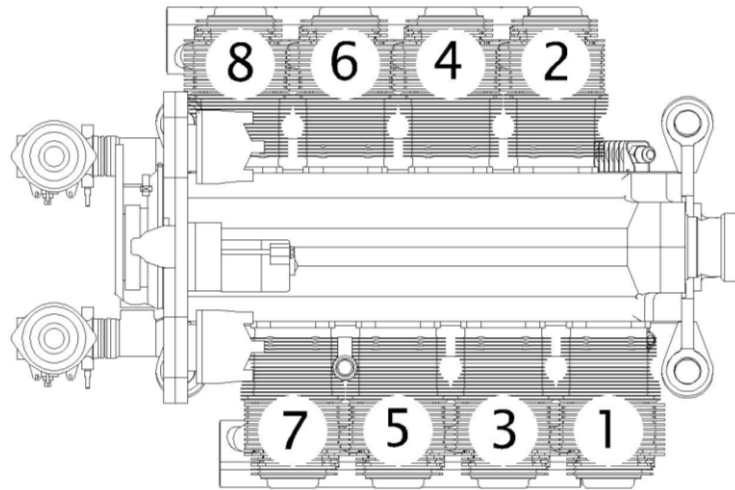


Figure 1. Drawing W5000510 Engine Dimensions

### 3.10 Denomination Of Cylinders



Cylinder Firing Order: 1 - 5 - 8 - 3 - 2 - 6 - 7 - 4

Figure 2. Cylinder Denomination & Firing Order

### 3.11 Distributor Cylinder Map

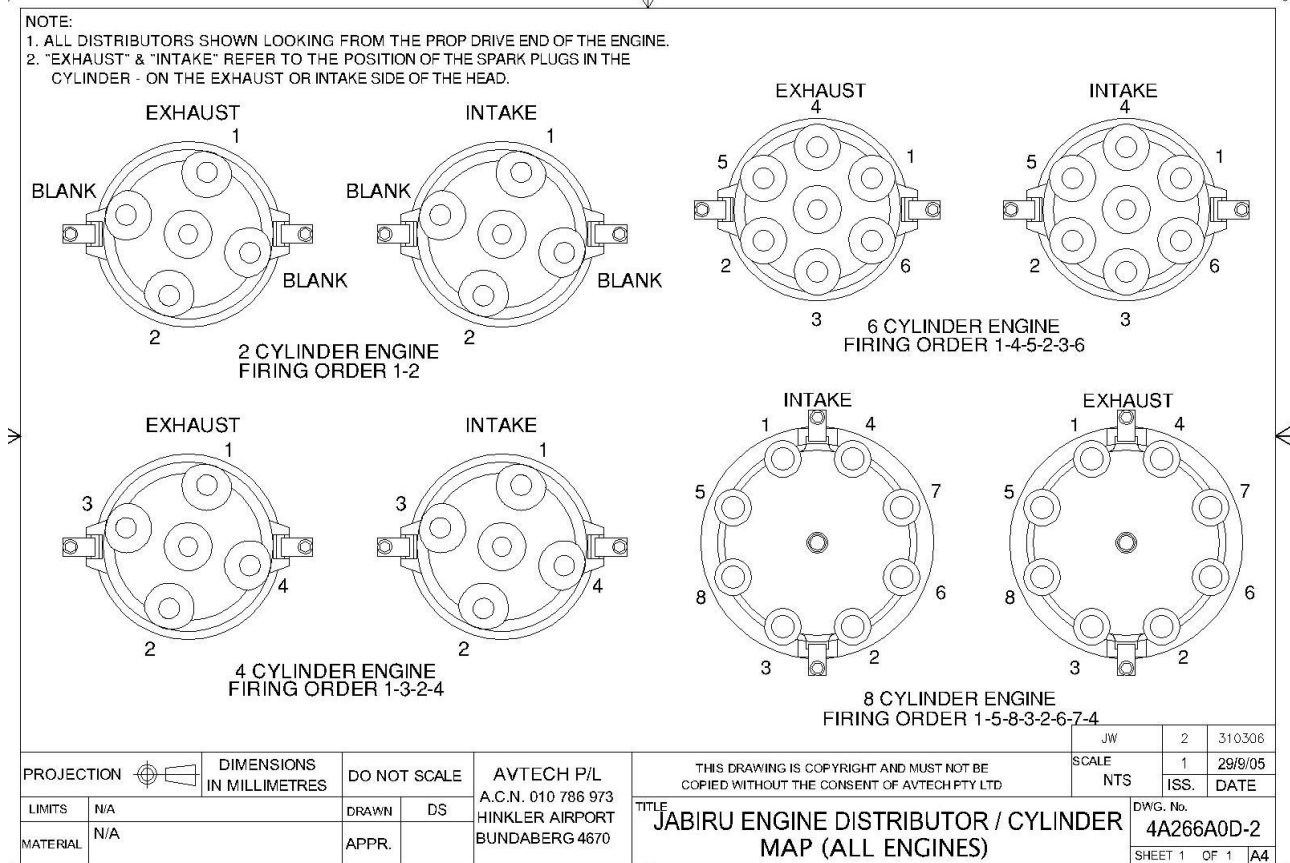
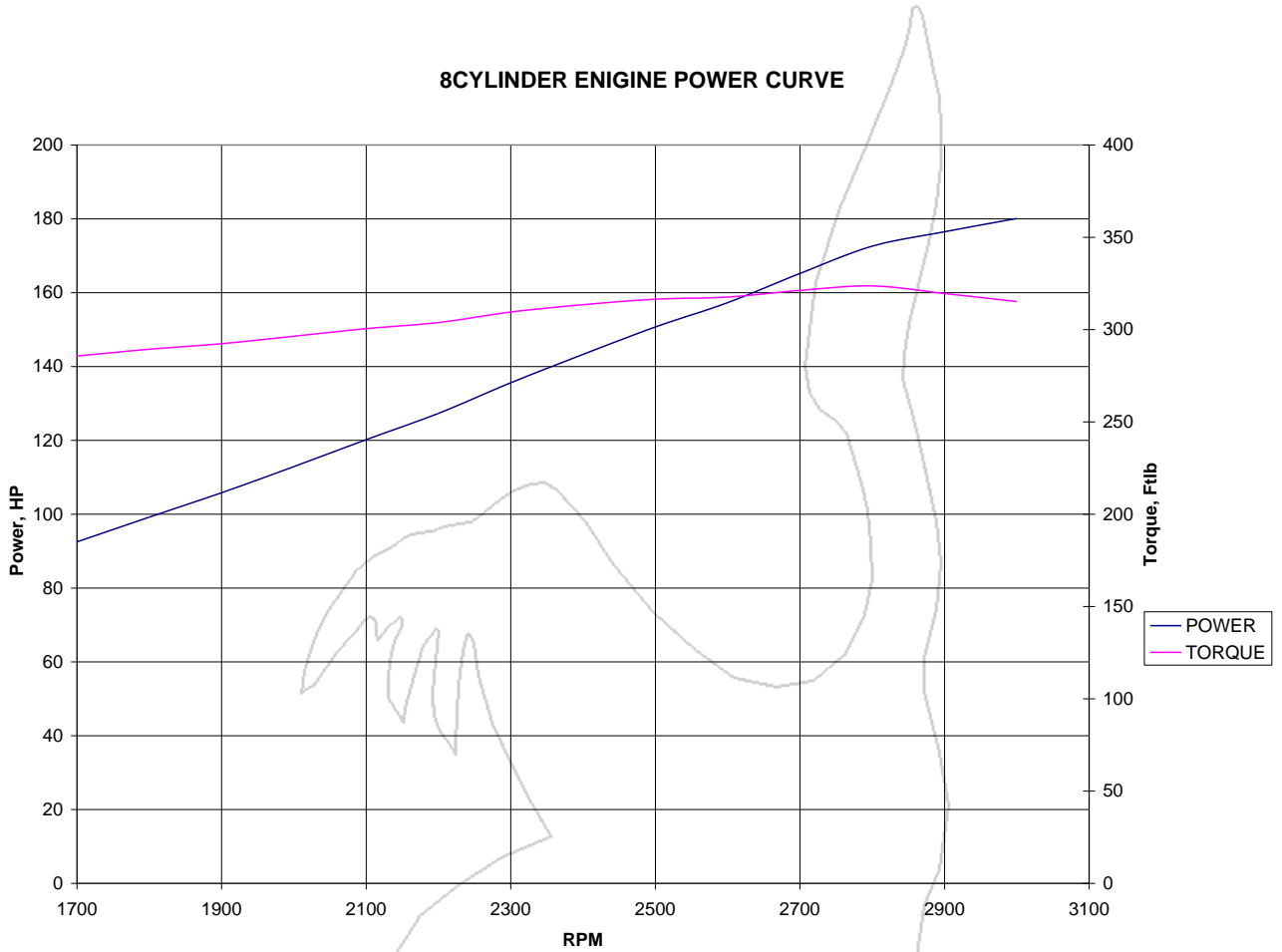


Figure 3. Distributor Cylinder Map



### 3.12 Power Curve



**Figure 4. Power Curve**

Note: Multiply Horsepower (hp) by 0.746 to convert to Kilowatts (kW)

i.e. 180 hp x 0.746 = 134 kW.



## 4 OPERATING INSTRUCTIONS

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

### 4.1 Pre-Start Checks

- Daily Checks (See Paragraph 5.1)
- Move throttle position to FULL & check for ease of movement over the entire range. Return to idle before attempting to start engine.

### 4.2 Starting Procedure

Note:

- 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. It is strongly advised to close choke while cranking on first attempt. Too much choke will cause over fueling in the venturi ("flooding" the engine) and loss of start.

#### 4.2.1 Cold Engine

Fuel Tap	OPEN
Choke	ON (in cold conditions less than 20°C)
Fuel Pump	ON for 10 seconds then off
Throttle	CLOSED to Stop
Master	ON
Ignition	BOTH ON
Starter	PRESS

After an oil change, it is strongly recommended to crank the engine with the ignitions OFF to obtain oil pressure before turning ignitions ON and attempting to start.

#### 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, Ground Test

Start the warming up period with the engine running at 1200 RPM. 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: - RPM with only one ignition should not drop by more than 100 RPM.

DO NOT apply full power until CHT reaches 100 °C (212°F)

DO NOT apply full power until Oil Temperature reaches 50°C (104°F)

DO NOT allow cylinder heads to rise above 150°C (302°F) during ground running.



#### 4.4 Take-Off

Climb with the engine at maximum continuous power. Observe Oil, Cylinder Head Temperatures & Oil Pressure.

**Limits must not be exceeded !** ( Max. continuous RPM at Full Throttle is 3000 RPM ).

#### 4.5 Engine Stop

In normal conditions, cooling down the engine during descent & taxiing will permit the engine to be stopped by switching OFF the ignitions.

#### 4.6 Engine Stop and Start During Flight

Reduce power to 2000 RPM to cool engine for 30 seconds, then to idle. Switch ignitions OFF. Starting procedure is the same as ground starting, without choke for a warm engine & with choke for a cold engine. Note: Engine cools quickly with propeller stopped in flight. Choke will therefore normally be needed to restart.





## 5 CHECKS ON ENGINE & INSTALLATION

### 5.1 Daily Checks

- Ensure free movement of throttle & choke cables.
- Check Oil Level, replenish if necessary.
  - i) Check oil level by screwing in cap fully before withdrawing
  - ii) Oil level should be between the MAX & MIN marks - but must never be below the MIN mark.
  - iii) Before long periods of operation, ensure that the level is at least at the mid position.
  - iv) Difference in the oil quantity between MAX & MIN mark is 0.5 litres (0.53 US Quarts).
  - v) See section 3.5 for first 25 hours of Operation.
  - vi) Overfilling is detrimental to the engine and causes high oil temperature.
- 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.**

**WARNING**

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

**CAUTION:**

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. Prolonged operation with leaking valves may cause valve failure an in flight engine failure.

**DO NOT IGNORE LEAKING VALVES.**

- Prior to takeoff - follow the Starting & Warm Up procedure, observe the engine behavior & throttle response.

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- Check temperatures & pressures. Conduct a short ground test at full power (a few seconds) (consult aircraft Flight Manual).

**NOTE:**

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

**5.2 Periodic Checks**

- After the initial 10 hours, check in accordance with para. 5.3.
- After the initial 25 hours, check in accordance with para. 5.4.
- After 50 hours of operation, check in accordance with para. 5.5 & thereafter after each 50 hours of operation.
- After 100 hours of operation, check in accordance with para. 5.6 and thereafter after each 100 hours of operation.
- At TBO, overhaul in accordance with para. 5.7.

**5.3 Check after initial 10 Hours**

- Details of specific operations are shown in "Maintenance" section of this manual.
- Remove engine cowlings
- Check engine mounts.
- Thoroughly check engine for missing or loose bolts, nuts, pins, etc.
- Check fit of cooling air ducts & baffles. Check the engine (including oil cooler) for signs of abrasion against cowls and ducts.
- Check induction and exhaust flange for loose bolts.
- Check safety wires, ignition wiring & hose connections.
- Retorque cylinder head bolts at 20 ft.lbs in diagonal pattern
- Check exhaust system and exhaust cap screw tensions.
- Check fuel system for leaks & abrasion.
- Check wiring for damage & for tightness.
- Test run engine.
  - i) Turn engine on starter with both ignitions OFF until oil pressure registers



- ii) Start engine. Observe starting, warm up & acceleration behavior to maximum RPM (10 seconds max)
- iii) Check temperatures & pressures.
- iv) Stop Engine.

## 5.4 Check After Initial 25 Hours

Details of specific operations are shown in Chapter 6 "Maintenance" of this manual.

- Remove engine cowlings
- Check engine mounts.
- Thoroughly check engine for missing or loose bolts, nuts, pins, etc.
- Check fit of cooling air ducts & baffles. Check the engine (including oil cooler) for signs of abrasion against cowls and ducts.
- Check induction and exhaust flange for loose bolts.
- Check safety wires, ignition wiring & hose connections.
- Oil Change. Refer to Chapter 6 "Maintenance" for details. Use normal aviation running oil.
- Change oil filter. Inspect old filter for excessive contamination, metal filings etc.
- Retorque cylinder head bolts at 20 ft.lbs in diagonal pattern
- Check exhaust system, check exhaust cap screw tensions.
- Check fuel system for leaks & abrasion.
- Check wiring for damage & for tightness.
- Test run engine.
  - v) Turn engine on starter with both ignitions OFF until oil pressure registers
  - vi) Start engine. Observe starting, warm up & acceleration behavior to maximum RPM (10 seconds max)
  - vii) Check temperatures & pressures.
  - viii) Stop Engine.

## 5.5 50 Hours Check

- Details of specific operations are shown in "Maintenance" section of this manual.
- Conduct the items shown under 25 Hour Check at above (include oil and filter change)



## 5.6 100 Hours Check (See Inspection Checklists at rear of book)

- Details of specific operations are shown in "Maintenance" section of this manual.
- Conduct the items shown under 25 Hour Check (include oil and filter change)
- Renew spark plugs.

## 5.7 TBO

- Details of specific operations are shown in "Maintenance" section of this manual.
- Engine Overhaul, in accordance with Service Bulletins
- Conduct the items shown under 25 Hour Check above.
- Check clearance on throttle valve shaft. If radial clearance exceeds 0.5mm (0.020"), repair carburettor.
- The overhaul work must be carried out to Jabiru specifications at an approved aeronautical service facility or by an approved Jabiru Service Centre.
- If necessary, changes to the TBO Limit due to operational experience, will be announced by Jabiru in a Service Bulletin.

## 5.8 Engine Preservation

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 period of time, in excess of 90 days, without taking the preventative measures as outlined in the manual will affect claims upon Jabiru's Limited, Express Warranty

### 5.8.1 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, ensuring all fuel is drained from the carburettor bowl.
- Fit covers to engine induction air inlet and exhaust outlets to minimize moisture ingress to cylinders.
- Every 7<sup>th</sup> day the propeller should be rotated through 5 revolutions, without running the engine. 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. Note that intake & exhaust covers should be removed before performing this task.

**CAUTION**

Ensure that the Master and Ignition Switches are **OFF** before turning engine.

**5.8.2 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 from the intake & exhaust.

**5.8.3 Temporary Storage**

- Temporary storage is defined as aircraft in non-operational status for a maximum of 90 days.
- Disconnect or remove battery.
- Treat as for flyable storage (see details above), plus:
  - i) For temporary storage, fill fuel tank with correct grade of fuel (to prevent moisture accumulation).

Then:

- Disconnect spark plug leads and remove spark plugs from each cylinder.
- Using a spray atomiser, spray corrosion inhibitor through the spark plug hole with the piston down, then rotate until both valves are open and re-spray to coat the induction and exhaust system. When all cylinders are treated leave prop horizontal and retreat each cylinder.

**NOTE:** Use Shell Aero fluid 2UN (MIL-C-6529C Type1) Corrosion Preventive Concentrate or similar engine preservative.

**CAUTION**

Ensure that the Master and Ignition Switches are OFF!

- Install spark plugs and connect leads.
- Seal exhaust pipes. Attach a red streamer to each seal.
- DO NOT seal fuel tank breather.
- Attach a warning placard to the propeller stating that vents and breathers have been sealed and prop should not be turned.
- The engine must not be started with the seals in place.





**5.8.4 Inspection During Storage**

- Generally inspect airframe and clean as necessary.
- Inspect the interior of at least one cylinder through the spark plug hole for corrosion at least once a month.
- If, at the end of the 90 day period, the aircraft is to be continued in non-operational storage, repeat Steps 1-5 above (most will only need to be checked).

**5.8.5 Indefinite Storage**

For indefinite storage, treat the engine as per Temporary Storage Section above. In Addition:

- Drain fuel tank & ensure carburettor bowl is empty by running engine with fuel valve off until it stops, or by draining the bowl manually.
- Long term storage: Flood the cylinder / sump with corrosion inhibitor. Periodically remove one spark plug per head, turn engine over then replace spark plugs.

**5.8.6 Returning Engine to Service After Temporary Storage**

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

- Check battery charge level and install.
- Check carburettor air filter and service if necessary.
- Remove warning placard from propeller.
- Remove inlet & exhaust covers.
- Remove, clean and gap spark plugs.
- Drain all oil before rotating. While spark plugs are removed, rotate propeller several revolutions using the starter to clear excess corrosion inhibitor from cylinders.

**CAUTION**

Ensure that the Master and Ignition Switches are OFF!

- Install spark plugs -- torque to 11 Nm (8 ft/lbs).
- Check fuel filter -- replace if necessary.
- If returning to service after indefinite storage, fill fuel tank with correct grade of fuel.
- Check fuel tank and fuel lines for moisture and sediment. Drain enough fuel to eliminate any moisture and sediment.
- Check fuel tank breather is clear.
- Perform a thorough pre-flight inspection.



- Start and warm engine.

### 5.8.7 Operation in Winter

- It is recommended to carry out an engine service prior to the start of the cold season. For selection of oil, consult the table of lubricants given in the Engine Specifications above. Follow the following advice for operation at extremely low temperatures:

### 5.8.8 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.

#### 5.8.8.1 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) Add up to 2% isopropyl to fuel. Note: Addition of alcohol raises vapour pressure and may aggravate vapour lock in warm weather; this practice should be used only when needed and not in warm weather.

### IMPORTANT

Fuels containing alcohol always carry a small amount of water in solution. In situations where there are changes in temperature, or where there is an increase in alcohol content, water (or a mixture of water & alcohol) may settle & could cause problems.

### CAUTION:

**Do not add any form of alcohol (including automotive fuels with Ethanol or similar additives) to a Jabiru Aircraft fiberglass fuel tank. The sealant in these tanks will be damaged if it comes into contact with alcohol, leading to leaks.**

- f) Prevent condensation of humidity, ie avoid temperature differences between the aircraft & fuel.

#### 5.8.8.2 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. Severe intake icing can lead to engine failure. The only effective remedy is to preheat the intake air by use of the Carburettor Heat Control.

**CAUTION: When using auto fuels, ensure all components of the fuel delivery system are cooled to prevent fuel vaporization.**



## 6 MAINTENANCE

### 6.1 Lubrication System

- Oil Change as required. Oil Filter Change as required. Visual Check for Leaks.
- Drain the oil while engine is still warm.
- Change the oil filter at every 50 hourly inspection.
- Fill with oil. (approx 5.5 litres)
- Check oil level then run the engine to ensure that all lines, filters etc are full. The MAX mark must not be exceeded after the engine has been run.
- Use only registered brand oils meeting the specification detailed in Para. 3.5.
- 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.

### 6.2 Air Intake Filter

- Clean filter by removing from the intake housing & blowing compressed air against the direction of the intake flow.
- For operation in heavy dust conditions, clean air filter at shorter intervals than recommended for normal conditions.
- A clogged filter will reduce engine performance as well as promote premature engine wear.

### 6.3 Carburettor Adjustment

- Idle stop screw is a 7mm screw against throttle lever. Adjust its position to adjust engine idle speed.
- Standard idle mixture screw position is 1-1/4 turns out. Fine adjustment may be necessary to give a smooth idle.
- 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 running a propeller that does not meet the requirements listed in the installation manual, or by ambient temperature extremes. If an engine is to be used in these situations an EGT gauge should be fitted and monitored against the limits specified above.

**CAUTION: Do not change carburetor 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.**

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- The carburettor automatically adjusts the mixture to account for altitude.

**IMPORTANT**

- Check carburettor joints for degradation.
- Check carburetor linkage for full & free movement, and correct positioning of stops and security.

**6.4 Compression Check**

**6.4.1 Compression Gauge:**

- Measure compression using a compression tracer. Readings are taken with fully open throttle valve at engine oil temperature between 30° & 70°C (90° to 160°F).
- If readings are below 6 bar (90 psi) a check of the pistons, cylinders, valves & cylinder heads must be undertaken.

**6.4.2 Pressure Differential Test:**

- Check using a pressure loss or leakage tester eg SUN or BOSCH tester; max. allowable pressure loss is 25%.

As an alternative to a compression test, a pressure differential test (Leak down) can be carried out. This is a much better test of the condition of rings, bore, head sealing and valve. This is the normal test used in aviation and requires specific equipment. The test is carried out with the engine in warm to hot condition. Input pressure is best set at 80 PSI; a second gauge reads the differential. This is done with piston on TDC on the firing stroke. Note that the propeller needs to be restrained. A differential of lower than 80/60 (or generally, a 25% loss) indicates a problem.

Problems can be better identified using the leak down:

- i) Blow by through the crankcase vent indicates worn rings or bore
- ii) Leaking from carby indicates a poor intake valve seal
- iii) Leaking from exhaust indicates a poor exhaust valve seal
- iv) Head leak indicates poor head to cylinder seal

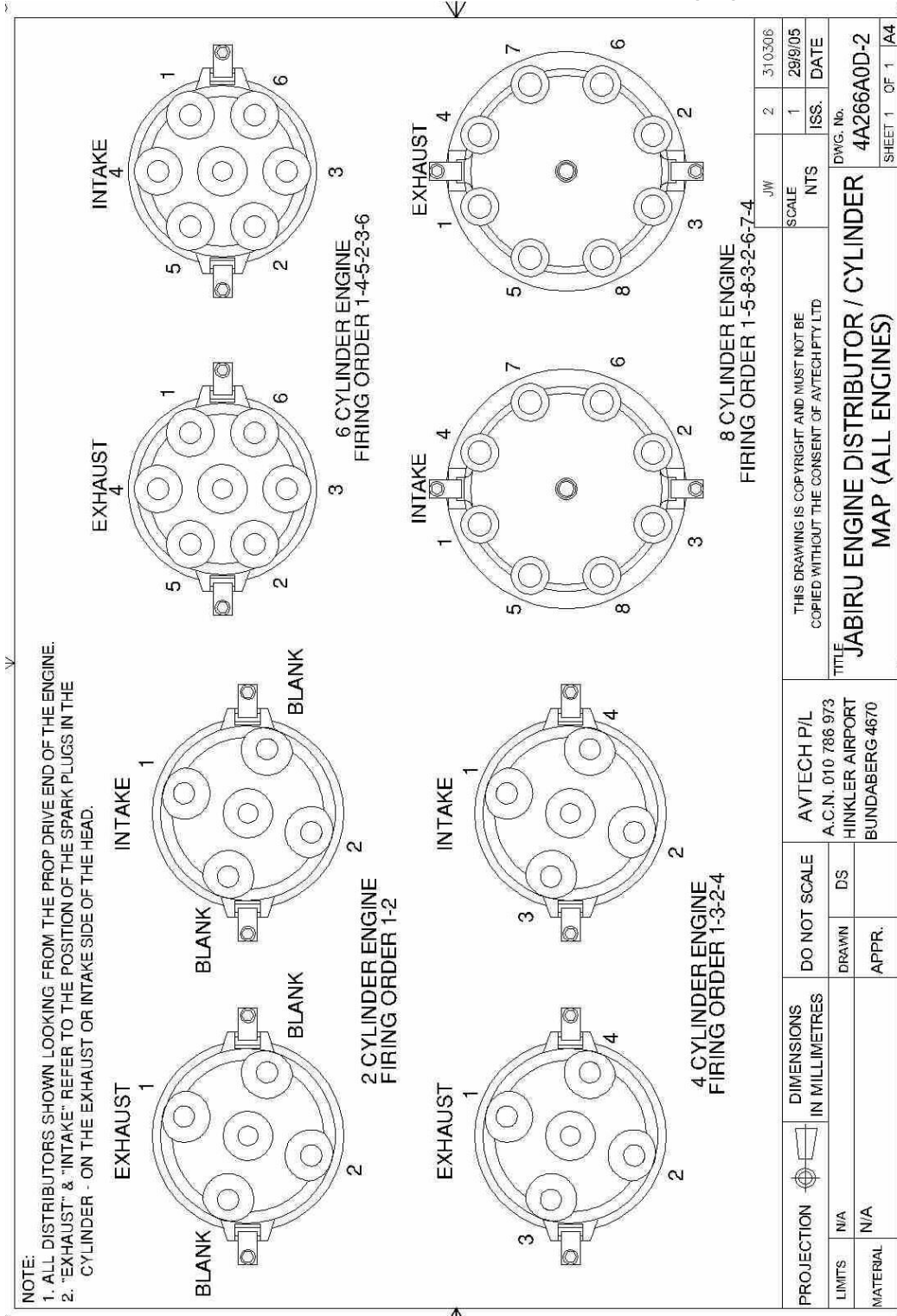
With the problem narrowed down, correction work can more easily be carried out.

- A Pressure Differential Tester can be made by placing an orifice of 1 mm ID and 3mm long between two pressure gauges. This will give the same result as with the above instrument. Maximum pressure drop is 25%.

**CAUTION: 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 eventual **valve failure** and **heavy damage to the piston, con-rod, barrel and head.** If **low compression is found which cannot be solved by reference to the Troubleshooting section below, please contact Jabiru Aircraft or our local authorized representative.**

## 6.5 Ignition System

### 6.5.1 High-Tension Lead Connections



**Figure 5. High-Tension Lead Connections**

Figure 5 above shows the High-Tension lead connections between the distributors and the spark plugs.

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### 6.5.2 Spark Plugs

- Do not use steel or brass brushes for cleaning & never sandblast plugs.
- Clean with plastic brush in a solvent.
- Check electrode gap & if necessary, adjust to 0.55 - 0.6mm (0.022" - 0.024") by carefully bending the electrode.
- Recommended Plugs: NGK D9EA.
- Use suitable anti-seize on thread.

#### IMPORTANT

Only tighten spark plugs on cold engine & only to the torque values shown in Section 12 using appropriate anti-seize compound

Note: When plugs are removed from a warm engine, the inspection of the tip of the spark plug can be used to indicate the health of the engine:

- *Light Coloured to Brown* :- Plug & calibration is correct.
- *Velvet Black*:- Mixture too rich. Check choke. Insufficient air intake. Check for clogged air filter.
- *Oily, Glossy Coating*:- Misfiring. Too much oil in combustion chamber. Worn cylinder & piston rings.
- *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.**

### 6.6 Exhaust System

- Visual check for damage, rubbing, leaks & general condition.

### 6.7 Bolts and Nuts

- Check for tightness, re-torque if necessary (see Section 12).

### 6.8 Tappet Adjustment

- Tappets must be adjusted to: Inlet 0.254mm (.010")  
Exhaust 0.254mm (.010")

Adjust the tappets when the engine is cold. Head torqued to 24 ft.lb. when cold. Carry out this adjustment after five hours of operation and again after ten hours of operation. At the 25 hour inspection this is done again. There is no need to back off studs when checking, we

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are trying to check if movement has occurred and the seal of cylinder to head is in tact. Bolts in the exhaust area may move on checking.

Subsequent checking at 20 – 22 Ft Lb is sufficient.

**CAUTION**

**Continued operation with incorrectly adjusted tappets will result in damage to valves, valve seats, valve guides & overhead gear.**

**6.9 Head Bolts**

- Head bolts are torqued to 20 ft.lb. when cold.
- Carry out this adjustment after five hours of operation and again after ten hours of operation. The bolts should thereafter be checked annually.

**6.10 Tachometer and Sender**

- 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.
- Tachometer sender gap 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.

**6.11 Additional Checks – Post Service**

- Check engine for ease of starting.
- Conduct idle test run.
- Checklist of engine inspection.

**6.11.1 Propeller**

- Check spinner, spinner flange, screws, prop, tension, spinner and prop tracking.

**CAUTION:**

**The maintenance schedules given in this manual are designed for engines using a propeller and propeller flange approved by Jabiru Aircraft Australia.**

**Jabiru Aircraft strongly recommend owners using non-approved parts follow a system of extra preventative maintenance checks to monitor their engine – particularly propeller installation and flywheel attachment.**

**Airworthiness and issues when claiming upon Jabiru’s Limited, Express Warranty may also result.**

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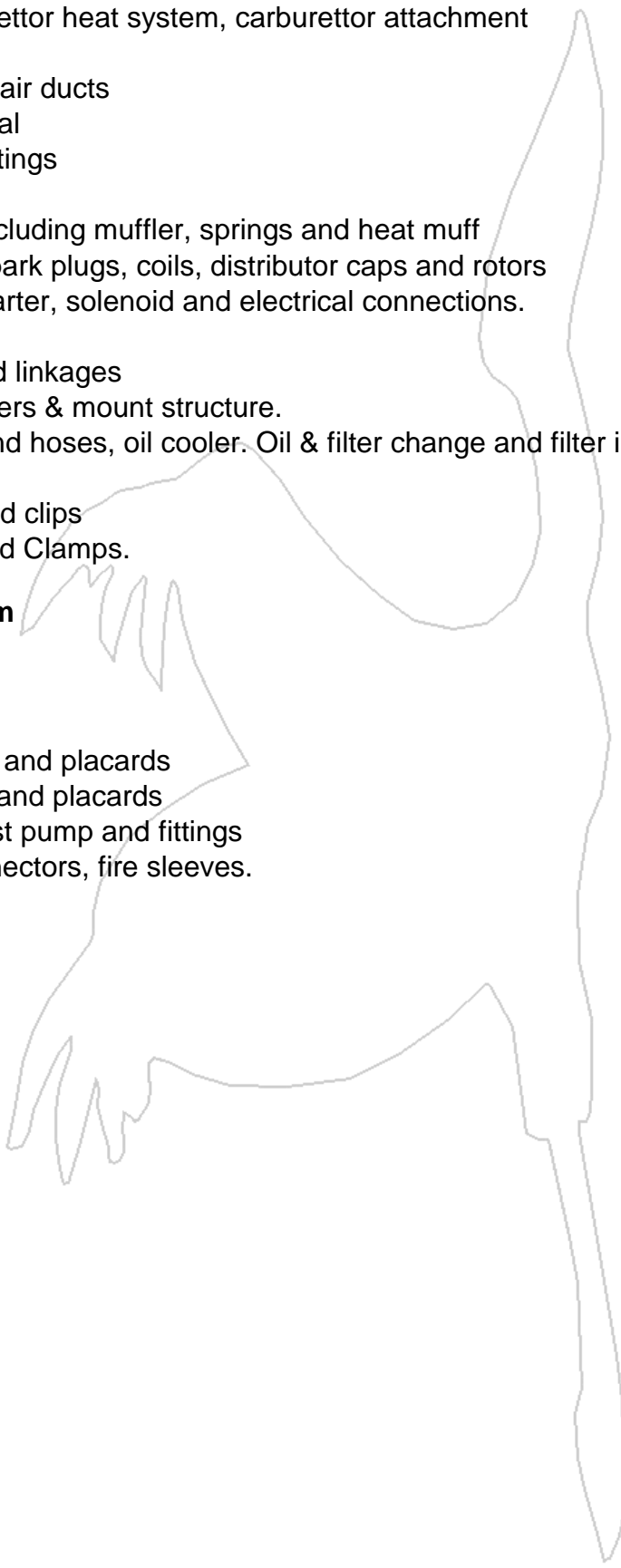


**6.11.2 Engine**

- Carburettor, carburettor heat system, carburettor attachment
- Air filter
- Engine baffles and air ducts
- Front crankcase seal
- Hoses, lines and fittings
- Intake system.
- Exhaust system, including muffler, springs and heat muff
- Ignition harness, spark plugs, coils, distributor caps and rotors
- Electrical wiring, starter, solenoid and electrical connections.
- Fuel pump
- Engine controls and linkages
- Engine mount rubbers & mount structure.
- Oil system tubes and hoses, oil cooler. Oil & filter change and filter inspection if due.
- Firewall
- Engine cowlings and clips
- All SCAT Hoses and Clamps.

**6.11.3 Fuel System**

- Fuel filter
- Fuel drain valve
- Carburetor bowl
- Fuel tank vent, cap and placards
- Fuel shut-off valve and placards
- Electronic fuel boost pump and fittings
- Fuel lines and connectors, fire sleeves.







### 6.12 Engine Inspection Chart

**Note: READ ALL INSPECTION REQUIREMENTS PARAGRAPHS PRIOR TO USING THESE CHARTS.**

		Annual Inspection		
		Each 100 Hours		
		Each 50 Hours		
<b>PROPELLER</b>				
1	Spinner		*	*
2	Spinner Flange		*	*
3	Spinner screws		*	*
4	Propeller		*	*
5	Propeller bolts/nuts - Tension		*	*
6	Spinner / Prop Tracking		*	*
<b>ENGINE &amp; ENGINE COMPARTMENT</b>				
Check for oil, fuel exhaust & induction leaks, then clean entire engine & compartment before inspection.				
•	Check flywheel screw tensions to 24lb.ft <sup>1</sup> ,			*
•	Carburettor air filter – Check & replace if required	*	*	*
•	Engine baffles and air ducts			*
•	Cylinders			*
•	Crankcase & front crankcase seal			*
•	Fuel hoses, lines and fittings		*	*
•	Intake and exhaust systems			*
•	Ignition harness, distributor caps & rotors			*
•	Spark plugs	*	*	*
•	Compression check or leak-down check		*	*

<sup>1</sup> Note: if any screws rotate they must be removed, crankshaft and screw threads cleaned then re-installed with fresh Loctite 620 (Use no more than the size of a match head). Do not remove all flywheel screws at once or loss of valve timing may occur.



Annual Inspection			
Each 100 Hours			
Each 50 Hours			
•	Electrical wiring		*
•	Fuel pump	*	
•	Engine controls and linkages	*	*
•	Engine mounts, mount structure	*	*
•	Starter, solenoid and electrical connections	*	*
•	Coils and electrical connections	*	*
•	Carburettor heat system	*	*
•	Throttle and linkage	*	*
•	Carburettor	*	*
•	Oil system tubes and hoses	*	*
•	Firewall		*
•	Engine cowlings and clips	*	*
•	Exhaust system – including muffler	*	*
•	Cylinder Head bolt tension	*	*
•	Tappet Adjustment (Section 6.8 above)	*	*
•	Oil & filter change	*	*
•	SCAT hose condition	*	*
<b>Fuel System</b>			
1	Fuel filters, drain valves, carburetor bowl	*	*
2	Electronic fuel boost pump and fittings		*
3	Fuel lines and connectors	*	*
4	Fire sleeves	*	*



## 7 SERVICE & REPAIR

### 7.1 Service Interval Tolerance

- A tolerance of plus or minus 3 hours is allowable on all of the service intervals given within this manual.

### 7.2 Engine Overhaul and TBO

- 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.
- Changes to the TBO due to operational experience will be advised by Jabiru through Service Bulletins.
- Engines have full overhauls at 2000 hours with a Top End being done at around 1000 hours. This is also subject to certain conditions. Overhauls are influenced by condition.

#### 7.2.1 Engine Overhaul

- An overhaul must present the engine with a life of 2000 hrs. During that life at 1000 hours a top end overhaul is undertaken. Overhauls are dependant on condition. Particular attention must be paid to section 12 - Torque Specifications, Prescribed sealants, Tolerances and Maximum Allowable Clearances.
- MPI testing is carried out on the crankshaft, camshaft, prop drive and conrods. Any necessary upgrades to represent as close as possible a current engine must be undertaken.
- Parts that are replaced include:- Pistons, gudgeons and circlips, rings, main bearings, conrod bearings, thrust bearings, conrod bolts, all orings, gaskets and seals, fuel pump, valves, induction hoses, rubber oil feed tees, spark plugs, rotors, head bolts, fuel hose, oil filter, oil hoses, flywheel bolts, prop flange bolts, woodruff key (oil pump), crankcase through-bolts and crankcase studs. Cylinder, heads and dizzy shafts are usually replaced at a full overhaul.
- All parts are cleaned, measured, inspected and recorded in the prescribed build sheets in the manual. Engine assembled according to maintenance section and build sheet directions.
- Use the Run-in procedure in section 10.1. **If the run in is performed on the ground large air-cooling ducts and a large oil cooler must be used.** The engine can be run in, in the aircraft in the air with caution, using the run in program as the guide. Initial performance data must be recorded.



### 7.2.2 Top End Overhaul

- Top end overhauls are performed on engines at around 1000 hours dependant on operating conditions.
- Parts replaced include:- Conrod bearings, pistons, gudgeon pins and circlips, rings, valves, all relevant orings and gaskets, head bolts, spark plugs, induction hose joiners, rotors, relevant capscrews and fuel line. Other parts for inspection, measure and clean or replace are oil pump, starter, alternator, fuel pump, coils, ignition leads, oil seals, induction and exhaust capscrews, carby, heads and barrels.
- After a top end overhaul the engine is test run as detailed in section 10.1 Run-in schedule

### 7.3 Engine Removal Procedure

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 spanner
10	Remove Oil Pressure Gauge Lead	-
11	Remove Oil Temperature Gauge Lead	-
12	Remove Hour meter Lead (if fitted)	Screwdriver
13	Remove Cylinder Head Temperature Gauge Lead	- (Disconnect at cold junction)
14	Remove Exhaust Gas temperature Gauge Lead	-

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No.	Operation	Tools Required
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	-

#### 7.4 ENGINE DISASSEMBLY

No.	Operation	Tools Required
1	Mount Engine on an engine stand in vertical position	As required for stand
2	Remove Spark Plugs	Spark Plug Socket
3	Remove Oil Pressure Sensor	17mm Spanner
4	Remove Oil Filter	Oil filter tool
5	Oil Pressure Valve may be removed by removing snap ring (1)	Snap Ring Pliers
6	Extract Valve Seat (1), Valve (1), Spring (1)	-
7	Remove Oil Pump Assembly (Housing, Rotor, Stator & Backing Plate)	1/4" Allen Key
8	Remove 4 capscrews in front oil seal carrier and break seal on crankcase	1/4" Allen Key
9	Remove Fuel Line and Carburettor	Flat-bladed screwdriver
10	Remove Fuel Pump, Gasket and Push Rod	1/4" Allen Key
11	Remove Distributor Cap Clamps, Caps and Rotors	5/32" Allen Key
12	Remove Starter Motor	3/16" Allen Key
13	Remove Alternator Mount	7/16" Socket 5/16 Ring O/End spanner



No.	Operation	Tools Required
14	Remove Ignition Coils from Alternator Mount	3/16" Allen Key
15	Remove Flywheel	1/4" Allen Key
16	Remove Gearbox Cover	3/16" Allen Key
17	Remove Engine Mount Plate	1/4" & 3/16" Allen Key
18	Remove Crankshaft Timing Gear	-
19	Remove Lower Induction Pipes	Screwdriver
20	Remove Sump <i>Note: There are screws holding the sump to the engine backing plate which are only visible with the gearbox removed</i>	3/16" Allen Key
21	Remove Exhaust and Induction Pipes	3/16" Allen Key
22	Remove Tappet Covers	3/16" Allen Key
23	Remove rockers and Push Rods	3/16" Allen Key
24	Remove Cylinder Head	1/4" Allen Key 1/2" Socket
25	Remove Push Rod Tubes	-
26	Remove Cylinder	7/16" Crowsfoot
<b>Removal of Piston</b>		
27	Remove 1 Wrist Pin Circlip	Sharp Screwdriver
28	Remove Wrist Pin (keep pin matched with its piston)	-
29	Remove Piston Rings (keep rings matched with its piston)	-
30	Repeat Operations 27-30 on other pistons if required	-
<b>Crankcase Disassembly</b>		
31	Remove main Stud Nuts on Front 2 studs	7/16" Socket
32	Double check that all through studs, sump, gear case, engine mount plate, oil pump and Front Oil Seal Housing are removed	-



No.	Operation	Tools Required
33	Tap Crankcase slightly and open Crankcase by removing half Crankcase	Plastic Mallet
34	Remove both Crankcase Halves off Crankshaft and remove Cam Shaft	-
35	Remove valve lifters (16) <i>Note - Keep valve lifters matched to each Crankcase half.</i>	-
36	Remove Thrust Washers (front and rear) - 2 without tang on right half case - 2 with tang on left half case <i>Note</i> - <i>Visually check for marks or scratches</i> - <i>Keep matched to their seats</i>	-
37	Remove Main Bearing Inserts (20) <i>Note</i> - <i>Visually check for marks or scratches</i> - <i>Keep matched to seats</i>	-
38	Remove Crankcase dowels. Remove O'Rings and Discard. <i>Note</i> - <i>Do not attempt to remove studs as they are loctited in with 620 Loctite</i>	-
39	Remove Oil Gallery Plugs and Oil Pressure Sender. Remove Oil Relief Valve.	-
<b>Cylinder Head Disassembly</b>		
40	Remove Valve Springs and Valves	Valve Spring Compressor
41	Remove Push Rod Circlips and O'Rings	Internal Circlip Pliers
<b>Gearbox Cover Disassembly</b>		
42	Remove Distributor Shafts	-
43	Remove Oil Seals	-
<b>Crankshaft &amp; Camshaft Disassembly</b>		



No.	Operation	Tools Required
44	Remove Bolts from Conrod <i>Note</i> - <i>Rods will need to be heated</i> - <i>Big End Bolts are Discarded on Removal</i>	¼ Allen key 3/8 Ratchet Hot Air Gun Rags
45	Remove Rod Bearing Inserts <i>Note</i> - <i>Visually inspect for marks and scratches</i> - <i>Keep matched to their seat</i>	-
46	Remove Camshaft Gears. Discard Camshaft Bolts. Remove welsh plug in rear of camshaft.	-

## 7.5 5100 ENGINE OVERHAUL

### Inspection and Assembly of Sub-Assemblies

- a) Sub-Assembly A - Crankshaft, Prop Mount and Con Rods.
- b) Sub-Assembly B - Crankcase and Camshaft.
- c) Sub-Assembly C - Pistons, Cylinders and Cylinder Heads.
- d) Sub-Assembly D - Sump and Oil Pump
- e) Sub-Assembly E - Flywheel, Ignition Coils and Alternator
- f) Sub-Assembly F - Gear Case
- g) Fuel Pump and Carburettor
- h) Final Assembly of Sub-assemblies
- i) Run In: Engines can be run in statically using suitable mount structure and very large specially constructed air ducts, or in the airframe in flight with extreme care. Run In program can be found at the end of the build sheets (see also early run notes section).
- j) Overhaul: The overhaul of any engine is an exacting science. Approved Jabiru service centres as well as Jabiru can provide this service.





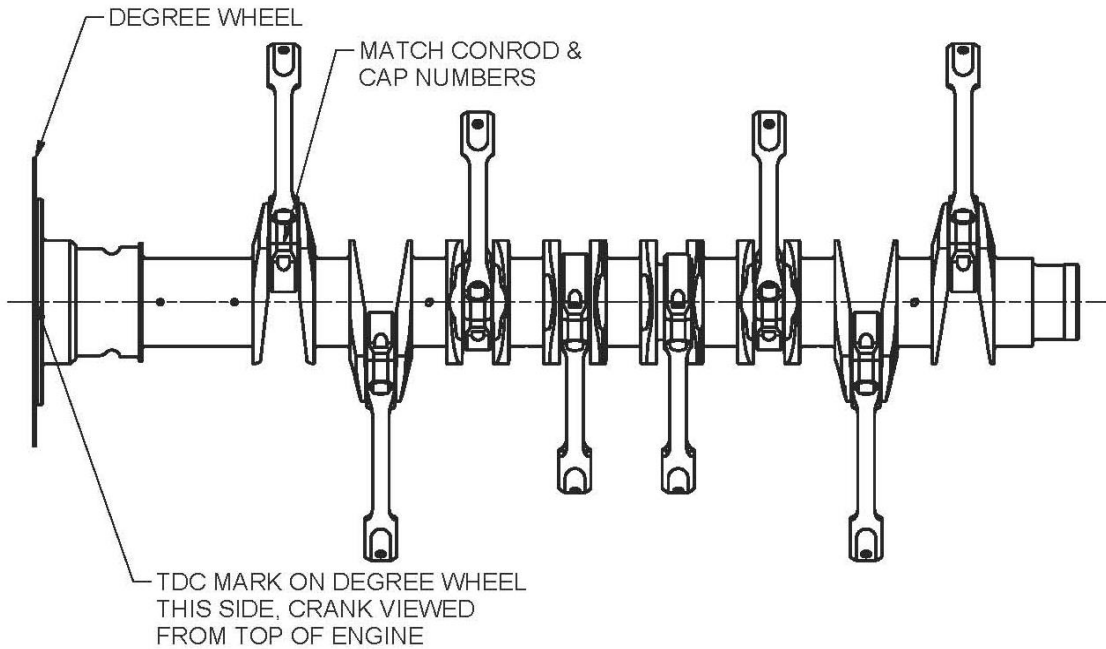
**7.5.1 Jabiru 5100 Component Inspection and Assembly Procedure**

**7.5.1.1 Sub-Assembly A - Crankshaft, Prop Mount and Con-Rods**

- A1
  - 1. Remove welsh plugs from crankshaft
  - 2. Clean conrods and crankshaft

*Note - Make sure all old Loctite is removed from threads*

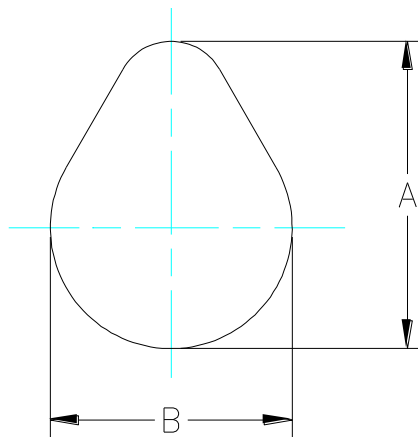
  - 3. Strip paint off prop flange and crankshaft.
  - 4. Magnetic particle inspect crankshaft, prop flange, cam and conrods
  
- A2 Measure crankshaft and record in Build Sheet
  
- A3 Inspect oil holes for cleanliness and insert new welsh plugs in crankshaft.
  
- A4 Inspect prop flange. Paint prop flange and end of crankshaft to prevent rusting
  
- A5
  - 1) Magnet particle inspect conrods for cracks.
  - 2) Fit bearings with a light smear of bearing blue on back of shells.
  - 3) Torque Caps to 18 ft lbs (with new bolts)
  - 4) Measure Big End Bearings. Record in build Sheet.
  - 5) Measure Piston Pin Bore. Record in build Sheet. Check CRUSH.
  - 6) Remove caps and check bearing back contact (Must be at least 90%)
  - 7) Remove all blue and thoroughly clean surfaces. Refit bearing shells.
  - 8) Clearance as close to 0.05mm is recommended.
  
- A6 Temporarily mount prop flange to crankshaft and mount to stand vertically. (Flange is removed later to fit front oil seal)
  
- A7
  - 1) Spray conrod bolts and conrod bolt threads with Loctite 7471 primer and allow to dry.
  - 2) Mount conrods to crankshaft. Use plenty of oil on journals. Closest to prop flange is number 1. Use Loctite 620 on rods and bolts torque up to 24.0 NM (18 ft/lbs)
  - 3) Wipe off excess Loctite at bases of cap screws on the end cap



**Figure 6. Drawing 4A472A0D – Crank & Rod Assembly**

A8

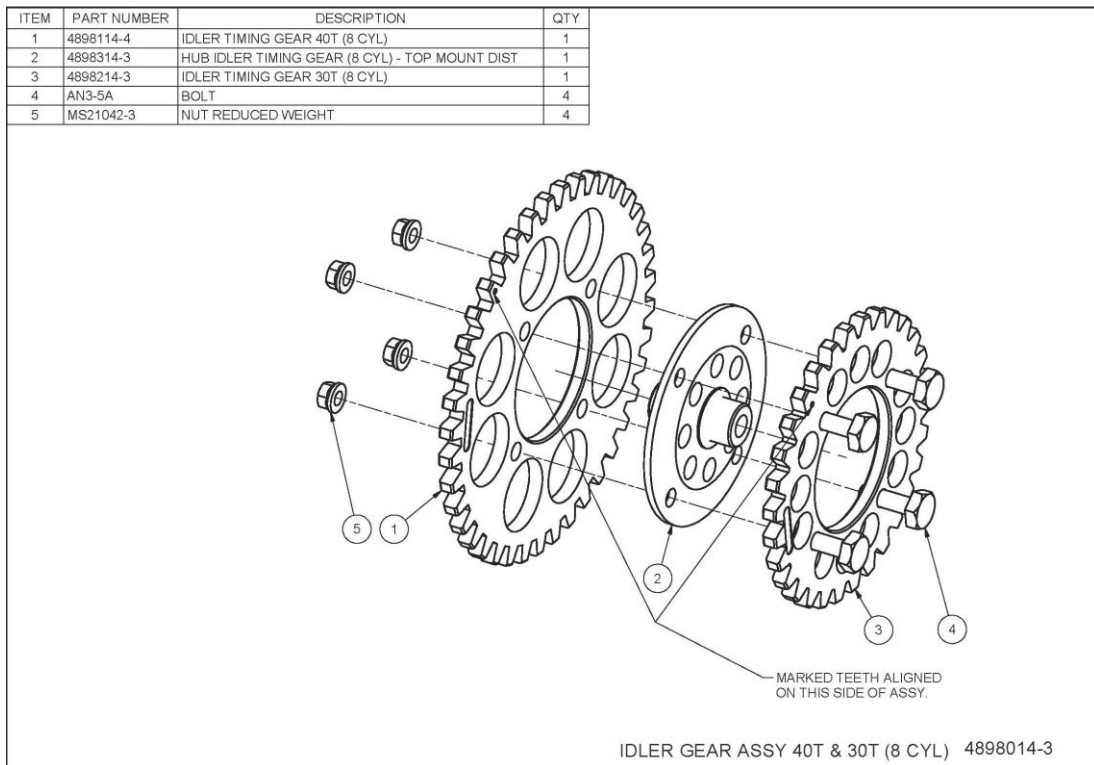
- 1) Clean and visually inspect camshaft
- 2) Measure journal diameter
- 3) Measure lobe lift
- 4) Inspect fuel pump lobe for wear.
- 5) Spray camshaft rear gears and bolts with Loctite 7471 Primer
- 6) Fit gears and new bolts. Use Loctite 620 torque to 8 ft lbs & Lock Wire



$$\text{CAM LIFT} = A - B$$

Drawing 9433064/1 CAM LIFT MEASUREMENT

**Figure 7. Drawing 9433064 – Cam Lift Measurement**

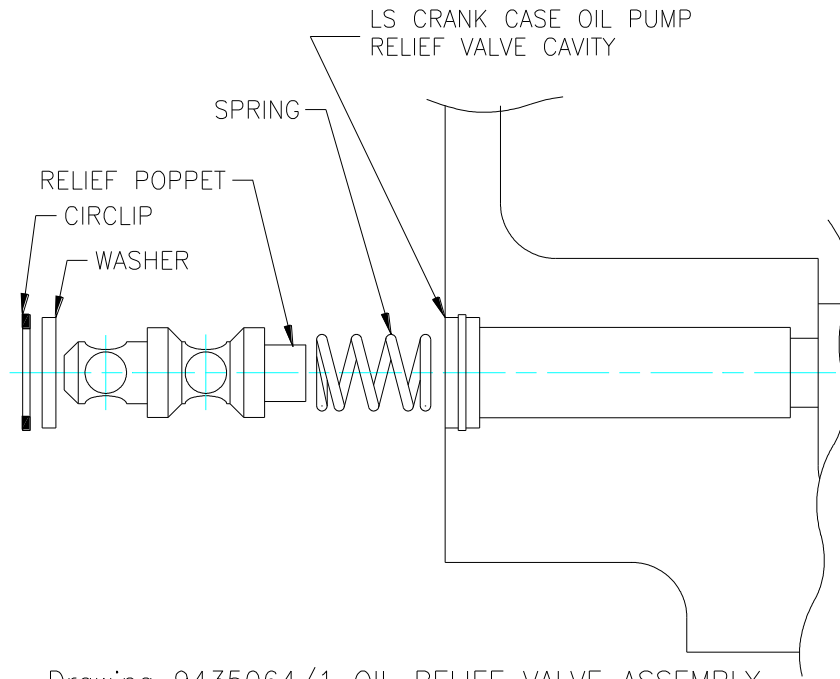


**Figure 8. Drawing 4898014 – Cam Idler Gear Assy**

A9 Stage Inspection by 2nd person of Sub-Assembly

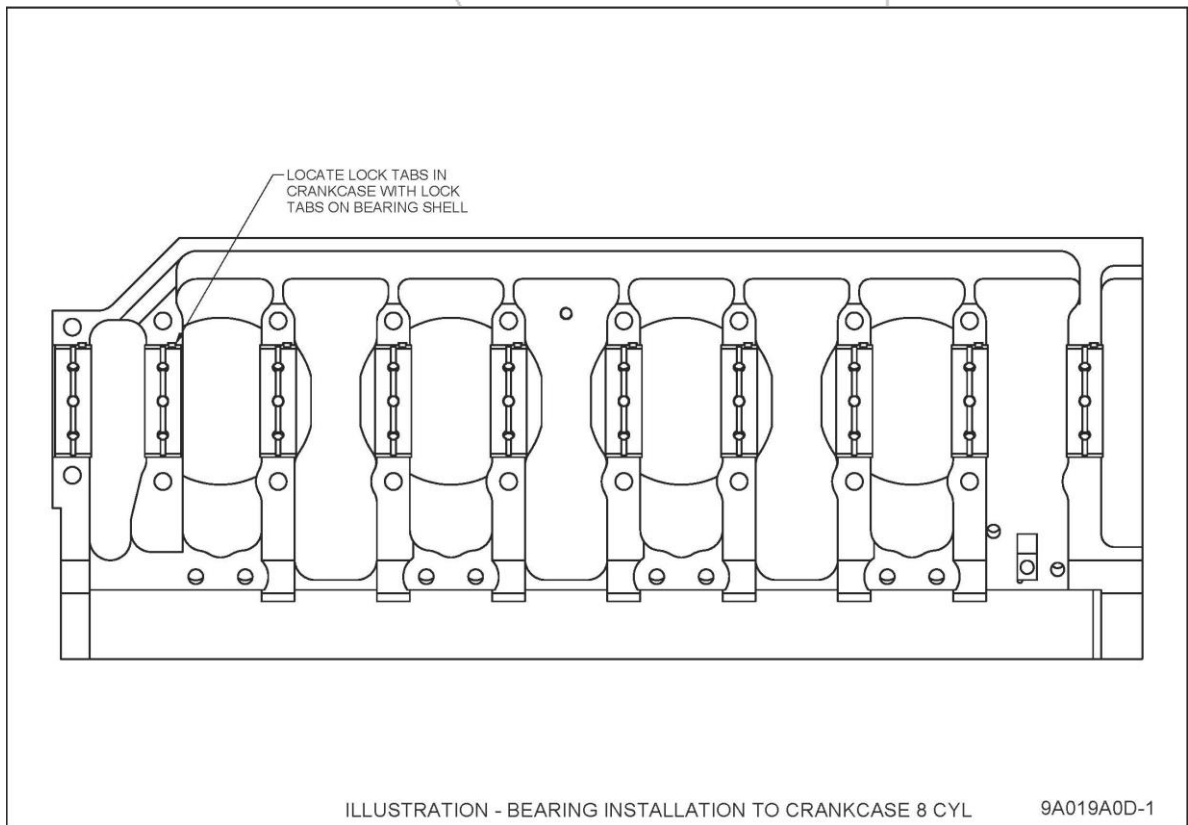
7.5.1.2 Sub-Assembly B – Crankcase and Camshaft

- B1
  1. Clean crankcase, remove old Loctite and clean oil galleries
  2. Visually inspect crankcase
- B2 Fit inner stud O Rings with a small smear of rubber grease or relevant lubricant.
- B3 Inspect all studs for tightness threads and stretching
- B4 Check oil suction pipe for security, replace O-ring.
- B5 Fit oil relief valve assembly, oil pressure sender and front plug/hourmeter switch. Relief washer should have a bevel to accept plunger (relief poppet). To increase oil pressure 1 or 2 AN4 washers can be placed behind the relief spring.
- B6
  1. Lightly blue bearing shells and one crankcase half
  2. Fit bearing shells.



Drawing 9435064/1 OIL RELIEF VALVE ASSEMBLY

**Figure 9. Drawing 9435064 – Oil Pressure Relief Valve Assy**

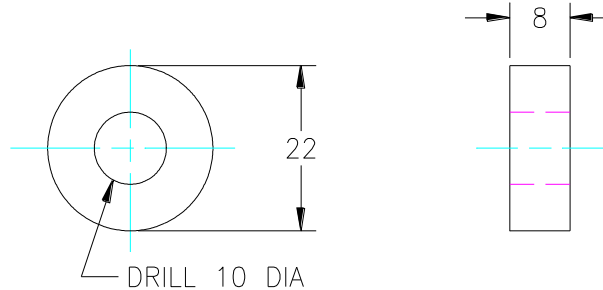


**Figure 10. Drawing 9A019A0D-1 – Crankcase Bearing Installation**

- B7
1. Make spacers as per drawing 9442064.
  2. Join crankcase halves
  3. Put through studs in case.

*Note the cylinders by themselves can be used as spacers. It is just a bit harder to measure the main tunnels.*

4. Fit old nuts and torque to 40 NM (30 ft/lbs) in two stages



Drawing 9442064/1 SPACER FOR MEASURING CRANKCASE

Figure 11. Drawing 9442064 – Crankcase Spacer

- B8 Measure main tunnel and cam tunnel and record in build sheet
- B9
5. Disassemble.
  6. Remove shells and check back contact (must be at least 90%)
  7. Check mating surface on crankcase
  8. Remove all blue and thoroughly clean surfaces. Refit bearing shells.
- B10 Measure cam followers and bores and record on build sheet. Oil and refit.
- B11 Check camshaft end float in both halves. Record in build sheet.
- B12 Check crankshaft end float in both halves and record in build sheet.

#### 7.5.1.3 Crankcase Decking / Machining

**NOTE:**

**This is an advanced procedure which must only be carried out by suitable workshops. It is recommended that this work be done through Jabiru Aircraft or our locally approved representative.**

- In some cases the crankcase may need to be machined – “decked” – to repair damage to the crankcase mating surfaces. A maximum of 0.15mm may be taken from each case half over its life.
- If the case is machined, line-boring may be required to re-size the crankshaft and camshaft bores to within the approved dimensional limits.
- If the case is machined, a continuous shim of 0.5mm metal shim material must be fitted beneath the cylinder bases to prevent an increase in the compression ratio.



7.5.1.4 Sub-Assembly C - Pistons, Cylinders and Cylinder Heads

- C1
1. Clean oil off heads
  2. Dip heads in a cold dip solvent (i.e. Redik dkt Degreaser - Decarboniser - Paint stripper) as per manufactures instructions to remove all carbon deposits.
  3. Note: The heads can be bead blasted, but care must be taken.
  4. Wire buff valves
  5. Clean all other parts
- C2 Cylinder Head Inspection and Repair
1. Inspect cylinder head for flatness. If sealing surface shows signs of leakage it may need refacing. When refacing, remove only the minimum to clean up.
  2. Measure valve guide wear
  3. If wear is excessive remove guides. Measure valve guide bore in the head. The new guide must have at least 0.05mm (0.002") interference on the outside diameter.

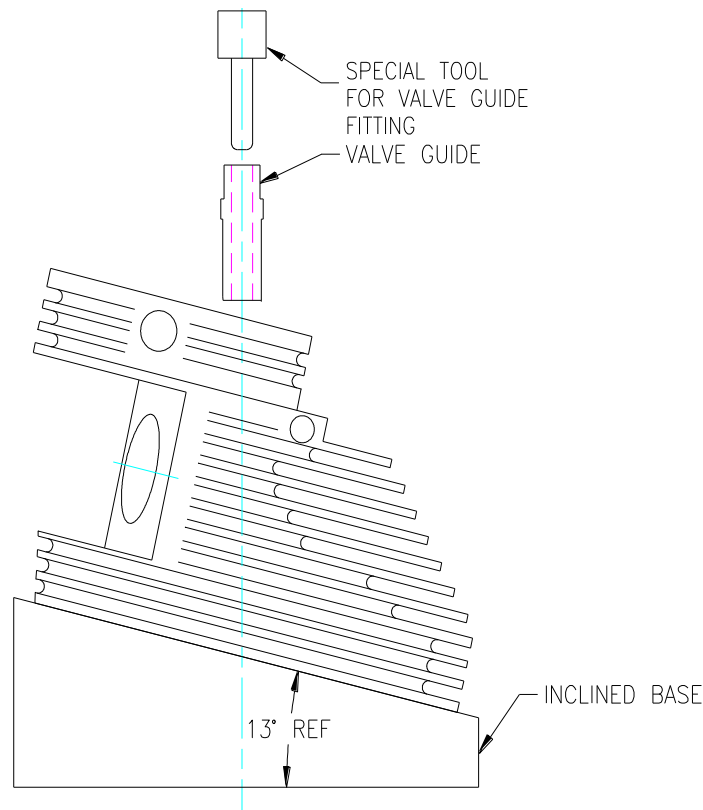
*Note - The standard guide has no dimples in top (P.N.4518064) In  
(P.N. 4519064) Ex*

*Oversize 0.05mm (0.002") has one dimple  
0.10mm (0.004") has two dimples  
0.15mm (0.006") has three dimples*

4. Press guides back in.
- Note - Oil hole must go up*
5. Special Note Guides: Guides are installed at 7.045-7.050mm bore diameter. Guides from 7.08mm can cause oil usage in the engine (max. valve stem to guide clearance is 0.12mm).

*Note – Valve guides and valve seats are installed to a specific program. Valve guide replacement is relatively straightforward. Valve seat replacement requires special tools and techniques and it is strongly recommended that valve seats are not replaced. Advice is available on request.*

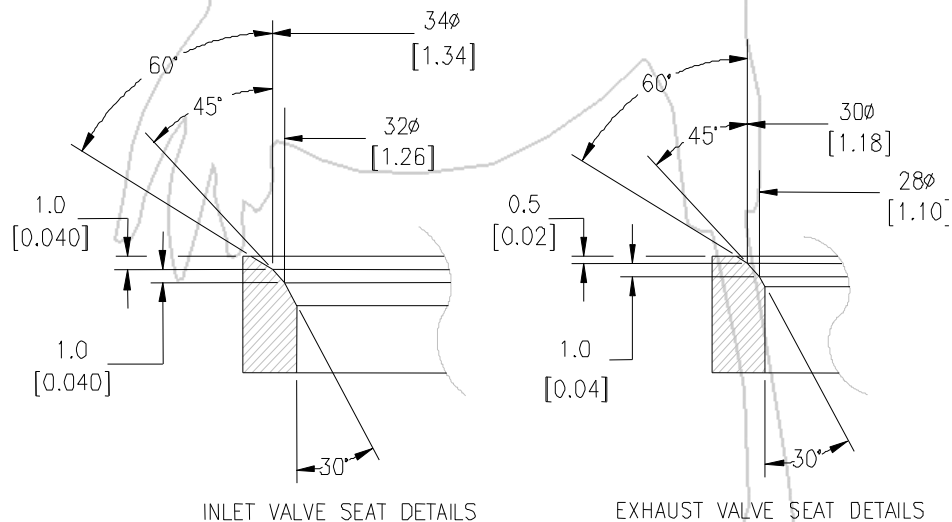
6. Mount head up and cut seats as per drawing



Drawing 9446064/1 VALVE GUIDE REPLACEMENT

**Figure 12. Drawing 944064 – Valve Guide Replacement**

Note - When cutting seats cut enough to clean up but try to remove as little as possible. This will give maximum number of overhauls on heads. The diagram below gives general valve seat cut geometry.



**Figure 13. Valve Seats**

7. Use ground and serviceable valves to check seat contact.

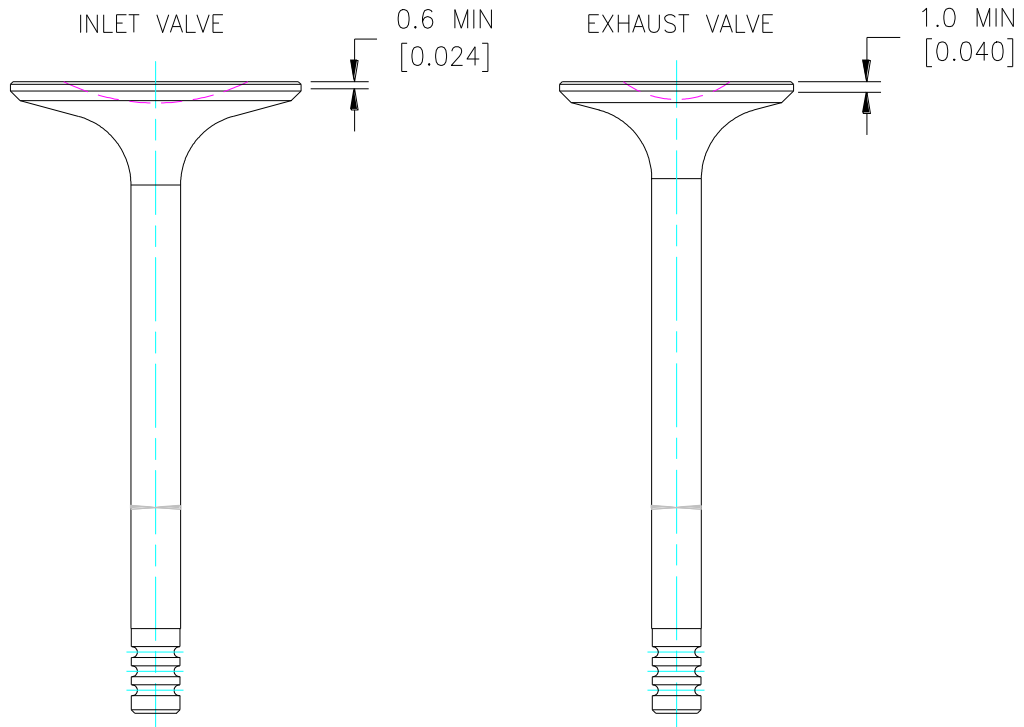
Note - If machine has a vacuum tester, vacuum test valves

8. Heads of valves must be above the level of the combustion chamber. If they are below, the valve seats and valves must be replaced. Minimum

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- deck height to valve face is 0.8mm
9. Measure valve stem for wear. Record in build sheet if within limits or replace valves
  10. Grind valve seats. If margin is too small, replace valves

C3

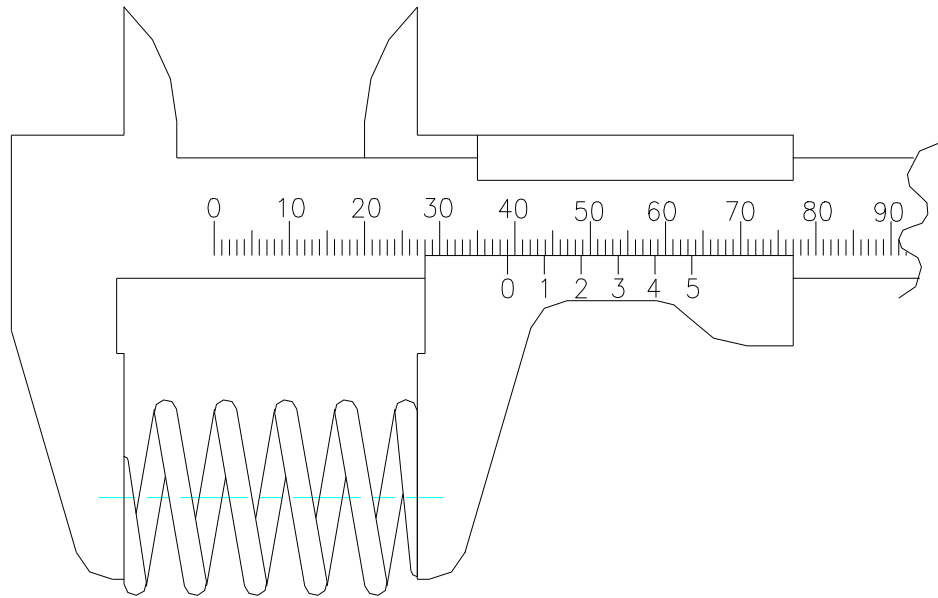


Drawing 9444064/1 VALVE DETAILS

**Figure 14. Drawing 9444064 – Valve Details**

1. Clean heads and valves ready for assembly
2. Measure valve springs. Replace if they are shorter than service limits. 40.0mm – 40.2mm (1.580" - 1.690")



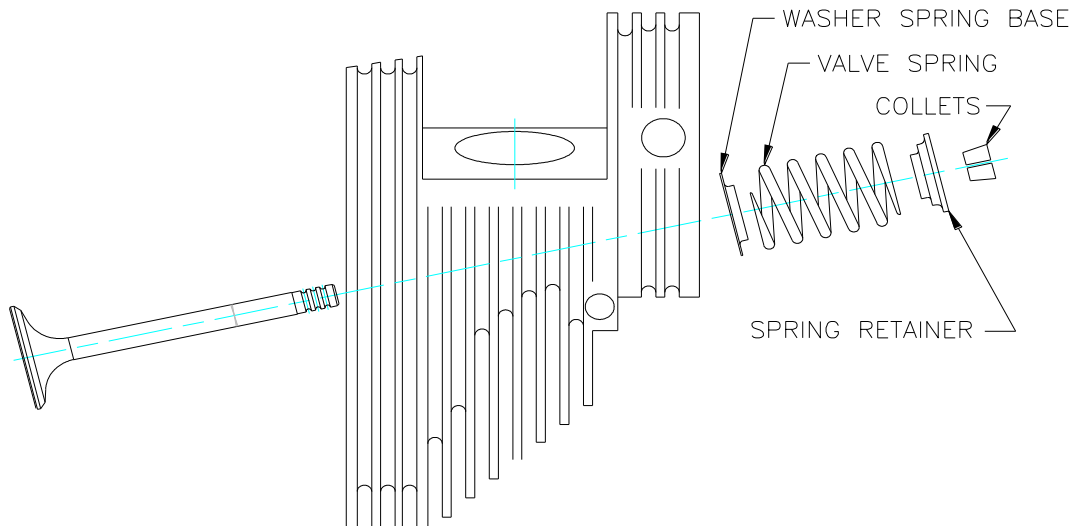


Drawing 9443064/1 VALVE SPRING MEASUREMENT

**Figure 15. Drawing 9443064 – Valve Spring Measurement**

3. Inspect valve spring seats, valve spring retainers and valve collets. Replace any that show signs of wear
4. Lube valves well. Install valves, valve spring seats, springs, retainers and collets.

*Note: All engines have the same spring retainer on exhaust and inlet valve.*



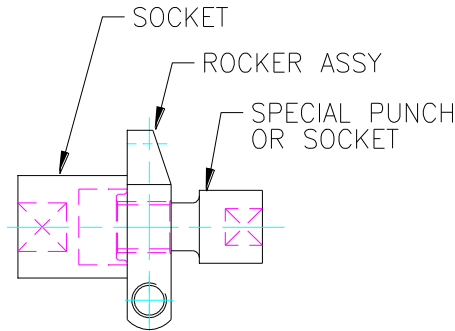
Drawing 94470641/2 VALVE ASSEMBLY

**Figure 16. Drawing 9447064 – Valve Assy**

- C4 Install Push Rod Tube O'Rings with a small amount of rubber grease

**Rocker Assembly**

- C5
1. Disassemble and clean off all carbon.
  2. Inspect rocker tip for wear. Replace any with excessive wear.
  3. Measure bushes and record on build sheet.
  4. If over service limits, replace.

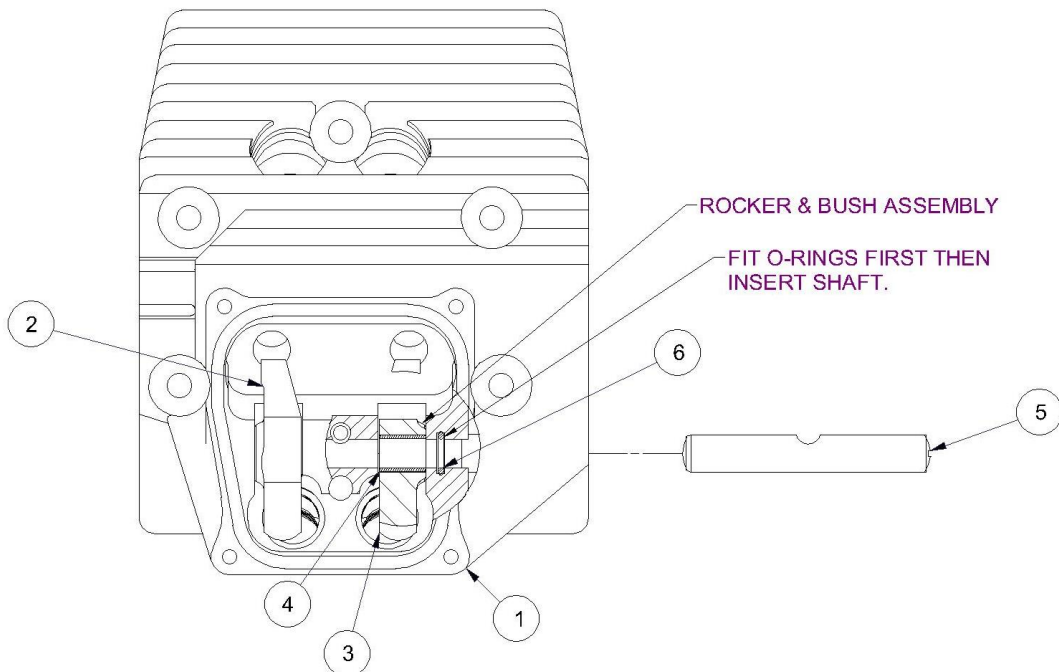


Drawing 9449064/1 ROCKER BUSH REMOVAL

**Figure 17. Drawing 9449064 – Rocker Bush Removal**

1. Clean off old Loctite from rocker bore.
2. Press in Bushes.

*Note - The width of the bushes is critical for the correct amount of end float, so they must be pushed right home.*



DRAWING 9A011A0D - ROCKER & BUSH REMOVAL - HYDRAULIC LIFTERS

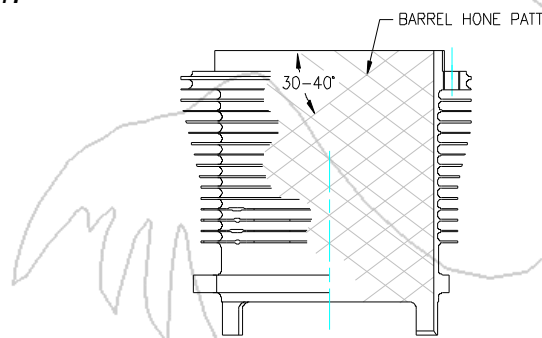
**Figure 18. Drawing 9A011A0D – Rocker Shaft Install**

1. Put capscrew through clamp hole and check rocker end float. Must be 0.1 to 0.4mm (0.004" to 0.014").
2. Clean up, oil well and reassemble.

### Cylinders

- C6
1. Clean and visually inspect
  2. Mount cylinders in honing machine by base and hone with Sunnen mm 33-J85 Stone
  3. Measure bore and record in Build Sheet
  4. Bead blast cylinder outer to remove all old paint and rust.
  5. Etch prime and paint with high temperature paint.
  6. Run 5/16 UNF Tap through head threads to remove all beads and to insure that head bolts torque up fully.
  7. Clean in kero then in hot soapy water to remove all honing oil etc.

*Note: Once cleaned, oil up cylinders straight away. Store in a cool dry place in a sealed container.*



**Figure 19. Drawing 9436064 – Barrel Hone**

### Pistons

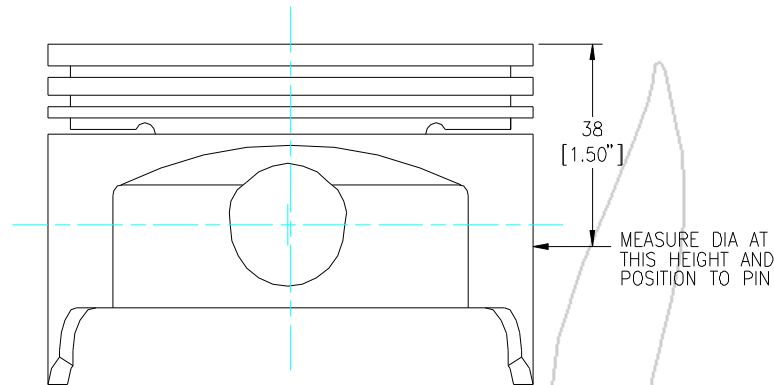
- C7
1. Clean oil out of pistons
  2. Dip Pistons in cold dip solvent (i.e. Redik DKT degreaser – decarboniser paint stripper) as per manufacturers instructions to remove all carbon.

*Note: The head of the piston can be bead blasted, but never bead blast the ring grooves, piston skirt and piston pin bores.*

3. Use an old ring to clean carbon out of ring grooves but care must be taken not to scratch grooves. Any scratching will cause Gas Leakage past the rings. A piece of 2mm (0.080") perspex can also be used, as it is kinder to the pistons.

- C8
1. Clean thoroughly.
  2. Visually inspect pistons for cracks or damage.
  3. Measure pistons diameter and record in build sheet.
  4. Check circlip groove.

*NOTE: Top ring has uninterrupted vertical edge. 2<sup>nd</sup> Ring has 2 cut-aways on vertical face (Top and Bottom). Ring manufacturers will specify machinings and orientation of first and second rings.*



**Figure 20. Drawing 9434064 – Piston Diameter**

5. Clean inhibitor off new rings.
6. Measure end gap of rings in the cylinder bore and record in build sheet.
7. Fit rings with dots up

*Note: End of oil ring expanded must be butted together. Piston rings orientated with joins opposite and not in thrust line.*

8. Fit pistons in cylinders. Oil Ring should only just enter so piston pin can be fitted later.

*Note: Arrows on inside of pistons point in direction of rotation. Oil rings and pistons and bore well. Notch on the piston crown faces the Propeller Flange.*

9. Fit front piston pin circlip.
10. Fit cylinder base O Ring.
11. Seal up in plastic bags ready for final assembly.

#### 7.5.1.5 Sub-Assembly D - Sump and Oil Pump

##### Sump

- D1
  1. Clean sump and remove all gasket eliminator.
  2. Inspect oil pick up.
- D2
  1. Remove & clean inlet manifold
- D3
 

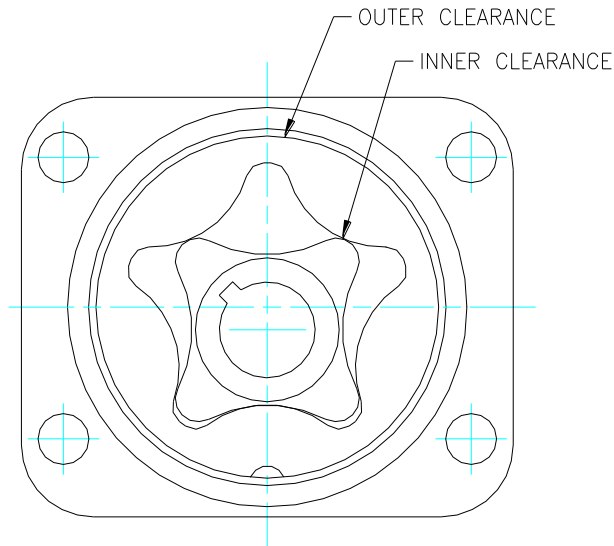
Inspect carburettor couplings replace if damaged or showing signs of deterioration.

*Note: It is very important that the carburettor and coupling are free of oil. If there is any oil present at all, it is possible for the carburettor to slip out of the coupling. This can also happen if the clamp is not positioned to the rubber edge facing the carby*
- D4
 

Fit new induction O Rings to Induction Pipes

##### Oil Pump

- D5
  1. Inspect oil pump inner and outer for damage to rotor surfaces
  2. Measure rotor clearance

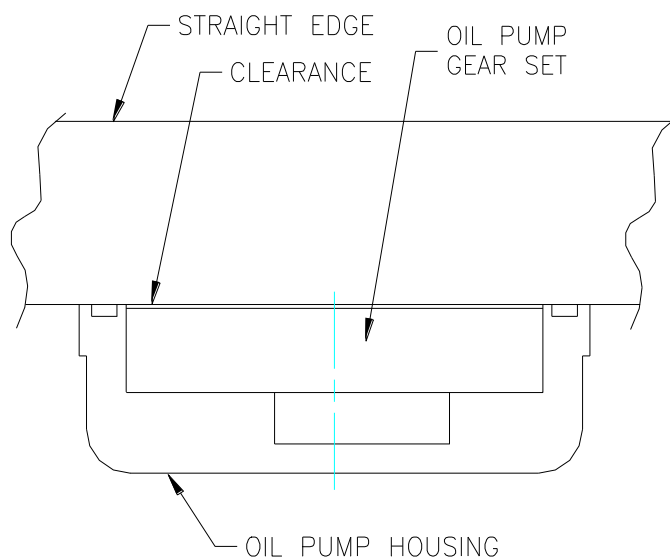


Drawing 9440064/1 OIL PUMP CLEARANCES

**Figure 21. Drawing 9440064 – Oil Pump Clearances**

- Housing to Outer Rotor clearance 0.07mm to 0.14mm (0.003" to 0.006")
- Inner Rotor to Outer Rotor 0.07mm to 0.14mm (0.003" to 0.006")

3. Fit Inner Rotor into Outer Rotor. Using straight edge check end clearance. End Clearance 0.03mm to 0.006mm (0.0015" to 0.003")



Drawing 9428064/1 OIL PUMP END CLEARANCE

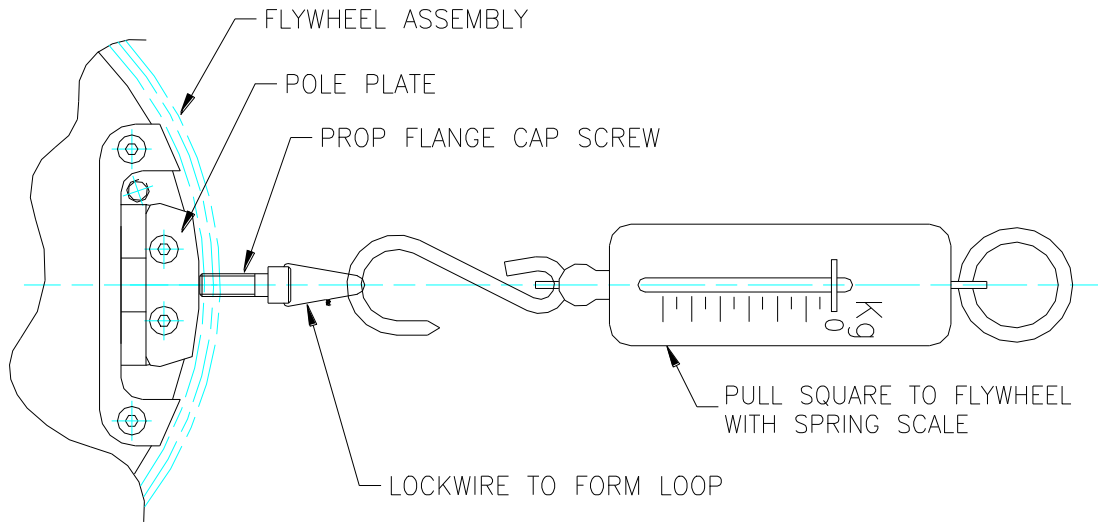
**Figure 22. Drawing 9428064 – Oil Pump End Clearance**

7.5.1.6 Sub-Assembly E – Flywheel, Ignition Coils, Alternator & Alternator Operation

**Flywheel Inspection**

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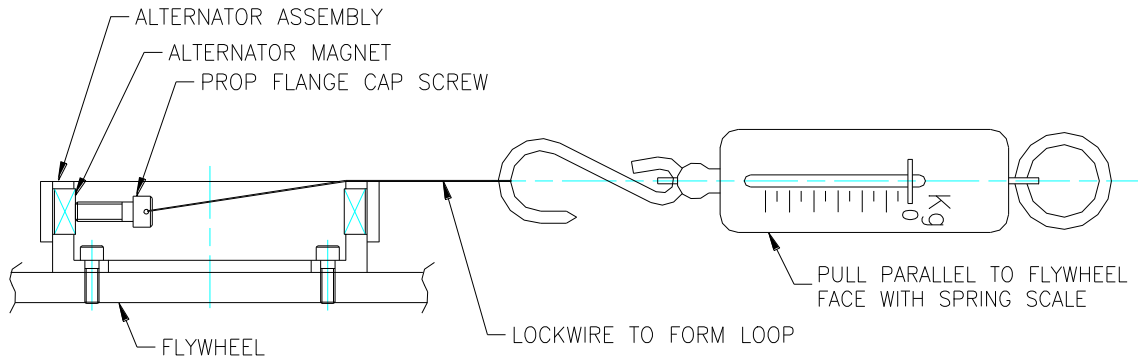
- E1 Inspect ring gear for damaged teeth
- E2 Use a spring scale and a prop cap screw as per drawing to test ignition magnet strength. Pull off should be 1.5 to 2.5 kg (3.3 to 5.5 lbs)



Drawing 9437064/1 MAGNET PULL TEST – FLYWHEEL

**Figure 23. Drawing 9437064 – Magnet Pull Test Flywheel**

- E3 Use spring scale and prop cap screw as in E2 to test alternator magnets. Pull off should be 1.5 to 2.5 kg (3.3 to 5.5 lbs).

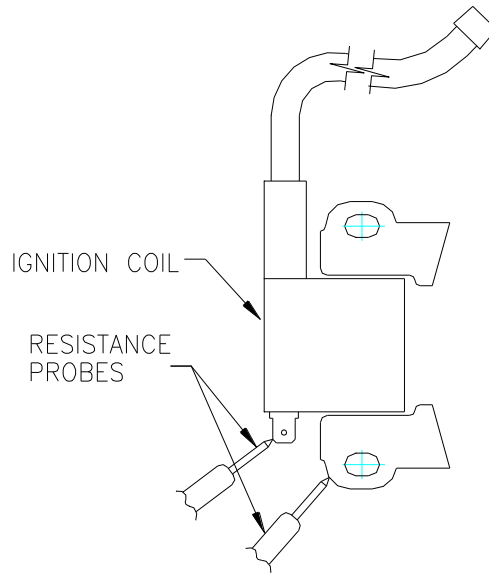


Drawing 9438064/1 MAGNET PULL TEST – ALTERNATOR

**Figure 24. Drawing 9438064 – Magnet Pull Test Alternator**

**Ignition Coil Inspection**

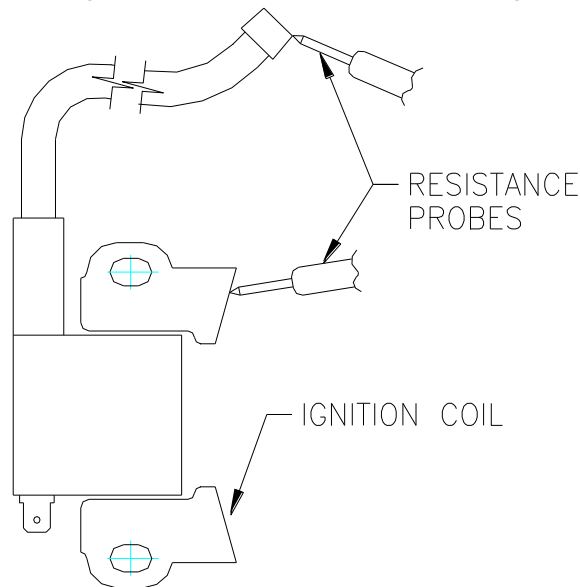
- E4 1. Using a multimeter measure the primary resistance (from the earth terminal to the iron core). It should be 0.8 Ω to 1.0 Ω.



Drawing 9439064/1 IGNITION PRIMARY RESISTANCE

**Figure 25. Drawing 9439064 – Ignition Primary Resistance**

2. Measure the secondary resistance (from the high tension lead to the iron core) it should be between 5.9 KΩ to 7.1 KΩ.



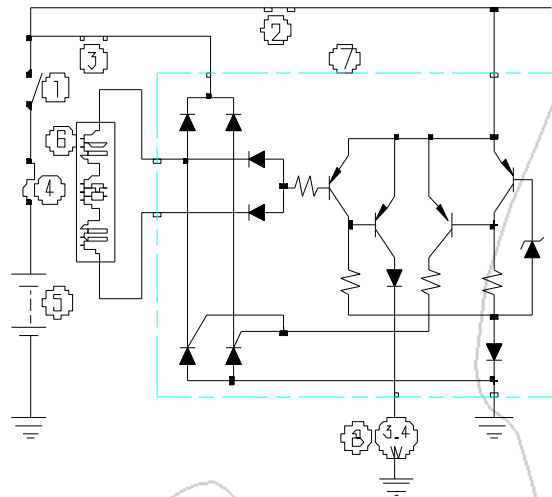
Drawing 9439064/1 IGNITION SECONDARY RESISTANCE

**Figure 26. – Ignition Secondary Resistance**

**Alternator Inspection**

- E5
1. Use multimeter to test resistance of windings. Resistance should be 0.2Ω to 0.3 Ω.
  2. Use multi meter to test resistance to ground. Resistance should be infinite

7.5.1.7 Permanent Magnet Alternator (PMA) Operation



**Figure 27 – Alternator Circuit Diagram**

- (1) Master Switch      (3) Main Bus Bar      (5) Battery      (7) Regulator  
 (2) Voltage Reference Line      (4) Fusible Link      (6) Permanent Magnet Alternator      (8) Charge Lamp

- The charging system supplies electrical devices and also charges the battery while the engine runs. It consists of a Permanent Magnet Alternator (PMA) and a Regulator.
- This permanent magnet alternator (PMA) is a 12 pole rotating magnet type generator. It is a simple construction consisting of a stator and rotor. The rotor is made up of twelve permanent magnets, alternator body and magnet retainer mounted on the flywheel.
- The stator has twelve poles with coils and is mounted on the rear plate. The stator goes inside the rotor.
- Coils are installed with heat insulating washers. The coils are positioned such that the coil output leads follow direction of prop rotation. Coils are set at a gap of between .010” - .012”



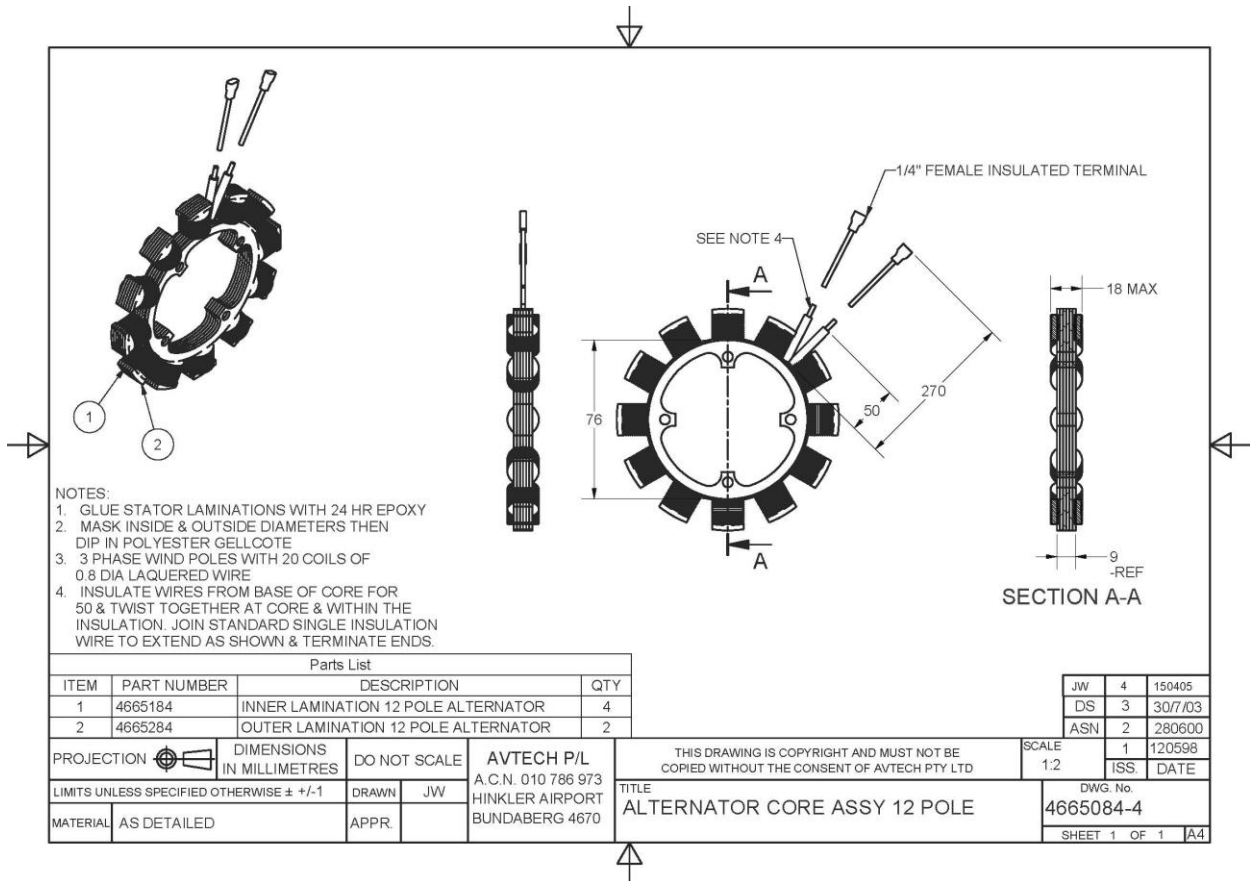


Figure 28. – Alternator Core Assy

7.5.1.8 Regulator

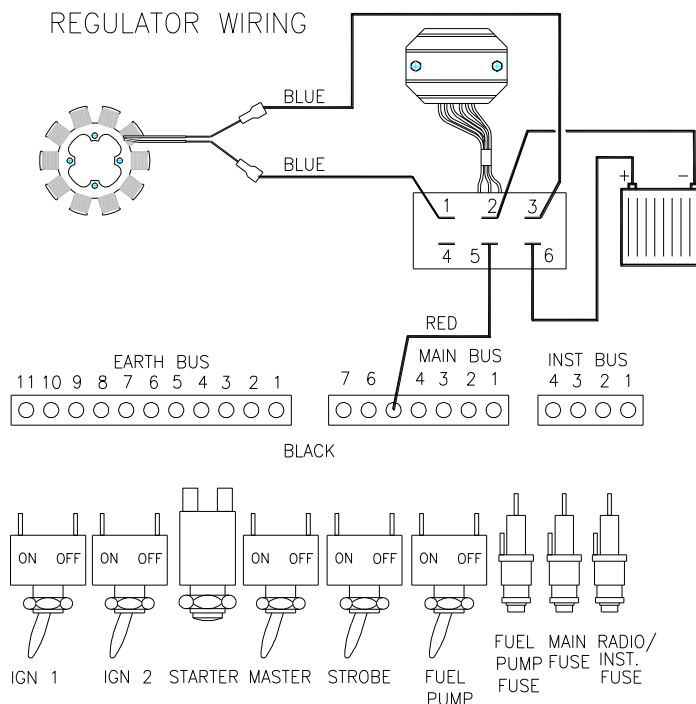


Figure 29. Regulator Wiring



- The regulator performs rectification and voltage regulation. The regulator converts A.C. into D.C. which flows through the power consuming circuits to the battery, maintaining battery charge.
- If the battery voltage exceeds a certain level, the D.C. is cut off from the charging circuit to prevent over charging. An isolating switch or fuse could be used.
- For best results it is recommended that positive and negative of the regulator go directly to the battery.

7.5.1.9 Sub-Assembly F - Gear Case

- F1 Remove distributor shaft seals and rotor seal and discard.
- F2 Inspect Distributor shaft posts for signs of leaking.  
*Note: If there is no signs of leaking there is no need to disassemble. If it is leaking, disassemble and clean off old master gasket. Inspect surfaces and reassemble.*
- F3 Clean gear case distributor shaft and gear case cover
- F4 Measure distributor shafts and record on build sheet.
- F5 Fit distributor shafts into bearings in gearcase and use a feeler gauge to measure end float to retaining circlip. Record in build sheet.
- F6 Visually inspect gears for wear.
- F7 Fit seals to gear case. Use suitable seal lubricant.
- F8 Lube shafts and fit to gear case
- F9 Fit rotors, rotors are glued to shafts.
- F10 Clean and inspect gearcase sealing faces and check for damaged threads.
- F11 Seal up and store for final assembly.

7.5.1.10 Sub-Assembly G - Fuel Pump, Carburetor and Carburetor Operation

• **Fuel Pump**

The fuel pump on the 5100 engine is replaced as a complete unit at overhaul. It can be inspected for faults by removing the top half.

- Things to look for are:
- 1) Stuck or leaking valves
  - 2) Torn diaphragm
  - 3) Weak springs
  - 4) Broken actuating lever.

• **Carburetor Operation**



The BING constant depression carburettor type 94/40 comprises a cross draught butterfly-valve carburettor with variable choke tube, double-float system arranged centrally below the carburettor venturi and a rotary-valve type starting carburettor. It features a throttle slide which is suspended from a roller diaphragm and projects into the venturi. It changes the smallest cross-section ("choke tube") of the venturi as a function of the vacuum at this point.

Throttle valve diameter is 42mm

- **Carburetor Mounting**

The carburettor is secured to the engine using a 52mm diameter push-on connection, which takes a flexible connecting piece with clamps. On the intake side the carburettor is provided with a stub having a diameter of 55mm and a length of 12mm for connecting an air filter or intake silencer.

- **Fuel Intake Control**

The float (40) of the carburettor consists of two plastic float elements joined by a metal hinge. The float is arranged centrally below the carburettor choke tube so that the carburettor can be tilted in all directions without impairing operation. The object of the float is to maintain the fuel level in the float chamber (44) constant. When the fuel has reached a specified level in the float chamber, then the float (40) mounted on pin (41) is lifted until the float needle (42) is pressed against the seat of the float needle valve, thus preventing any further supply of fuel. When the engine draws in fuel from the carburettor, the level in the float chamber (44) drops and so does the float. The float needle then opens the valve again and allows fuel to flow in from the tank. The float needle valve regulates the fuel supply in conjunction with the float but it does not act as a stop valve when the engine is at a standstill. Minute foreign bodies may be deposited between valve seat and needle tip, thus preventing complete closure of the valve. When stopping the engine, therefore, the fuel cock on the tank should always be closed. In addition the fuel should be filtered before it reaches the carburettor. The filter should be selected so that foreign bodies greater than 0.1mm are filtered out and the fuel supply is not impeded to too great an extent.

The float needle (42) contains a spring-loaded plunger, which contacts the float hinge. This absorbs vibrations on the float (40). In addition the float needle (42) is connected to the float hinge by the retaining spring (43) to prevent it from moving between float and valve seat and thus reducing the fuel supply. Spring and retaining guide make a considerable contribution towards keeping the fuel level in the float chamber constant.

When fitting a new float, the fuel level must be adjusted. When doing this care must be taken to ensure that the fuel needle spring is not compressed by the float weight. It is therefore advisable to put the carburettor in a horizontal position until the float just contacts the float needle. In this position the point on the float hinge is set in such a way that the float top edges are parallel to the top edge of the float chamber.

The float chamber (44) is secured to the carburettor housing by a spring yoke (45). A seal (46) is provided between float chamber and carburettor housing. The space above the fuel level is connected to atmosphere by two ducts. When these ducts are blocked, an air



cushion forms above the fuel. The fuel will not lift the float sufficiently to close the needle valve and the carburettor overflows.

The float chamber (44) incorporates an overflow pipe to allow fuel to drain off if the specified level in the float chamber is exceeded substantially due to a leaking needle valve.

**MAIN REGULATING SYSTEM WITH PRESSURE REGULATOR**

The amount of mixture drawn in by the engine and thus its performance is determined by the cross-sectional area in the choke tube, which is opened by the throttle valve (23). The throttle valve is secured to the valve shaft (24) by two screws (25). The end projecting from the carburettor housing carries the throttle levers (27) + (28) which are secured by the nut (3) and washer (29) to which the Bowden cable operating the throttle shaft is attached. The sealing ring (26) provides the seal between valve shaft and housing. The retaining arm (31) attached to the carburettor housing by means of screws (32) and washers (33) engages the notch in the valve shaft and thus prevents it from moving in axial direction. The return spring (35) whose action opposes the Bowden cable is attached between a bent-over tab at the lower end of the retaining arm and the throttle lever (28). If the throttle valve (23) is opened while the engine is running, the increased air flow in the choke tube results in a vacuum building up at the outlet of the needle jet (3) which draws fuel from the float chamber through the jet system. At low speeds and in particular in the case of four-stroke engines, this vacuum is not sufficient for an adequate fuel supply; it must therefore be increased artificially by using a pressure regulator. For this purpose the BING constant depression carburettor type 94 is provided with a plunger (13) operating in conjunction with a diaphragm (16); which reduces the cross-sectional area of the needle jet outlet by virtue of its own weight or, in some applications with the additional pressure from a spring (22), and thus increases air velocity and vacuum at this point.

The plunger (13) is located centrally in the cover (20) which is secured to the carburettor housing by screws (21). The diaphragm (16) is connected to the plunger (13) by a retaining ring (17) and four screws (18) and washers (19) each. The vacuum in the choke tube acts on the top of the diaphragm and the plunger via a bore (U) in the plunger (13) and attempts to lift the plunger against its own weight and spring (22). The considerably lower vacuum between air filter and carburettor is applied to the underside of the diaphragm via duct (V) as a reference pressure.

If the throttle valve (23) is opened when the plunger (13) is closed, then a vacuum will build up in the small cross-section at the bottom of the plunger (13) which is sufficient to provide a supply of fuel. The weight of the plunger (13) and the force of the spring (22) are matched in such a way that this vacuum will be maintained with increasing speed until the plunger has fully opened the carburettor cross-section. From this point onwards the carburettor acts as a throttle valve carburettor with fixed choke tube. The vacuum increases with increasing speed.

The space in the cover (20) above the plunger guide is vented through bore (D). Its diameter is designed in such a way that it acts as a restrictor for air flowing in and out and therefore acts as a vibration damper for the plunger.



On its way from the float chamber to the choke tube the fuel passes through the main jet (1), the jet carrier (10) and the needle jet (3); as it leaves the needle jet it is pre-mixed with air which is brought in from the air filter via an air duct (Z) and the atomiser (2) in an annular flow around the needle jet. This airflow assists the atomising process to form minute fuel droplets and thus favorably affects the fuel distribution in the intake manifold and combustion in the engine.

The conical section of the jet needle (4) that is secured to the plunger (13) with the retaining spring (14) and the serrated washer (15) engages into the needle jet (3). Depending on the dimension of the flat cone at the end of the jet needle, the annular gap between jet needle and needle jet is enlarged or decreased and thus the fuel supply is throttled to a lesser or greater extent. The jet needle (4) can be located in the plunger (13) in four different positions, which similarly to the jet needle cone, affect the amount of fuel drawn in. For example "needle position 3" means that the jet needle has been suspended from the retaining spring (14) with the third notch from the top. To achieve the height adjustment the jet needle is turned through 90° and pushed up or down, the retaining spring engaging the next notch in the jet needle. If the needle is suspended higher up, this will result in a richer mixture and vice versa.

In short the main regulating system is set using main jets and needle jets of various diameters and also jet needles, plungers and pistons of various types.

Between main jet (1) and nozzle stock (10) a washer (12) is provided which, together with the float chamber, forms an annular gap. In particularly severe operating conditions this ensures that the fuel is not spun away from the main jet.

A rubber ring (11) seals the nozzle stock (10) off from the carburettor housing to avoid any fuel being drawn in via the thread and thus bypassing the main jet.

### IDLING SYSTEM

During idling and low-load running the throttle valve (23) is closed to such an extent that the airflow underneath the plunger (13) no longer forms a sufficient vacuum. The fuel is then supplied via an auxiliary system, the idling system, which consists of the idling jet (5), the idling air jet (LLD) - no spare part - and the mixture control screw (7) which is sealed off against the carburettor housing by the rubber ring (9) and secured by spring (8) to prevent it from becoming slack. The fuel passes through the idling jet (5) whose bore will determine the amount of fuel. Behind the jet bore the fuel mixes with air which is supplied via cross ducts in the jet throat from the idling air channel, the amount of air admitted being determined by the size of the idling air jet at the inlet of this duct. This initial mixture then flows through the idling outlet bore (LA), the cross-sectional area of which can be adjusted by the mixture control screw (7); it then reaches the choke tube via bypass or transition passages (BP) where it is mixed further with pure air.

Idling should always be with the engine at operating temperature. First the mixture control screw (7) is turned fully clockwise and then backed off by the number of turns specified for the particular engine. Turning in clockwise direction results in a leaner mixture and turning in anti-clockwise direction in a richer mixture.

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The idling setting quoted serves as a guide only. The optimum will generally differ slightly. First select the desired idling speed by using the idling stop screw (34). When subsequently adjusting the mixture control screw - starting from the basic setting - a speed drop will be noticed in both directions. The optimum setting will generally be found half-way between the two settings at which this speed drop was noticed.

To facilitate the idling setting on engines having several carburettors where it is important that they are evenly adjusted, it is possible to connect a pressure gauge (in the simplest case a "U-tube pressure gauge") to a nipple below the throttle valve shaft bearing point, which is normally closed off by screw (39). To select the idling speed, the idling screw (34) is in this case adjusted until the same vacuum is indicated for all carburettors. By slightly opening the throttle valve via a turning handle or the accelerator it is also possible to adjust Bowden cables or linkages evenly by making this vacuum comparison.

### STARTING CARBURETTOR

BING constant depression carburettor is provided with a rotary valve starting carburettor as an aid for starting a cold engine using a Bowden cable. A disc (47) resting against the carburettor housing is turned via a shaft in the starting carburettor housing (48) so that the starting carburettor chamber into which air enters from the air filter side of the carburettor is connected to the engine side of the carburettor via a duct. The airport in the disc (47) is shaped in such a way that depending on the disc position, more or less air is drawn in. At the same time the disc opens the fuel system of the starting carburettor via bores matched to the disc position. The fuel flows from the float chamber through the starting jet into the vented starting chamber also contained in the float chamber (44) and from there through a riser where it is pre-mixed with air via transverse bores, into the starting carburettor. There it forms a particularly rich mixture with the air drawn in, and this mixture bypasses the main carburettor to flow into the intake manifold of the engine direct. **During starting the throttle valve has to be closed to make sufficient vacuum available for the starting carburettor.** When the engine is at a standstill and also during normal operation the fuel level in the float chamber compartment incorporating the riser will be the same as in the rest of the float chamber. When starting with opened-up starting carburettor, the fuel will initially be drawn in from this compartment, which forms a very rich mixture. The fuel supplied subsequently will only be the amount allowed through by the starting jet. This ensures that, once the engine has started, it is not supplied with an excessively rich mixture and stalled. The starting carburettor is therefore matched to any given engine by modifying the starting jet and matching the space behind it.

The starting carburettor is secured to the carburettor housing by four screws (51) and protected against ingress of dirt and water by the seal (50) between the two. The starting shaft is also sealed against the starting carburettor housing by a rubber ring (49).

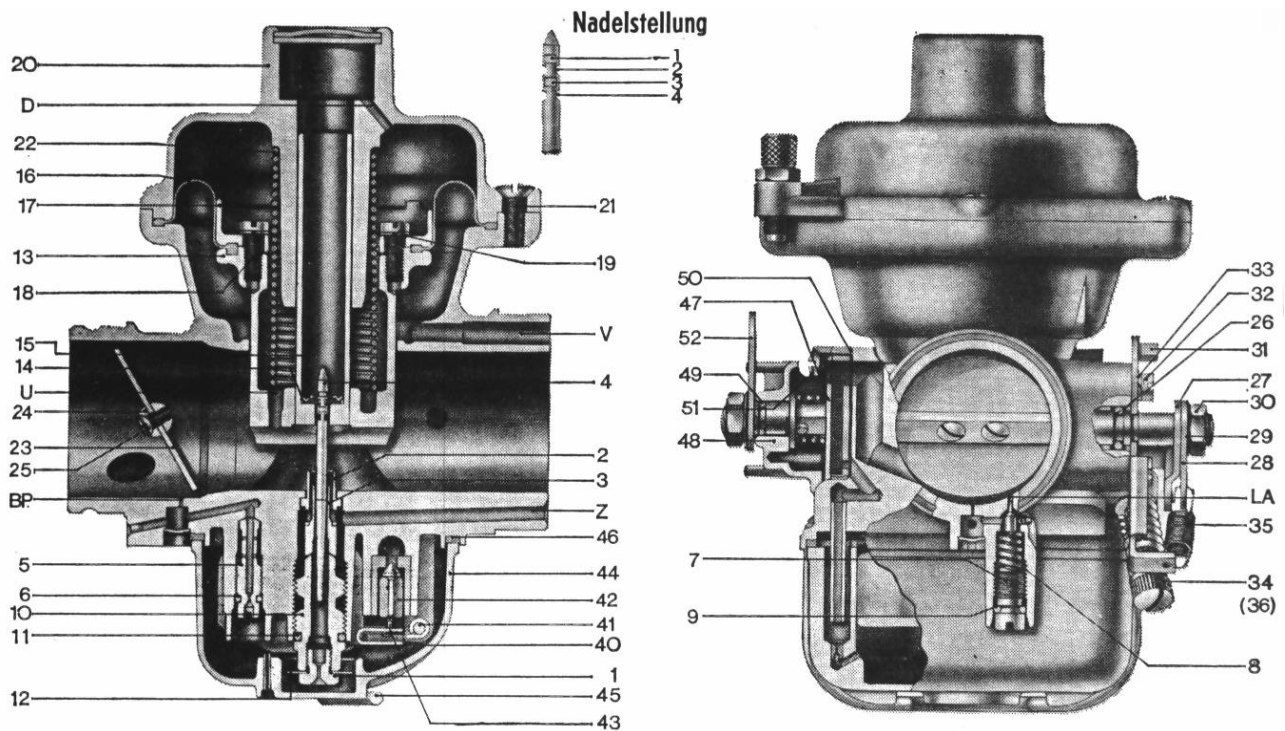


Figure 30 – Carburettor Details

**Carburettor Overhaul**

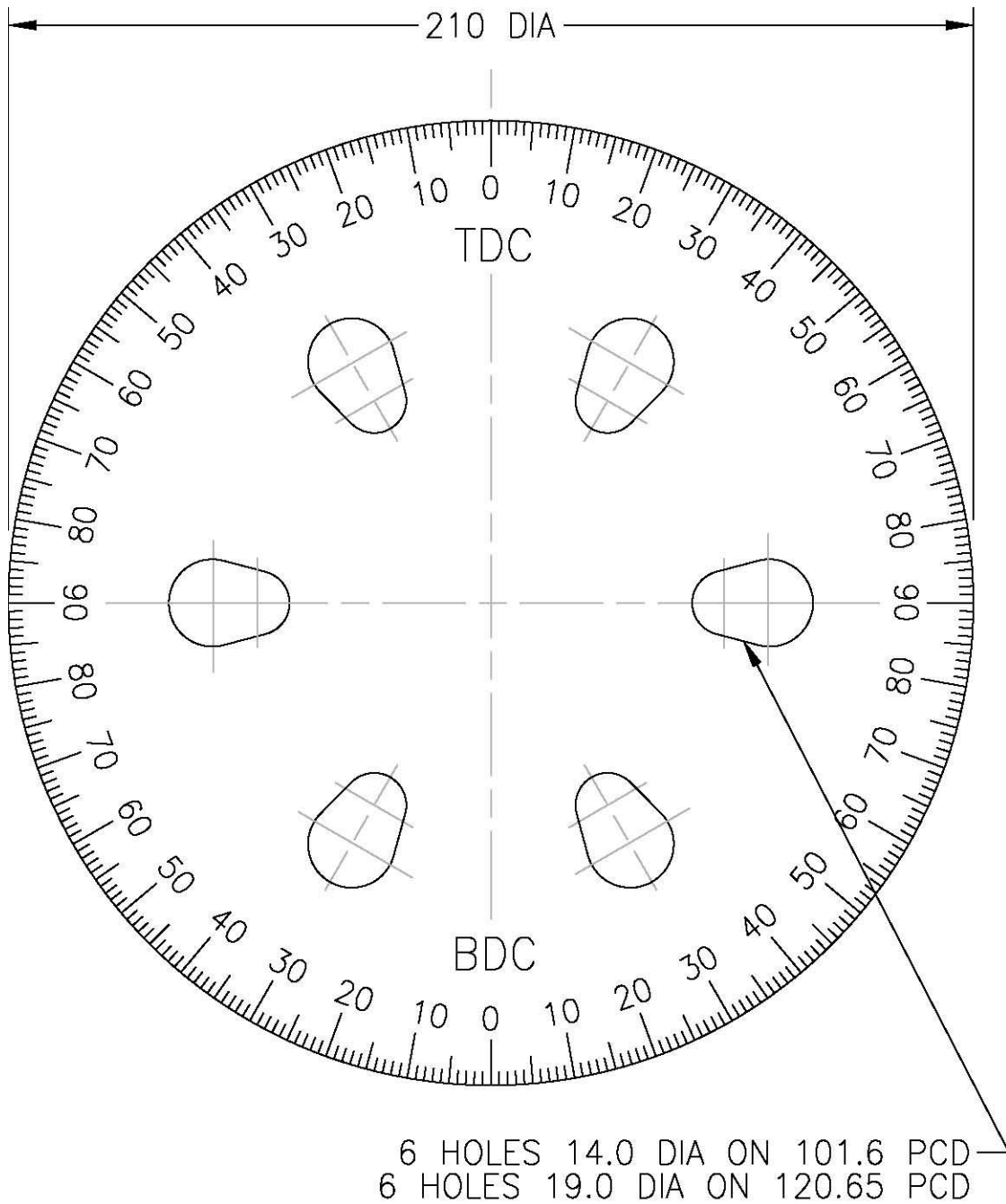
*Note: As a guide to overhaul read carburetor operation*

- G1 Disassemble carburettor
- G2 Using over haul kit replace all components
- G3 Record jet size
- G4 Record needle position
- G5 Reassemble carburettor

7.5.1.11 Sub-Assembly H - Final Assembly

**Crankcase Joining**

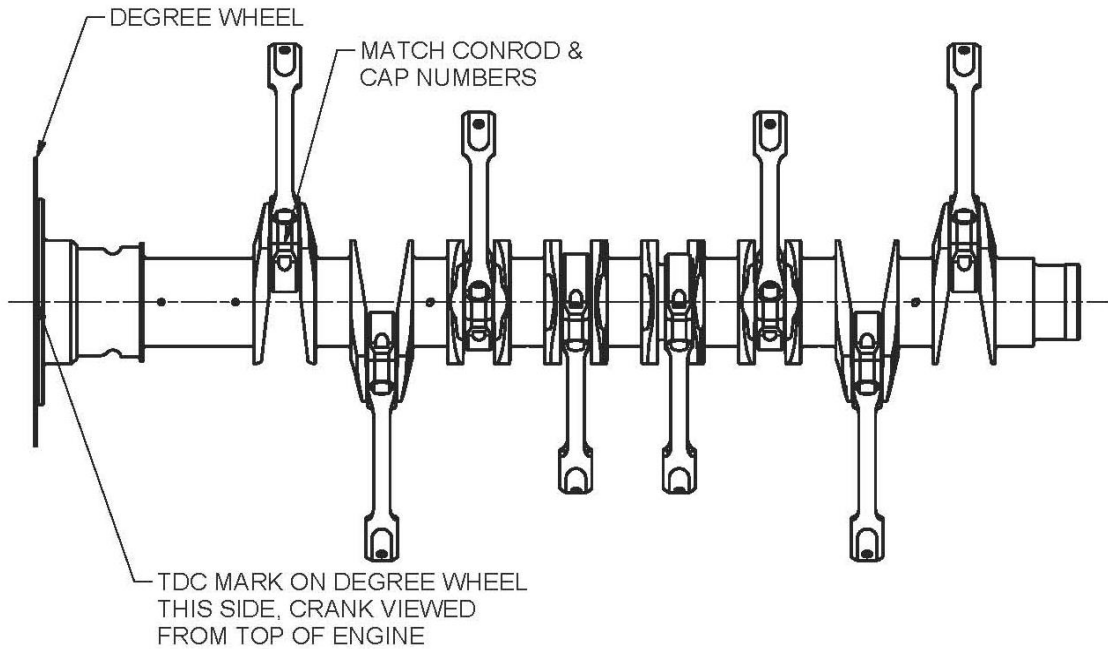
- H1 1. Photocopy Degree Wheel and glue to stiff cardboard with prop flange holes cut out.



Drawing 9427063 DEGREE WHEEL

**Figure 31. Drawing 9427063 – Degree Wheel**





**Figure 32. Drawing 4A472A0D – Crank & Rod Assembly**

2. Stand crankshaft (Sub assembly A) up vertically, mounted on the prop flange.
3. Apply Loctite 515 to left side of the crankcase

H2

1. Fit cam shaft to left side
2. Inspect

3. You will need

- 1) Bearing shells in position
- 2) Loctite on all sealing faces
- 3) O Rings in
- 4) Piston/Cylinder Assembly complete
- 5) Thrust washers in position
- 6) Dowels in
- 7) Valve Lifters inserted in both halves

- 1) An extra person
- 2) 4 7/16 Ring Open End spanners
- 3) 2 9/16 Ring Open End spanners
- 4) 2 3/8 Plain grade 5 nuts
- 5) 2 3/8 Belleville Washers
- 6) 36 through stud nuts (MS21042L6)
- 7) 16 through studs
- 8) Torque wench
- 9) 7/16 x 3/8 drive 2" extension
- 10) Long Nose Pliers

*Note: An extra person makes it easier to bolt up and also can cross check work.*



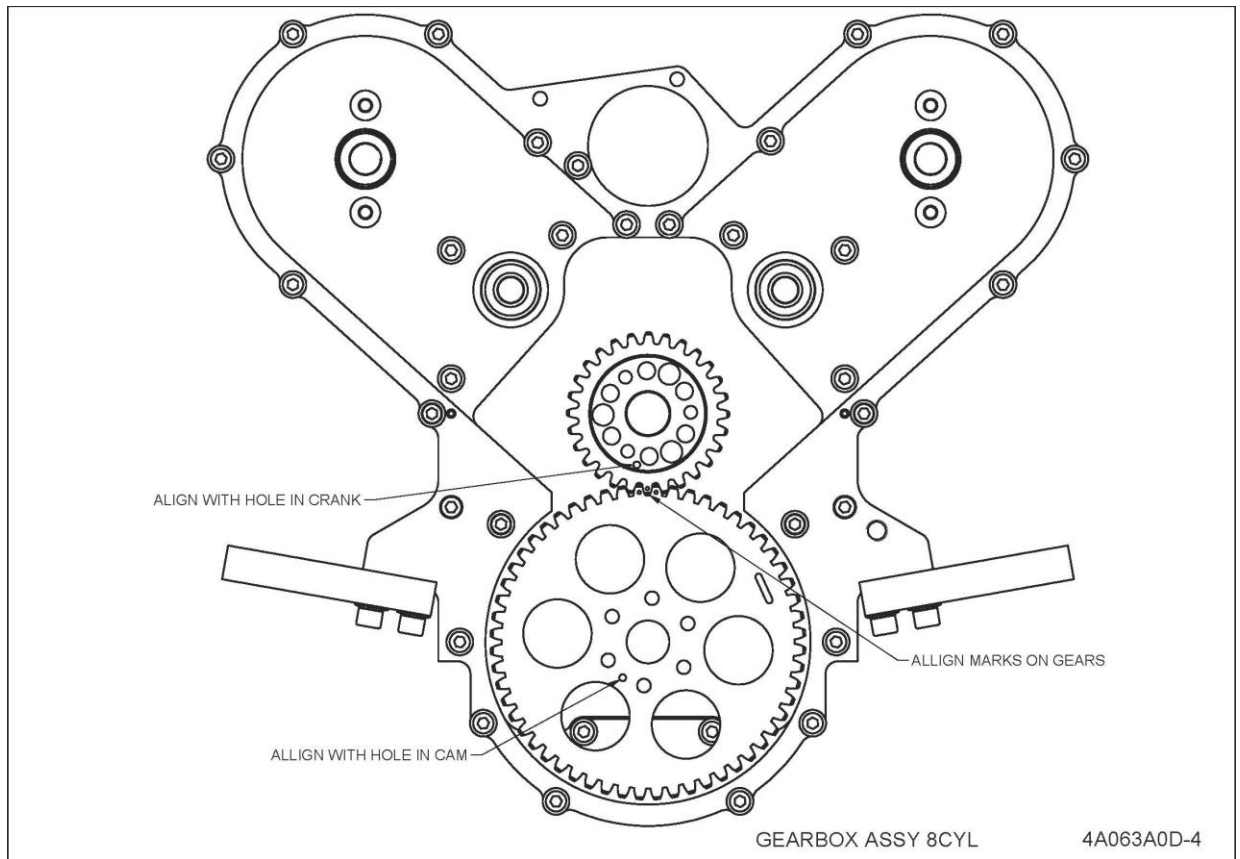
- H3
  1. Stage Inspection
  2. Oil all bearings, crank and camshaft
  3. Fit halves over crankshaft assembly and squeeze up by hand
  
- H4
  1. Using spacers and plain nuts on rear studs and belleville washers and MS21042L6 nuts on the front studs pull the crankcase together (but don't do up tight)
  2. Remove rear nuts
  
- H5
 

Put all through studs in
  
- H6
  1. Fit piston/cylinder assemblies to No. 1, 2, 7, & 8 conrods
  2. Fit circlips cross check circlips for correct fit. Push cylinders home.
  3. Put cylinder base nuts (MS21042L6) on. Do up both sides at the same time using 2 7/16 ring spanners. If one nut goes on more than 3 turns put the 3/8 plain nut on top of it and use a 9/16 ring spanner to hold the nut, locking up the stud. Torque up by hand lightly.
  4. Turn engine 1/4 turn so No. 3 & 6 conrods are out, repeat procedure on No. 3 & 6.
  5. Turn engine 1/2 turn so No 4 & 5 conrods are out, repeat procedure on 4 & 5.
  
- H7
  1. Torque to 15 ft lbs then 30 ft lbs.  
*Note: Keep an eye on the amount of thread through each nut. Both sides should have approx 2 turns protruding.*
  2. Put anti sabotage paint on nuts (to show if nuts move).

**STAGE INSPECTION**

**Camshaft Timing**

- H8
  1. Fit crankshaft gear aligned with cam gear as shown in Fig 33 and put one bolt in crankshaft to hold gear



**Figure 33. Drawing 4A063A0D – Timing Gear Alignment**

*Note: Timing marks on cam gear are on 2 teeth. Crankgear marked on one tooth.*



2. Mount a dial indicator on cylinder with the plunger on the center of the piston.
3. Zero the indicator at T.D.C.
4. Fix a wire pointer of the oil seal bolt hole and roughly set to T.D.C.
5. Turn 1/4 turn backwards then forward until the piston is 2mm from T.D.C. Note degrees.
6. Turn past T.D.C. to 2mm down from T.D.C. Note degrees.

Add two together then divide by 2 and set pointer at this (with piston down 2mm)

*Note: The crank is mounted to turn the engine in direction of rotation. Turn crankcase anti clockwise when viewed from rear.*

7. Repeat again to check.

*Note: It is important to find T.D.C. accurately as it is the datum for setting the cam timing and ignition timing.*

8. Set dial indicator up to measure lift on No. 1 exhaust. Set to 0 on max lift.
9. Turn 1/4 turn backwards then turn until 0.5mm (0.020") from peak. note degrees, continue turning until 0.5mm (0.020") after peak.

*Note: Always turn in direction of rotation to eliminate back lash in gears.*

10. Calculate total degrees and divide by 2 to find peak. Peak should be 70°-72° after B.D.C.

### Head Fitting

- H9
1. Ensure
    - \* All O Rings are in place and greased
    - \* Have all head bolts
    - \* Push rod tubes
    - \* Push Rods
    - \* Loctite 515
    - \* Loctite 243
  2. Fit heads by hand.
  3. Fit O-rings to crankcase.
  4. Push the push rod tube through the head and all the way home and fit circlips.
 

*Note: Make sure outside of tubes are smooth or it will damage the O-Rings*
  5. Oil Push rods and fit.
 

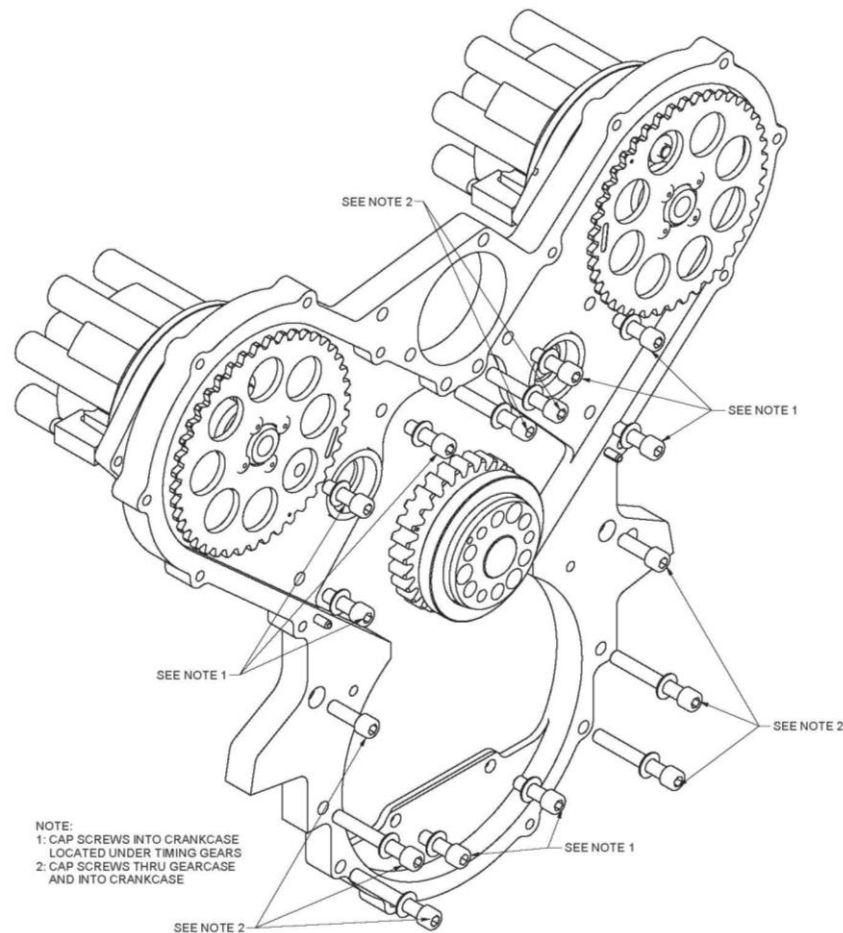
*Note: Make sure ball end of push rod is in the socket of the lifter. It also helps if the lifter is on the base circle of the lobe.*
  6. Put loctite 243 on rocker shaft cap screw and torque to 8 ft lbs after fitting rockers.
  7. Torque head bolts to 16 nm then 32 nm (12 ft lbs then 24 ft lbs).

### Sump and Induction

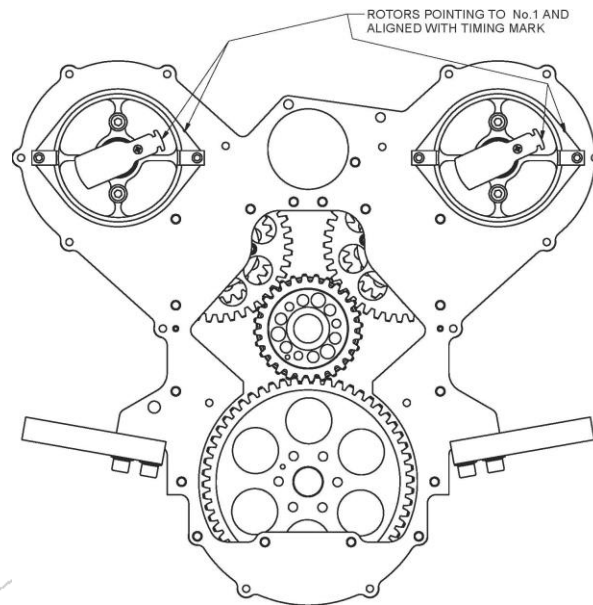
- H10
1. Fit sump using loctite 515 on faces and loctite 243 on threads.

**Gear Case**

- H11 1. Ensure
- \* Gear case is fitted up
  - \* Rear plate & gearbox cover are ready
  - \* All bolts are ready
  - \* Loctite 515
  - \* Loctite 242
  - \* Loctite 620
2. Turn engine around until it is 25° B.T.D.C. No. 1 compression
3. Put loctite 515 on crankcase. Fit rear gearbox mount plate. Make sure 4 inside cap screws are in. Use loctite 242 on all cap screws.
4. Put loctite on gear case & point rotors to No. 1 Position.
- Note: It is recommended that rotors are attached with small amount of silastic or 5 minute araldite/flox mix. This will prevent them from loosening. This still allows rotors to be removed when necessary.*



**Figure 34. Drawing 4A063A0D – Gearcase Through Bolts**



**Figure 35. Drawing 9431064 – Gearbox & Distributor Rotors**

*Note: When gear case cover goes on*

1) *Make sure No. 1 is 25° before T.D.C. compression. Both valves should be seated.*

2) *The rotors point to the No. 1 position on the rotor caps. Fit cap screws with loctite 242 and torque.*

3) *Check socket head screws clear front of timing idler gear assemblies*

H12 1. *Fit flywheel with the magnets horizontal (they then should line up with the coils). Note: The small hole in the flywheel will line up with the hole in the crankshaft. Fit dowels and then apply loctite 620 on new flywheel cap screws and torque to 24 nm (18 ft lbs).*

2. *Fit coil mount posts and alternator mount.*

3. *Fit coils and set gap to 0.25mm (0.010")*

*Note: A strip of 0.25mm (0.010") card is best because it is not magnetic. Coil direction lead follows prop rotation.*

H13 *Fit Carburettor assemblies*

*Note: It is very important to make sure hose clamp is at the outside end of coupling, the coupling and carby are free of oil and the carburettor goes fully into coupling, clamp is of 10mm wide stainless type.*

H14 *Fit Fuel Pump Assembly*

*Note: Use loctite 242 on cap screws. Use molybdenum disulphide grease on push rod*

## Oil Pump



- H15
1. Put loctite 515 on back face of oil pump backing plate and fit.
  2. Fit woodruff key
  3. Fit inner gear to camshaft.
  4. Fit outer gear to housing and fill with oil.
  5. Fit O Ring
  6. Fit Oil pump housing. Use loctite 242 on cap screws.
- Note: Before torquing up, rotate engine carefully to ensure oil pump is not binding. If oil pump binds it can shear the end of camshaft.*
- H16 Fit exhaust system. The muffler stubs slip over the exhaust stubs in the head and springs are used to retain the muffler.

### Front Seal & Prop Flange

- H17 **CAUTION:** This is a critical operation in the process of assembling the engine and must be only carried out by a suitably qualified competent person, with suitable calibrated tools.
1. Remove from vertical stand and mount on engine mount stand
  2. Remove prop flange.
  3. Clean oil from sealing surfaces of front seal.
  4. Fit seal to seal housing.
  5. Apply Loctite 515 on crankshaft seal housing - crank face joint. Put a little grease on seal lip and install seal and seal housing assembly to crankcase. Apply Loctite to cap screws and torque to 20Nm (15 ft lbs)
  6. Before fitting the prop flange check that the screws protrude through the prop flange by 11 - 12 mm for correct engagement in the crankshaft. The screws used to fit the original flange may be re-used provided they are the correct length and are not visibly damaged. If the screws are replaced then high-strength cap screws must be used – “Unbrako 1960” type or equivalent.
  7. Visually inspect the front face of the crankshaft and the mating face of the propeller flange are clean, free from burrs, rust and defects and fit together with minimal radial clearance.
  8. If the screws are to be re-used their threads must be cleaned with a wire brush and primed with Loctite 7471 activator and allowed to air dry.
  9. The crankshaft threads must be cleaned using a 3/8” UNF tap to remove leftover retaining compound in the threads. Care must be taken to not cross-thread the tap as it will damage the thread in the crankshaft. Blow out the holes using dry compressed air and prime with Loctite 7471 activator and air dry.
  10. Apply a small amount – approximately the size of a large match head – of Loctite 620 retaining compound to the flange screws and threads in the crankshaft. Fit the flange to the crankshaft & fit the screws by hand, then tension the screws using a calibrated torque wrench immediately. Tension the screws in a standard diagonal tightening pattern. Torque all screws first to 27 Nm (20 lb.ft), then all to 34 Nm (25 lb.ft), and finally all to 40 Nm (30 lb.ft). This operation must be done in one

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session so the Loctite does not cure before the final torque is applied to the cap screws.

**CAUTION**

**Over-tightening propeller flange screws can damage the screws and/or the crankshaft. Ensure torque wrench is properly calibrated & do not over-tension screws**

- 11. Lock-wire screws in pairs if a standard prop flange is used. Note: Where prop flange extensions are used the cap screws are not lock wired.
- 12. Allow the retaining compound time to cure (refer to manufacturer specifications) before starting the engine.

**CAUTION**

**If for any reason prop flange or prop has been damaged rear flywheel cap screws must be replaced.**

7.5.1.12 Engine Run In

When built, the Jabiru engine is run in on a Dynamometer and cooled with fan driven air. In the absence of a Dynamometer controlled run, engines can be run-in in the airframe. Very large air ducts must be constructed to get adequate airflow for cooling in the static situation. The flying air ducts must not be used for this purpose. Extreme care must be taken with the cylinder head temperatures if run in is done in the airframe. Engine run in procedure allows progressive build up of the B.M.E.P. (break mean effective pressure) in the cylinders while carefully limiting the heat build up. In essence short periods of hard work; increasing in intensity while limiting the heat build up is the format. The run-in schedule is detailed in section 10.1. **All engines are run in before delivery - including overhauled engines. When delivered they are ready for flight.**

Run Procedure to be used only if engine has not been run-in.

- i) Mount Engine on test rig.
- ii) Fill with non-detergent oil.
- iii) Remove spark plugs and wind over until oil pressure is reached.
- iv) Fit plugs and cooling ducts.
- v) Run in. Follow run in program, section 10.1.
- vi) Cool down (at least 12 hours)
- vii) Retorque heads
- viii) Rerun
- ix) Check leak down

*Note: There is a run-in checklist to fill out in section 10.*

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## 7.6 Engine Installation

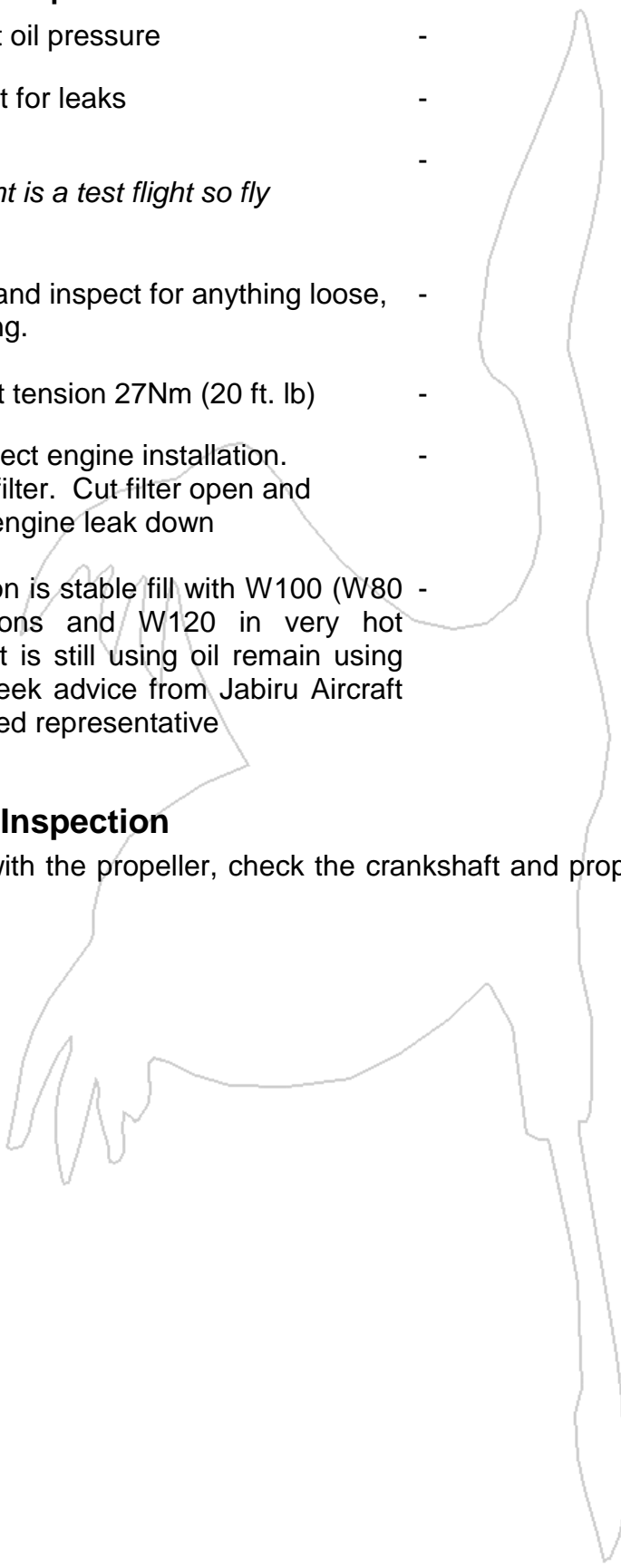
No.	Operation	Tools Required
1	Fit engine to engine mount	-
2	Torque engine mount bolts	7/16 Tube Socket 7/16 Ring Open End Spanner
3	Fit muffler (if not already fitted) and fit carburettor heat muff and hose	3/16 Ball End Allen Key
4	Connect left and right ignition coils leads	-
5	Connect Tacho sender	-
6	Connect exhaust gas temp (if fitted)	-
7	Connect cylinder head temperature 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 oil level. Fill if needed.	5.5L (5.8 US quarts)

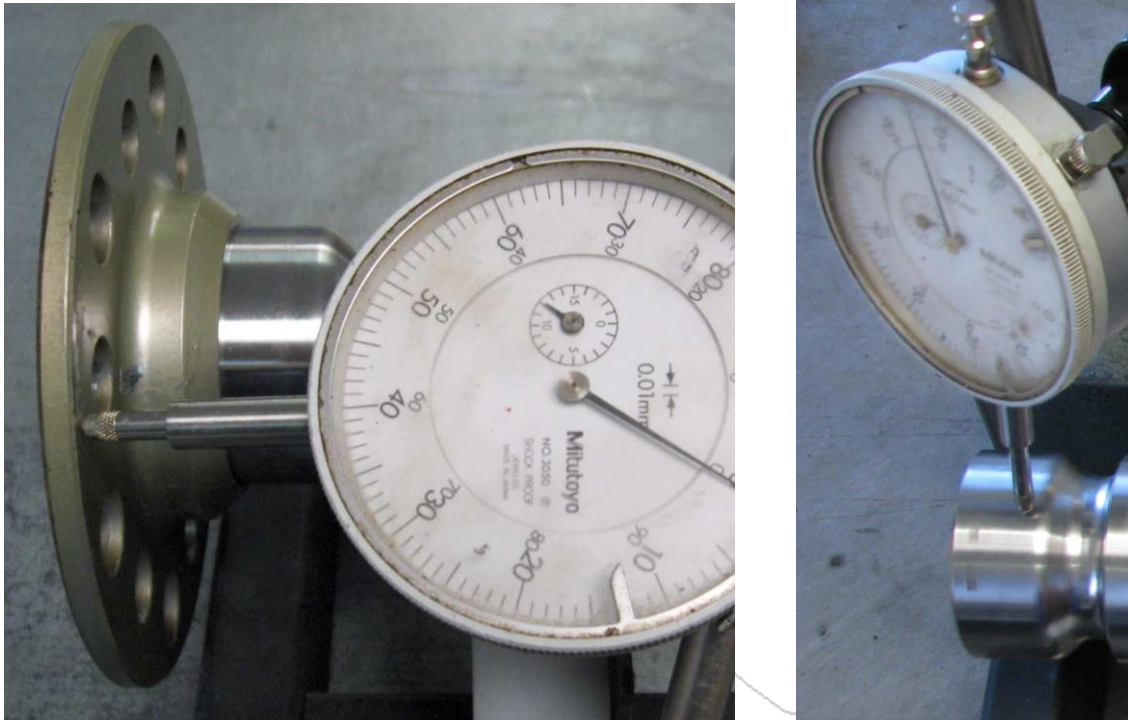


No.	Operation	Tools Required
22	Wind over to get oil pressure	-
23	Start and inspect for leaks	-
24	Test Fly <i>Note: First flight is a test flight so fly conservatively</i>	-
25	Remove Cowls and inspect for anything loose, rubbing or leaking.	-
26	Check Head bolt tension 27Nm (20 ft. lb)	-
27	At 25 hours inspect engine installation. Change oil and filter. Cut filter open and inspect. Check engine leak down	-
28	If oil consumption is stable fill with W100 (W80 in cold conditions and W120 in very hot conditions). If it is still using oil remain using run in oil and seek advice from Jabiru Aircraft or local authorized representative	-

**7.7 Prop Strike Inspection**

After ground contact with the propeller, check the crankshaft and prop flange for run out as shown below.





**Figure 36 Dial Indicator Position for Crankshaft & Prop Flange Run Out**

- Remove one spark plug from each head.
- Carefully sand off paint on crank diameter and prop flange where dial indicator will be located.
- Position dial indicator onto crank as shown above and eliminate main bearing clearance by bearing down on crank when rotating. Rotate crankshaft to measure crankshaft run out, normally expect to see 0.01 - 0.03 mm, but if run out exceeds of 0.08 mm the crankshaft must be replaced.
- Position dial indicator onto prop flange as shown above, eliminate end float by either pulling or pushing flange when rotating. Rotate prop flange to measure the face run out, normally expect to see 0.02 - 0.06 mm, but if run out exceeds 0.08 mm then replace the prop flange.

**Note:**

- If the crankshaft run-out exceeds the above limit the engine has to be stripped and the crankshaft replaced.
- The flywheel retaining cap screws (6) need to be replaced after any prop strike.

Even if the above run out requirements are met and depending on the severity of the prop strike, it could be prudent that an engine strip be performed and the crankshaft MPI tested, as internal damage may have occurred and can only be revealed by stripping the engine.

The decision to run an engine after a prop strike and after carrying out the above run out checks, rests with the owner. If you have any doubt about the action to take, then consult the Jabiru factory or your Authorised Jabiru dealer for advice.

Engines running a non-Jabiru propeller (especially composite propellers), must check the tension of the 6 flywheel cap screws at each service to determine that the cap screws meet

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the torque requirement, if not, then replace the cap screws and apply Loctite to the screws on assembly.

**If an engine stoppage due to force is not recorded in the logbook and not advised to Jabiru, the liability for all subsequent and consequential damage will remain with the owner.**

This applies to both prior to and after engine overhaul. If a crankshaft has been severely stressed but measurements and MPI testing indicate a sound item it is Jabiru policy to not re-use, but replace with a new crankshaft.

## 7.8 Starter Motor Overhaul

### 7.8.1 Starter motor disassembly and inspection

- Remove clutch housing from starter housing
- Remove clutch and bendix gear assembly
- To disassemble the starter housing from the drive motor you need to remove the 2 long AN3 bolts. These bolts are loctited on assembly and will require heating with a hot air gun onto the starter housing in the area where the bolts enter the housing. If the Loctite is not heated to soften it, there is a possibility that the bolts will shear off and a new starter housing will be required.
- Clean and wash all parts in solvent except the motor. Clean the motor by wiping with a clean rag to remove dust and metal particles. Clean the commutator with a soft brush and a fast drying solvent.
- Check commutator for wear, if you are not experienced in this field then seek a suitable qualified person to check the commutator for serviceability.
- Check brushes for wear, if you are not experienced in this field then seek a suitable qualified person to check the brushes for serviceability, replace if they are less than 10 mm long.
- Check bendix gear for chipped or missing teeth, and that the clutch slides freely on the shaft, replace if necessary.
- Check the ball bearings on the motor rotor for serviceability, replace if necessary.
- Check the bushes at each end of the clutch and bendix gear for wear and replace as required, lubricate the bushes with grease.

### 7.8.2 Reassembly

- Assemble motor and starter housing, and include the earth wire, (refer to JSL 005-1 service bulletin for details if the earth wire connection was not connected to the long through bolt on the starter motor). Assemble bolts with a small amount of Loctite 242 on

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the threads of the long AN3 bolts and tighten, check that the armature is able to rotate freely after tightening bolts.

- Apply grease to the clutch gear and assemble into the starter housing, then fit the clutch housing.
- The assembly is now ready to be fitted to the engine rear plate with the 3 socket head screws and Belleville washers, torque to 20 Nm (15 ft.lbs)





## 7.9 Build Sheets and Run In Programme

Included with the build sheets are \* Pre Run Check List

\* Run In Programme

\* Post Run Checklist

Photocopy all documents and use photocopies to fill in. When complete, fax to Jabiru Aircraft so all documents can be kept up to date. This helps us provide a better service to our customers if we know what our engine is in and what has been done to it.

Fax Number Within Australia      07 4155 2669  
 Outside Australia      + 61 7 4155 2669



## 8 Notes Before Starting Engine

**Jabiru Aircraft Pty Ltd**  
5100 Air Cooled Engine

### **WARNING**

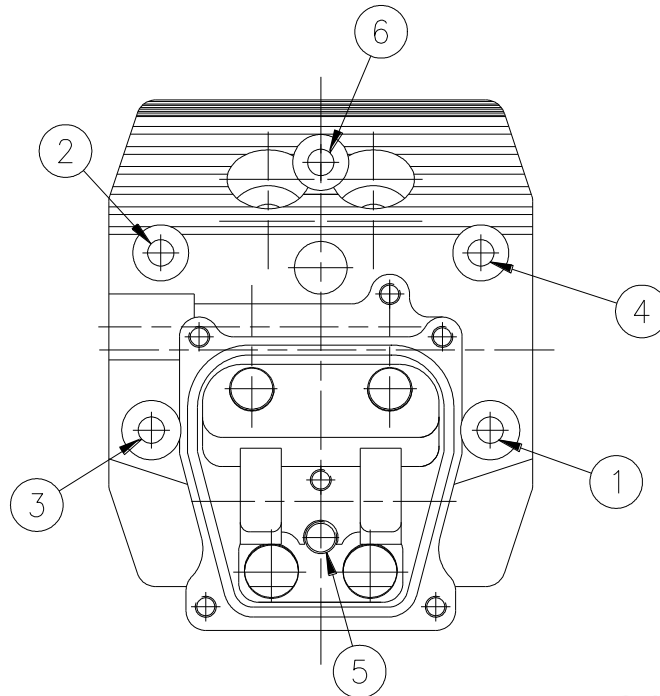
This engine has been run in and is ready for flight.

### **DO NOT GROUND RUN THIS ENGINE**

This engine has been inhibited and the oil system drained. Before first start of new engine, remove 1 spark plug from each head. Add the required run-in oil to sump (5.5 litres), engine must have oil cooler fitted. Press starter to obtain oil pressure and to throw out excess inhibiting oil in cylinders. Replace plugs. NOTE: ALL plastic bungs must be removed

Note: Cylinder heads have a 1/8 NPT plug to be unscrewed to uncover head bolt No. 5. After torquing, refit plug.

**CAUTION: Do not over-tighten. Over-tightening will eventually loosen fit between plug & head to the point where the plug will not be secure.**



**Figure 37 – Head Bolt Locations**

- If the engine is run on the ground before flight use minimum power settings and minimum time to avoid overheating. If the engine is to be run at more than idle power on the ground extra-large cooling ducts and oil cooler will be required.
- For the first 25 hours of operation, add 5.5 litres of Shell 100 oil. After 25 hours drain oil, check torque of cylinder head bolts to 27Nm (20 ft lbs.)



- Use 5.5 litres of W100 oil for normal operation or W80 oil for cold weather operation. Shell also manufacture a multigrade oil Aeroshell 15W50 which is particularly suited for operations in cold climates.

**CAUTION: UNDER NO CIRCUMSTANCES USE AUTOMOTIVE OIL IN THIS ENGINE. Use only oils, which are designed for Air Cooled Aero Engines.**

- Some brands of automotive oils have been shown to cause very rapid cylinder wear. This will not be covered under Jabiru’s Limited, Express Warranty.
- Operate engine only on AVGAS 100LL. Failure to do so could result in engine damage and void Jabiru’s Limited, Express Warranty.

**CAUTION**

**\*USE OF OIL/FUEL ADDITIVES VOID JABIRU’S LIMITED, EXPRESS WARRANTY**







## 9 Service Documentation

### 9.1 Subassembly A – Component Assembly Procedure

#### Crankshaft, Propeller Mount Flange & Conrods

No.	Details	Sign	Sign	Date
A1	Inspect for Burrs, Oil Holes, Chamfers; Clean Crankshaft, Conrods and Propeller Mount Plate			
A2	Inspect Oil Holes and Insert Welch Plugs			
A3	Measure Crankshaft (refer to Goods Inwards Inspection Sheet)			
A4	Inspect and Measure Propeller Mount Flange			
A5	Inspect and Measure Conrods (refer to Goods Inwards Inspection Sheet)			
A6	Mount Propeller Mount Flange to crankshaft; Use Loctite 620, Torque to 40Nm, (30ft.lbs) / Lockwire <sup>2</sup>			
A7	Fit the Conrods to the Crankshaft; Use Loctite 620 on the bolts and torque to 24Nm (18ft.lbs)			
Stage 1	A8 Stage Inspection of Assembly – Conrods/Crankshaft			

I hereby certify that the subassembly has been completed using the approved procedures and data; and is fit for installation.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
Production Certificate #444128

Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

<sup>2</sup>For std prop flange length only



## 9.2 Subassembly A – Component Register & Parts Inspection Record Crankshaft, Propeller Mount Flange and Conrods

Batch	Description	Part No	Batch	Item	Date																	
					Serial No																	
					Details																	
	Crankshaft	4957022																				
	Prop Flange	4876014																				
	Conrod 1	4831004																				
	2	4831004																				
	3	4831004																				
	4	4831004																				
	5	4831004																				
	6	4831004																				
	7	4831004																				
	8	4831004																				
	SHCS 5/16 x 1" UNF																					
	Bearing	PB4A000																				

I hereby certify that the above listed parts conform with the dimensions, have been engraved, and installed as recorded.

Signed \_\_\_\_\_ Date \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
Certificate of Approval #444128

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### 9.3 Subassembly B – Component Assembly Procedure Crankcase and Camshaft Assembly

No.	Details	Sign	Date
B1	Inspect case, deburr, clean, check oil holes		
B2	Fit inner stud "O" rings		
B3	Fit all studs		
B4	Fit outer oil suction and conrod welch plugs		
B5	Fit oil relief valve, oil pressure sender and pressure switch		
B6	Fit bearing shells (20)		
B7	Assemble and torque to 30 ft.lbs		
B8	Measure main tunnel and camshaft bearings		
B9	Measure Cam Follower Bores		
B10	Fit Valve Lifters		
B11	Check Camshaft End Float		
B12	Check Crankshaft End Float		

I hereby certify that the subassembly has been completed using the approved procedures and data; and is fit for installation.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
Production Certificate #444128

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**9.4 Subassembly B – Component Register & Parts Inspection Record**  
**Crankcase and Camshaft Assy**

Batch _____ Serial No _____ Date _____											
Description	Part No	Batch	Item	Details						C/Case	
				1	2	3	4	5	6		
Crankcase LS	4834002			1	2	3	4	5		C/Case	
Crankcase RS	4835002			6	7	8	9	10		Tunnel	
Camshaft	4832003			1	2	3	4	5		Cam	
Studs – Long Barrel	4862014			6	7	8	9			Tunnel	
Studs – Short Barrel	4861014				Cam Followers						
Studs - Front	4860014		LHS	2	4	6	8				
Camshaft Gear	4842014		RHS	1	3	5	7				
Idle Gear Assembly	4898014										
Crankshaft Gear	4841014										
Main bearings	PB01324										
I hereby certify that the above listed parts conform with the dimensions, have been engraved, and installed as recorded.											
Signed _____		Date _____									
For Jabiru Aircraft Pty Ltd Certificate of Approval #444128											

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**9.5 Subassembly C – Component Assembly Procedure**  
**Pistons, Cylinders and Cylinder Heads**

No.	Details	Sign	Date
C1	Clean and deburr all parts		
C2	Record all measurements		
C3	Install pushrod tube "O" Rings		
C4	Check valve seats, fit spring retainers, install valves		
C5	Fit intake & exhaust pipes to heads		
C6	Complete rocker shafts and rocker assemblies		
C7	Fit cylinder base "O" rings		
C8	Fit front circlip in piston for gudgeon pin		
C9	Check ring end gaps, fit rings to pistons		
C10	Install piston assembly to cylinder just clear of the oil ring		

I hereby certify that the subassembly has been completed using the approved procedures and data; and is fit for installation.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
 Production Certificate #444128

Notes:	



### 9.6 Subassembly C – Component Register & Parts Inspection Record Pistons, Cylinders and Cylinder Heads

Batch \_\_\_\_\_ Serial No. \_\_\_\_\_ Date \_\_\_\_\_

Description	Part No	Batch	Item	Details		
				Guides		
				Inlet	Outlet	
Head 1	4A466B0N					
2	4A466A0D					
3	4A466B0N					
4	4A466A0D					
5	4A466B0N					
6	4A466A0D					
7	4A466B0N					
8	4A466A0D					
				Bore	Length	
Cylinder 1	4958022					
2	4958022					
3	4958022					
4	4958022					
5	4958022					
6	4958022					
7	4958022					
8	4958022					
				Ring Gap		
				Dia	Top	Bottom
Piston 1	4891013					
2	4891013					
3	4891013					
4	4891013					
5	4891013					
6	4891013					
7	4891013					
8	4891013					
Rockers LH	4591074					
RH	459207N					
Gudgeon Pin	4299054					

I hereby certify that the above listed parts conform to the dimensions, and have been engraved, and installed as recorded.

Signed \_\_\_\_\_ Date \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
Production Certificate #444128



**9.7 Subassembly D – Component Assembly Procedure**  
**Sump**

No.	Details	Sign	Date
D1	Deburr and wash sump, inspect for defects		
D2	Fit oil temperature sender		

I hereby certify that the subassembly has been completed using the approved procedures and data; and is fit for installation.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
 Production Certificate #444128

Notes: \_\_\_\_\_  
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**9.8 Subassembly D – Component Register & Parts Inspection Record Sump**

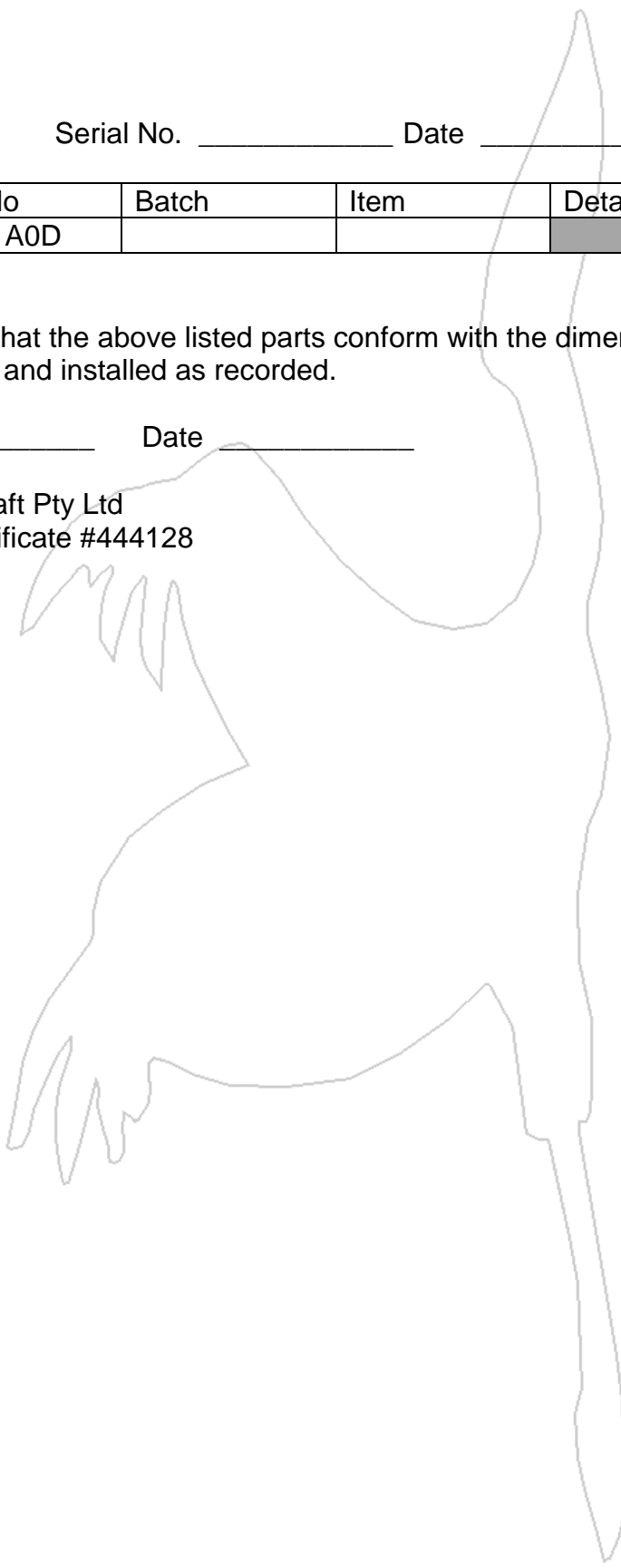
Batch \_\_\_\_\_ Serial No. \_\_\_\_\_ Date \_\_\_\_\_

Description	Part No	Batch	Item	Details
Sump	4A141A0D			

I hereby certify that the above listed parts conform with the dimensions, have been engraved, and installed as recorded.

Signed \_\_\_\_\_ Date \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
Production Certificate #444128







**9.9 Subassembly E – Component Assembly Procedure**  
**Flywheel and Ignition Coils**

No.	Details	Sign	Date
E1	Deburr and Clean		
E2	Fit magnets using silastic		
E3	Using Loctite 620 fit the ring gear		
E4	Fit the alternator rotor		
E5	Fit the plugs to the ignition coils		

I hereby certify that the subassembly has been completed using the approved procedures and data; and is fit for installation.

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
 Production Certificate #444128

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



**9.10 Subassembly E – Component Register & Parts Inspection Record**  
**Flywheel Assy**

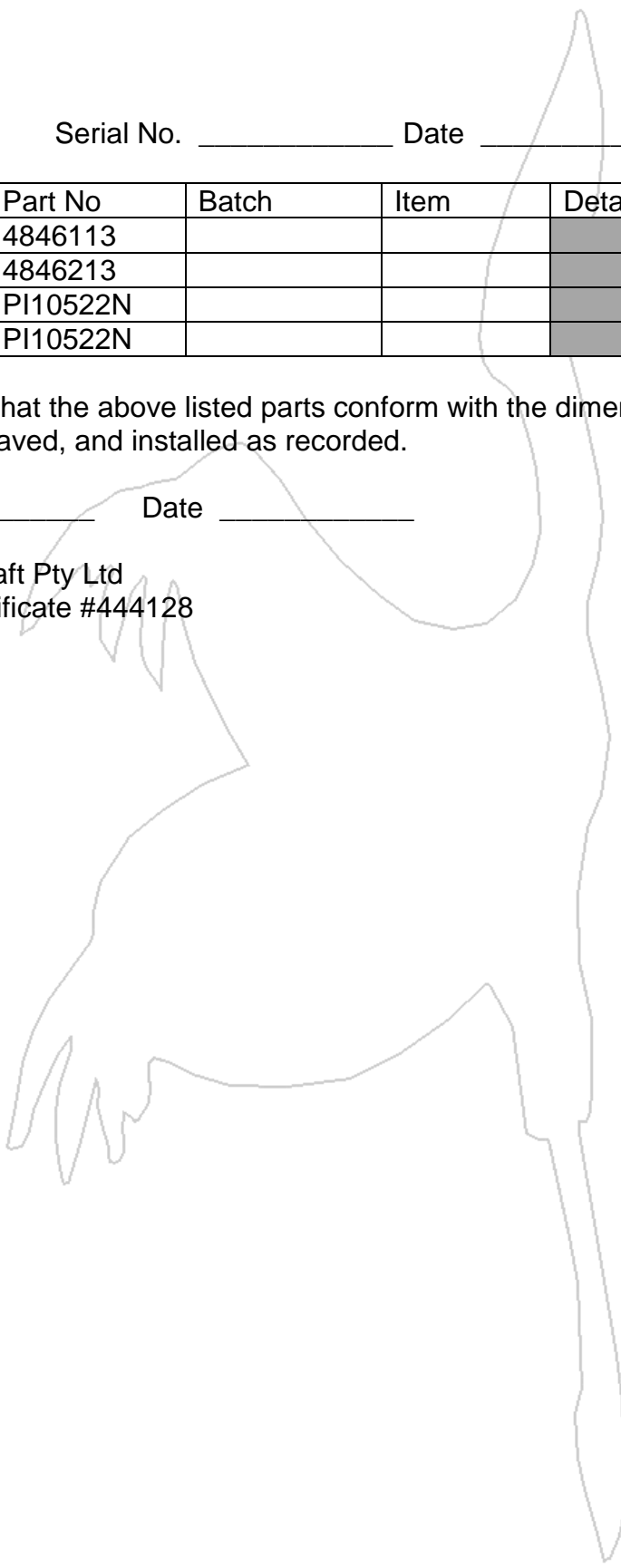
Batch \_\_\_\_\_ Serial No. \_\_\_\_\_ Date \_\_\_\_\_

Description	Part No	Batch	Item	Details
Flywheel	4846113			
Ring Gear	4846213			
Coil 1	PI10522N			
2	PI10522N			

I hereby certify that the above listed parts conform with the dimensions, have been engraved, and installed as recorded.

Signed \_\_\_\_\_ Date \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
 Production Certificate #444128





### 9.11 Subassembly F – Component Assembly Procedure

#### Gear Case

No.	Details	Sign	Sign	Date
F1	Deburr, clean and inspect all of the gears			
F2	Measure the shaft diameters and the distributor shaft and bearing diameters			
F3	Using Loctite 515 fit the spacer posts to the gear housing			
F4	Fit the distributor shaft seals and rear crankshaft seal			
F5	Fit distributor shaft bearings			
F6	Fit shafts to gears with 24 hour araldite			
F7	Fit the distributor shafts and gears to the gear housing			
F8	Check end clearance of distributor shaft to case flange			
Stage 2	F9	Stage Inspection of Assembly		

I hereby certify that the subassembly has been completed using the approved procedures and data; and is fit for installation.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
Production Certificate #444128

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
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**9.12 Subassembly F – Component Register & Parts Inspection Record**  
**Gear Case**

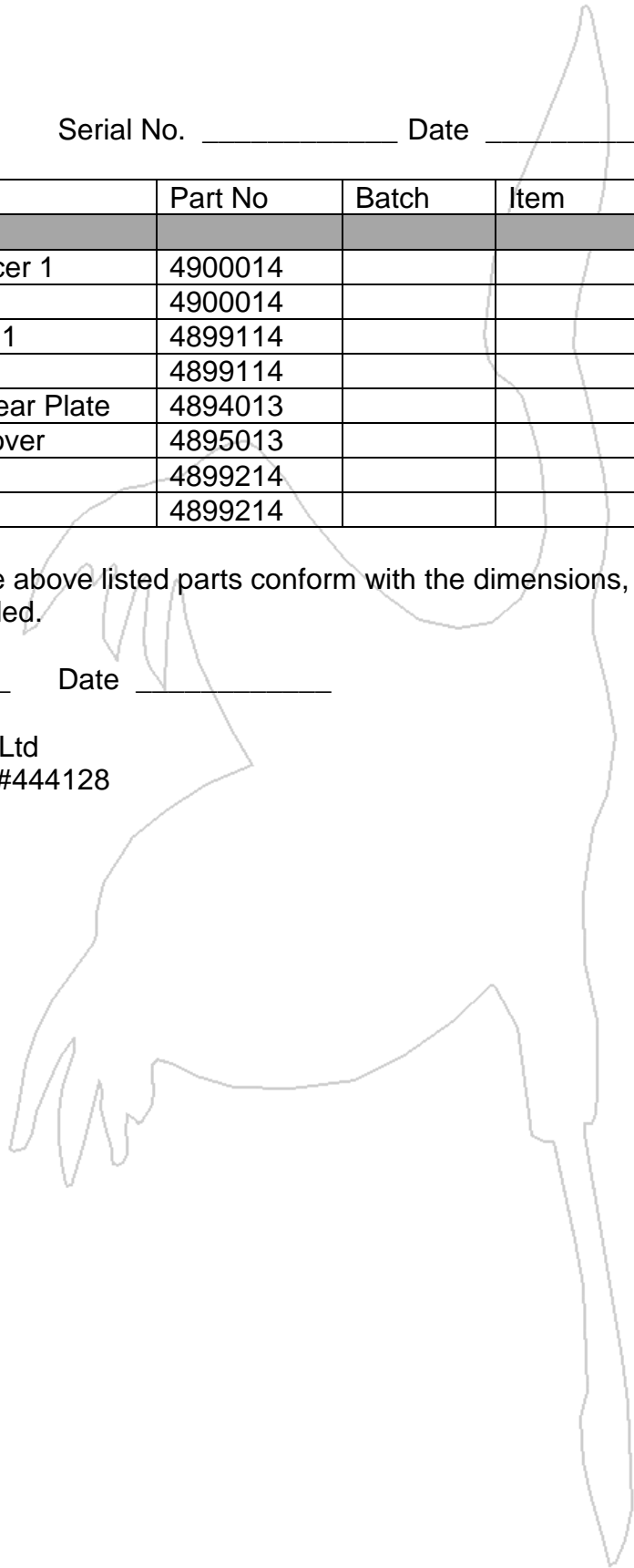
Batch \_\_\_\_\_ Serial No. \_\_\_\_\_ Date \_\_\_\_\_

Description	Part No	Batch	Item	Details
				Dia
Distributor Mount Spacer 1	4900014			
2	4900014			
Distributor Drive Shaft 1	4899114			
2	4899114			
Front Gear Housing/Rear Plate	4894013			
Rear Gear Housing/Cover	4895013			
Distributor Gear 1	4899214			
2	4899214			

I hereby certify that the above listed parts conform with the dimensions, have been engraved, and installed as recorded.

Signed \_\_\_\_\_ Date \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
 Production Certificate #444128





**9.13 Subassembly G – Component Assembly Procedure**

**Fuel Pump and Carburettor**

No.	Details	Sign	Date
G1	Fuel Pump – Disassembly		
G2	Drill hole in spacer and insert breather		
G3	Final assembly checked for correct flow		
G4	Drill and tap upper half for 90o elbow and fit		
G5	Clean and reassemble		
G6	Carburettor needle position		
G7	Fit fuel line		
G8	Remove bowl and check jet size		
G9	Reassembly bowl		
G10	Fuel pump and carby engraved		

I hereby certify that the subassembly has been completed using the approved procedures and data; and is fit for installation.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

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Production Certificate #444128

Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
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### 9.14 Subassembly H – Component Assembly Procedure

#### Final Assembly

No.	Details	Sign	Sign	Date
H1	Apply Loctite 515 to crankcase halves; lubricate where necessary			
H2	Locate camshaft and crankshaft in crankcase half, fit valve lifters in both crankcases			
Stage 3	Stage Inspection Pre-joining Crankcase			
H3	Locate crankcase half over crankshaft and camshaft			
H4	Tension front (2) and rear (2) studs			
H5	Fit oil pump assembly and front seal housing			
H6	Place all through bolts in crankcase			
H7	Fit piston and cylinder assemblies and check circlips			
Stage 4	Stage Inspection Piston/Circlips			
H8	Tension the cylinder base studs to 25 ft.lbs then 30 ft.lbs			
H9	Fit sump			
H10	Fit heads to cylinder torque 12 ft.lbs / 24 ft.lbs			
H11	Fit push rod and valve gear. Set gap to 0.10" (0.25mm)			
H12	Check camshaft timing DEGREES			
H13	Fit fuel pump			
H14	Fit engine mount plate/gearbox front housing			
H15	Fit gearbox timing gears & rear gearbox cover			
H16	Fit flywheel alternator mount plate and ignition coils and lead			
H17	Fit carby assemblies			
H18	Fit exhaust system			

I hereby certify that the subassembly has been completed using the approved procedures and data; and is fit for installation.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

For Jabiru Aircraft Pty Ltd  
Production Certificate #444128

Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## 10 Jabiru 5100 Engine Run-In & Testing

### 10.1 Run-In Schedule

Serial No: Date Operator Block			Start Time				Temp	Win	QNH	Humidity
			Finish Time							
			Total Time							
			Low Idle RPM							
Seq	Time	Duration	Condition	RPM	Rec RPM	CHT	EGT	Oil T	Oil P	Current
1		3	Start & Idle	1400						
2		30 Sec	WOT	Full						
3		1		2000						
4		1		2800						
5		2		2000						
6		1	WOT	Full						
7		2		2000						
8		15 Sec	WOT	Full						
9		2		2000						
10		2		2800						
11		1	Cooling	2000						
12		2		2800						
13		3	Cooling	2000						
14		1	WOT	Full						
15		2		2800						
16		1		2000						
17		2		2800						
18		2		2500						
19		2		2800						
20		2		2500						
21		3		2900						
22		2		2500						
23		3	WOT	Full						
24		3	Cooling	1200						
	Total 43.75									
Replenishments			Qty	Record of Maintenance or Adjustments:						
Start Fuel Qty										
Fuel Added										
Finish Fuel Qty										
Fuel Used										
Oil Added										

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I hereby certify that the above listed run has been carried out in accordance with the details given.

Signed .....	Date / /20	
For Jabiru Aircraft Pty Ltd Certificate of Approval #444128		



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## 10.2 Run-In Checks

### 1. Preliminary

- Paperwork Complete
- Sufficient Fuel
- Correct Oil Level
- All Connections Correct and Secure

### 2. Start Run

- Start Time \_\_\_\_\_
- End Time \_\_\_\_\_

### 3. Ignition Checks (repeat a couple of times for each side)

- Left Side 1000/2000 rpm
- Right Side 1000/2000 rpm

### 4. Oil Leaks

- Check Visually

### 5. Instruments

- Working and Correct Range

### 6. Idle

- Check idle screw (3/4 to 1 turn out)

### 7. General Running

- Smoothness
- Noises
- Manifold Sealing

### 8. Oil Pressure and Temp

### 9. Check Ignition light to Tacho Test Rig (Top End RPM)

### 10. Check alternator Charging Voltage

## 10.3 Jabiru – Engine Post Run Procedure

					SIGN	DATE
1. Heads retorqued 32 Nm (24 ft/lb). Valves Adjusted.						
2. Check induction bolts.						
3. Any changes to be made.						
4. Rerun, check for oil leaks and/or any modifications made (oil pressure/leaks etc).						
5. Check charging rate of alternator Volts						
6. Leak Down 80                      80                      80                      80						
Cyl	1	2	3	4		
	5	6	7	8		
7. Check all paper work						
8. Drain fuel/oil. Prepare for Shipment.						

## 11 TABLE OF LUBRICANTS

Use only oils of registered brands meeting the specification detailed at para. 3.5.

Acceptable engine lubricating oils:

Run in Period

Oil	80	100	120
Outside Air Temp	-17°C to 25°C	15°C to 35°C	Above 35°C

Normal Operations

Oil	W80	W100	W120
Outside Air Temp	-17°C to 25°C	15°C to 35°C	Above 35°C

Note: Multigrade aviation oils are also available.

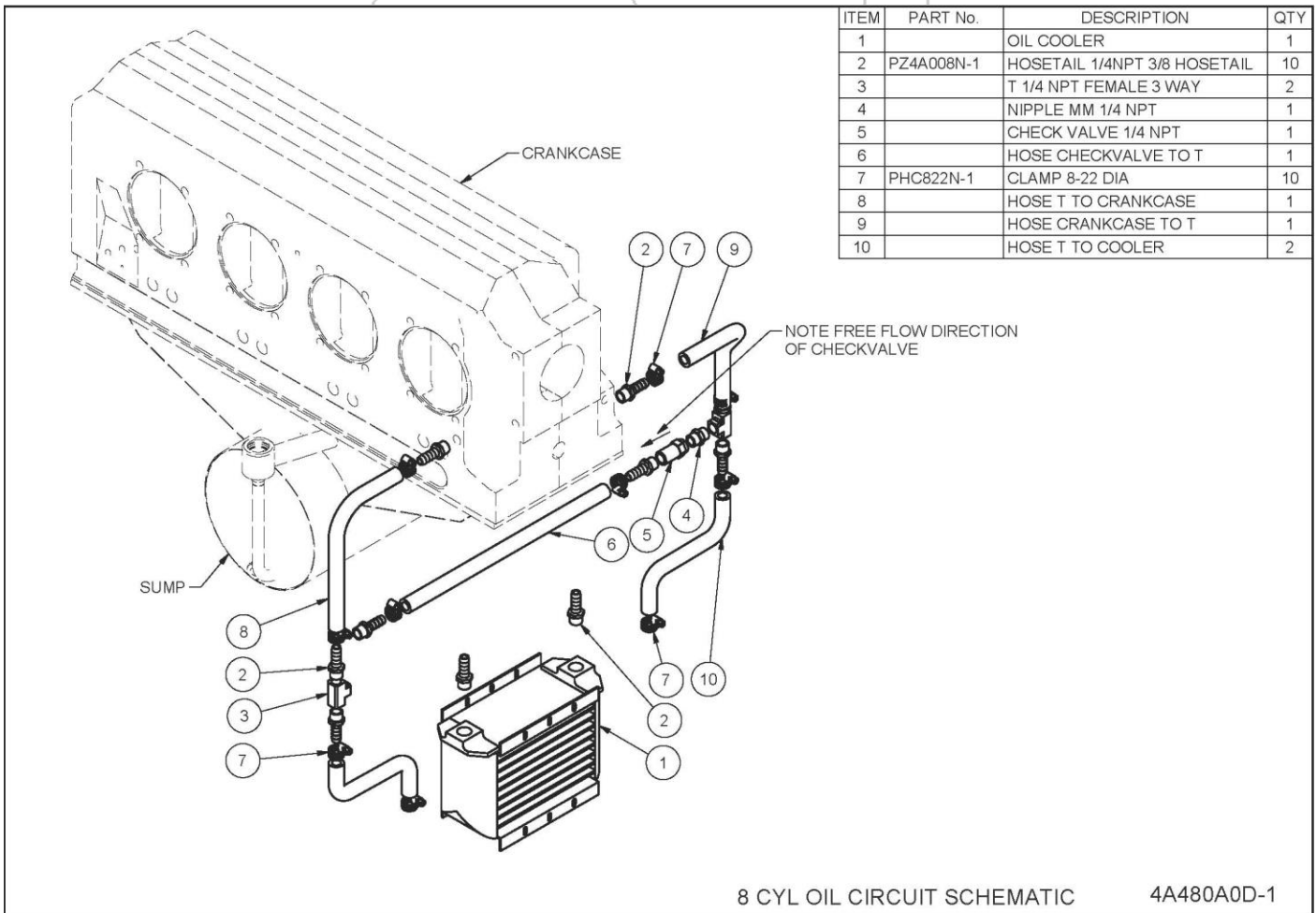


Figure 38 Oil System Schematic



## 12 TORQUE SPECIFICATION FOR BOLTS & NUTS

Part	Nom. Dia (mm)	Torque nm (ft.lbs)
Spark Plugs	12mm	11 (8)
Cylinder Head Bolts	5/16"	34 (24)
Crankcase Main Studs	3/8"	40 (30)
Flywheel/Gear Bolts	5/16"	34 (24)
Crankshaft Prop Flange Cap Screws (Lockwire – for std length flange only)	3/8"	40 (30)
Oil Pump Cap Screws	5/16"	20 (15)
Tappet Cover Cap Screws	1/4"	7 (5)
Starter Motor Bolts	5/16"	20 (15)
Carburettor Flange Bolts	1/4"	11 (8)
Engine Mount Plate Bolts	1/4"	14 (10)
	5/16"	16 (12)
Gearbox Cover Bolts	1/4"	14 (10)
Alternator & Coil Mount Bolts	1/4"	14 (10)
Sump Cap Screws	1/4"	14 (10)
Conrod Bolts	5/16"	24 (18)
Propeller Bolts	1/4"	9.5 (7)
Camshaft Gear Bolts (Lockwire)	1/4"	11 (8)

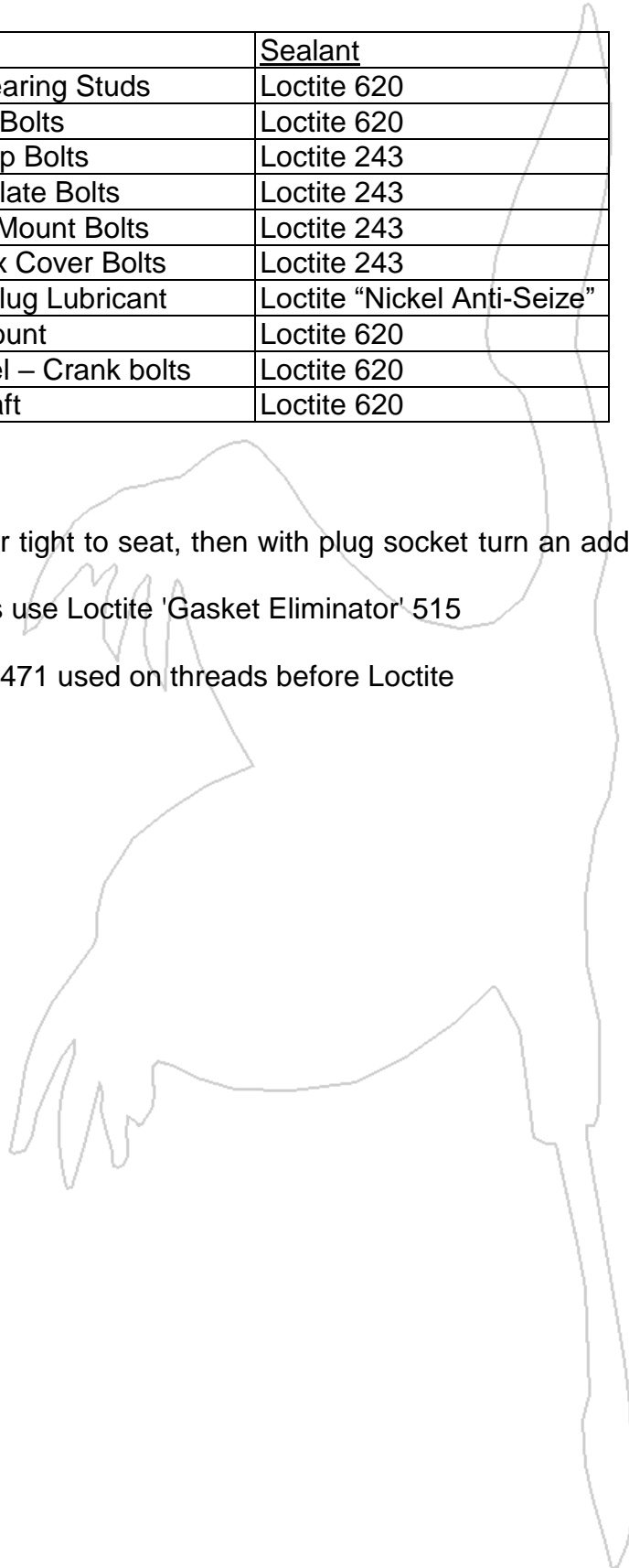
***Initially head bolts are assembled at 34Nm (24 Ft Lb.) After 25 hours head bolts can be checked at 27Nm (20 Ft Lb.)***



## 12.1 PRESCRIBED SEALANTS AND PRIMERS

Item	Sealant
Main Bearing Studs	Loctite 620
Conrod Bolts	Loctite 620
Oil Pump Bolts	Loctite 243
Sump Plate Bolts	Loctite 243
Engine Mount Bolts	Loctite 243
Gearbox Cover Bolts	Loctite 243
Spark Plug Lubricant	Loctite "Nickel Anti-Seize"
Prop Mount	Loctite 620
Flywheel – Crank bolts	Loctite 620
Camshaft	Loctite 620

- \* Tighten to finger tight to seat, then with plug socket turn an additional ½ turn (8 ft/lbs) for a new plug.
- \*\* All gasket areas use Loctite 'Gasket Eliminator' 515
- \*\*\* Loctite Primer 7471 used on threads before Loctite





## 12.2 NEW TOLERANCES

(All Dimensions are in Millimetres)

<i>Crankshaft</i>	Mains Journals	64.015 to 64.00
	Big Ends Journals	55.015 to 55.002
	Thrust Face	79.80 to 79.60
<i>Crankcase</i>	Main Bearings	68.028 to 68.010
	Cam Bearings	20.00 to 20.020
	Cam Thrust Face	24.95 to 25.10
	Lifter Bores	9.00 to 9.04
	Crank Thrust	77.025 to 76.975
<i>Con Rods</i>	Big Ends	58.024 to 58.00
	Little Ends	23.02 to 23.01
	Length Between	
	Bore Radius	69.945 to 69.628
<i>Cam Shaft</i>	Journals	19.96 to 19.97
	Valve Lift	6.900 to 7.100
	Fuel Pump Lift	2.45 to 2.55
	Thrust Faces	25.18 to 25.25
<i>Lifter</i>	Outer Diameter	8.965 to 8.990
<i>Pistons</i>	Dia	97.50 to 97.53
	Side ring Clearance	0.01 to 0.02
	Pin Dia	22.990 to 23.000
	Ring End Gap	0.400 to 1.000
<i>Cylinder Bore</i>	Dia	97.59 to 97.61
	Length over flanges	106.950 – 107.00
<i>Valve</i>	Stem Dia Inlet	6.970 to 6.990
	Stem Dia Exhaust	6.970 to 6.990
	Guide I.D. Inlet	7.040 to 7.050
	Guide I.D. Exhaust	7.040 to 7.050
	Spring Free length	39.5 to 42
<i>Distributor</i>	Shaft dia at rotor	14.85 to 14.70
	Shaft dia at brg contact	14.99 to 14.96
	Shaft End Float	0.5mm

*Note: Early engine components can exhibit slight variations to these new tolerances but still be serviceable.*



### 12.3 MAXIMUM ALLOWABLE CLEARANCES (Wear Limits)

(All Dimensions are in Millimetres)

Mains	0.10
Big Ends	0.08
Little Ends	0.03
Camshaft Journals	0.08
Crank End Float	0.80
Cam End Float	0.50
Lifter - Crankcase	0.19
Piston/Cylinder	0.15
Ring Side Clearance	0.05
Pin/Piston	0.04
Ring End Gap	1.20
Inlet Valve/Guide	0.10
Exhaust Valve/Guide	0.12
Min Spring Length	39.00
Distributor Shaft/Post	0.10
Distributor Shaft End Float	0.80
Cylinder Dia at Half stroke	97.65
Rocker Shaft/Rocker Arm	0.18
Oil Pump Gears	0.15
Bearing Clearances main	0.04 – 0.09 typical
Big Ends	0.04 – 0.06 typical

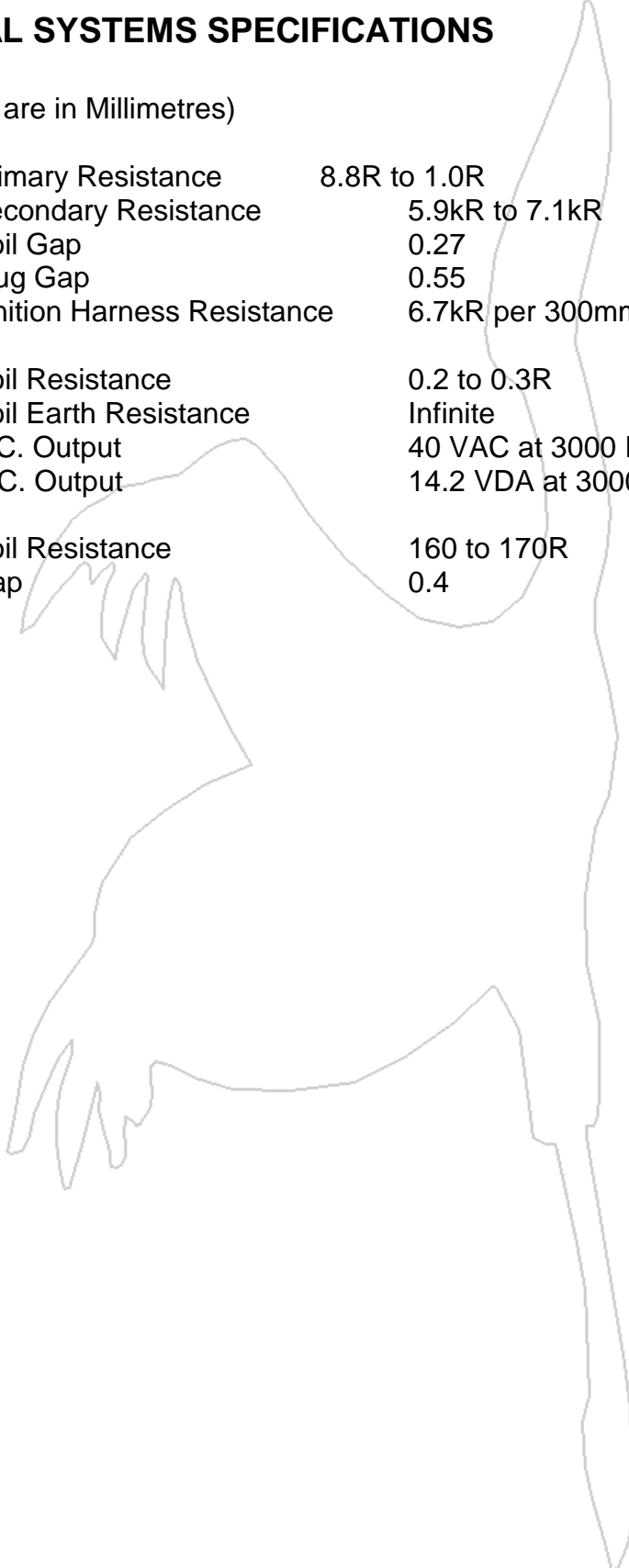
*Note: Variation can occur, overall tolerances may be acceptable with advice from Jabiru Aircraft Pty Ltd.*



## 12.4 ELECTRICAL SYSTEMS SPECIFICATIONS

(All Dimensions are in Millimetres)

<i>Ignition</i>	Primary Resistance	8.8R to 1.0R
	Secondary Resistance	5.9kR to 7.1kR
	Coil Gap	0.27
	Plug Gap	0.55
	Ignition Harness Resistance	6.7kR per 300mm of length
<i>Alternator</i>	Coil Resistance	0.2 to 0.3R
	Coil Earth Resistance	Infinite
	A.C. Output	40 VAC at 3000 RPM
	D.C. Output	14.2 VDA at 3000 RPM
<i>Tacho</i>	Coil Resistance	160 to 170R
	Gap	0.4





## 13 Operating Notes – Quick Reference Guide

### 13.1 New Engine Notes

- This engine has been ground run to a specific run in program and is ready for flight.
- The engine has been **INHIBITED**. However if you intend to store it for any length of time please refer to Section 5.8.5 of **INSTRUCTION AND MAINTENANCE MANUAL**. Removing spark plugs and turning over will help periodically.
- Before initial start add oil to engine (5.5 litres with cooler), remove one plug per head and turn the engine over on the starter to remove excess inhibitor. Once oil pressure is obtained replace plugs and continue start-up sequence.
- Remove **ALL** plastic bungs on engine before starting. EXHAUST (8) CARBY (2) OIL VENT (1) FUEL PUMP (1)
- **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 and climb at shallow angles & higher airspeeds
  - iii) Do not carry out glide approaches
  - iv) Gradually reduce power
  - v) Avoid sudden heating up and sudden cooling down
- When you change oil from the “run in” type to the “normal” oil at or around 25 hrs, replace oil filter.





## 13.2 Normal Operation Notes

The following are tips to ensure a long life. They are intended to bring attention to important aspects of caring for a Jabiru 5100 engine. For details on the required work, refer to the main body of this manual.

### 13.2.1 Regular Checks

- With ignition and master OFF and throttle closed turn the prop by hand and observe engine for odd noises or heavy movements.
- Turn the engine over by hand before starting to check for regular compressions. If irregular (one cylinder with lower compression than others) a leak-down or similar pressure differential test should be done. If the results show a low-compression cylinder, contact Jabiru Aircraft or our authorized local representative.
- **Compression Test:** Condition of compression can be gauged by testing the engine with a compression gauge. The test is carried out with the engine warm, wide open throttle, **ignitions OFF**. Turn over on starter. A reading below 90 PSI may indicate removal of head and possibly cylinder.
- **Pressure Differential Test:** As an alternative to a compression test, a pressure differential test (Leak down) can be carried out. This is a much better test of the condition of rings, bore, head sealing and valve. This is the normal test used in aviation and requires specific equipment.

The test is carried out with the engine in warm to hot condition. Pressure input of 80 PSI; a second gauge reads the differential. This is done with piston on TDC on the firing stroke. Note that the propeller needs to be restrained. A differential pressure of lower than 80/60, indicates a problem.

Problems can be better identified using the leak down:

- v) Blow by through the crankcase vent indicates worn rings or bore
- vi) Leaking from carby indicates a poor intake valve seal
- vii) Leaking from exhaust indicates a poor exhaust valve seal
- viii) Head leak indicates poor head to cylinder seal

With the problem narrowed down, correction work can more easily be carried out.

- Your **Tension Wrench** should be accurate. It should be a “good” brand and have had some method of calibration. Even new wrenches can be un-calibrated and can vary to manufacturers claims.
- The **Coil Gap** can be adjusted easily by cutting a 15mm wide strip of plastic or thin card (thickness .010”). Place between magnets on flywheel and coil. Check both sides, that is each coil to each magnet (4 checks).

### 13.2.2 Oil

- Use a non-compounded *AVIATION* oil:-  
*Aero Shell 100*

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*Mobil Red Band (EXXON Aviation Oil 100)  
BP Aviation Oil 100*

- Use for 20-25 hours, then drain and replace with a compounded AVIATION oil:-  
Aero Shell W100  
Aero Shell 15W50 (for cooler climates)  
Mobil Aero 100 (SAE 50) (EXXON Aero Elite 100)  
BP Aero Oil D100/BP Multigrade Aero Oil D SAE 20 W 50  
Aero Shell W 100 Plus
- The normal running oils are detergent and ashless dispersant types. See MAINTENANCE SECTION 5.3
- Oil capacity:  
The new engine will hold 5.7 litres with an oil cooler.  
On subsequent oil changes the engine will hold approx 5.5 litres.
- **Do not use any type of automotive oil.** Aviation oils have been blended specifically for the difficult operating conditions found in an air cooled aero engine operation and using automotive will be **extremely detrimental** to its operation.
- When you change oil from the “run in” type to the “normal” oil at or around 25 hrs replace oil filter. You may want to cut the filter open for inspection. It is usual in Jabiru engines to find a small amount of aluminium but definitely no metal. If bearing metal is present contact the Jabiru Service Department.

### 13.2.3 Engine Cooling

- Avoid prolonged ground running at elevated RPM. Engine can be over heated during ground operations – remember air ducts are designed for *in flight* cooling. Ground running at more than idle power requires special, oversize cooling ducts and oil coolers.
- Do not apply full power until CHT has reached at least 100°C (212°F)
- **ALWAYS TAKE OFF AT FULL POWER** – especially when the engine is new.
- For the first few take offs climb at a higher airspeed than normal to assist engine cooling. Reduce power at cross wind leg and shallow climb (lower nose).
- Avoid high nose altitude continual climbs. The higher the climb out speed the better for engine cooling. No low speed high nose altitude climb outs.
- RETORQUE heads on annual inspection.
- The ducts supplied with the engine need to be fitted. See Installation manual. Occasionally, periodic research and development dictates that changes must occur to cooling ducts. The ducts supplied with new engines may differ to those supplied with older engines.



**13.2.4 Consumables**

- Filters – Regular inspections are a must for fuel and air filters. Conditions will dictate when they need to be changed. The air box has a rubber flap to give partial inspection of air filter.
- Spark Plugs - NGK D9EA are recommended. Refer to main body of this manual for plug gap. Spark plugs are installed at 8 ft lb or given 1/2 turn after contact with head. 18mm Plug spanner used.

**13.2.5 Starting**

- A warm idle of around 900 RPM will automatically create the right starting environment. As the engine is run-in on a dynamometer the Idle set screw may have to be adjusted to give 900 RPM idle when warm.
- Normal start requires the application of choke with the throttle closed or just barely “cracked” (approx 2% throttle). With the throttle on the idle stop the butterfly in the throat body will be slightly cracked. The engine will be difficult to start if throttle is open too far.
- As the engine is cranked the choke should be pushed off. The engine should fire as the choke comes off. The choke is only used for a cold start. Prolonged cranking with choke on will “flood” the intake system, making starting difficult. Should this occur, leave the aircraft to sit for approx 10 minutes, or alternatively, clear the system on full throttle momentarily (mags off).
- If the Cranking speed is too slow (poor battery or starter fault) the ignitions will not fire, preventing starting. If jump starting is necessary, it indicates poor battery condition or faulty alternator charging. Further testing would then be required in these areas to identify the problem.

**13.2.6 Trouble Shooting**

While it is unusual for a problem to occur, a methods for finding the source of “common” problems are listed in the Trouble Shooting Section 14 of the this manual.



## 14 Trouble Shooting

### 14.1 Troubleshooting Tables

#### 14.1.1 Engine Won't Start

	Possible Cause	Remedy
1)	Ignition OFF	Switch ON
2)	Spark plug gap too large	Adjust gap to 0.6-0.7mm 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 to 0.25mm (0.010")
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.

#### 14.1.2 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

#### 14.1.3 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



**14.1.4 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

**14.1.5 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)	Carby diaphragm damage	renew diaphragm

**14.1.6 Low Oil Pressure**

	Possible Cause	Remedy
1)	Insufficient oil in sump	Check oil level & replenish as necessary
2)	High oil temperature	Check oil cooler performance and correct as necessary
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

**14.1.7 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

**14.1.8 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



**14.1.9 Knocking Under Load**

	Possible Cause	Remedy
1)	Octane rating of fuel too low	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.

**14.1.10 Engine Hard to Start at Low Temperature**

	Possible Cause	Remedy
1)	Starting speed too low	Preheat engine
2)	High oil pressure	At very low temperatures, a pressure reading of up to around 500 kPa doesn't necessarily indicate a malfunction
3)	Low battery charge	Fit fully charged battery

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





## 14.2 Troubleshooting Quick Guide

### 14.2.1 Low Oil Pressure

- A sudden drop of pressure usually is caused by a small piece of foreign matter being lodged under the relief valve. Remove oil filter and remove matter by depressing plunger or removing relief mechanism. Replace and check operation by ground run. If low pressure persists the problem will need further investigation.
- Elevated oil temperature can cause low oil pressure. Ensure oil temperature limits are complied with at all times. The fitting of an approved oil cooler is strongly recommended.

### 14.2.2 Flicking Of Oil Pressure Gauge

- It is not uncommon for the Jabiru engine to display flicking of the needle pointer for brief periods but still within normal operating regions. If it continues, check continuity of sender lead and or possible sender change. (This is assuming oil level is OK).

### 14.2.3 CHT

- If the gauge is not reading, the cause can be cause by a break in the sender wires or incorrect polarity.
- High readings can result from a poorly centred sender under the spark plug.
- Normal cruise CHT should not exceed 150°C and climb must not exceed 200°C. Air ducts supplied give results below these figures.

### 14.2.4 RPM

- Tacho's may need adjustment when a new engine is fitted. Inducted magnet sender units require coil gap to flywheel tags of 0.014" or 0.35mm.

### 14.2.5 Magneto Checks

- Possible causes of abnormal drop could be loose leads, faulty leads, rotor buttons, coil gaps, spark plugs.

### 14.2.6 Rough Cylinder Running

- Check plugs, ignition coils and the induction system for looseness.

### 14.2.7 Carby Breather

Carburetors have a brass fitting for venting. This is must be connected to a fitting screwed into filtered side of the carby heat box



**14.2.8 Limitations**

- Jabiru recommends TBO of 2000 hrs, with a Top End overhaul at 1000 (conditions apply). A guaranteed fixed price overhaul exists through the Jabiru factory.
- Warranty is 200 hours or 12 months which ever comes first.

**CAREFULLY READ MANUALS SUPPLIED**







## 15 New Engine – Jabiru’s Limited, Express Warranty

New Jabiru Aircraft Engines are covered by Jabiru’s Limited, Express Warranty. Details of this warranty are given below.

**NOTE:**

**JABIRU’S LIMITED, EXPRESS WARRANTY IS EXCLUSIVE, EXPRESSLY GIVEN AND HAS BEEN ACCEPTED IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, ORAL OR WRITTEN, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY, 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.**

Jabiru Aircraft Pty Ltd, hereinafter JABIRU warrants that it will make good without charge, any defect which appears in this engine.

Provided:

- 1 The defect has been notified in writing to JABIRU:
  - i) Before the engine has operated a total of 200 hours or,
  - ii) 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 a JABIRU Approved Service Centre or such other service facility as advised 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, and
- 5 The engine has been stored in accordance with the Engine Preservation instruction in the Jabiru Instruction & Maintenance Manual, and
- 6 JABIRU has determined that the defect complained of is one of workmanship and is not caused by:
  - i) Misuse or abuse of the engine such as by operation outside the approved Flight Manual, or Maintenance and Operation Manual, etc, or by neglect
  - ii) Improper installation, including overheating.
  - iii) Operation of the engine after it is known to be defective
  - iv) Accident or deliberate act
  - v) Atmospheric fallout or flood, hail, salt, wind, etc.
  - vi) Failure to carry out proper maintenance service
  - vii) Use of incorrect types and/or grades of fuel, oil or lubricants
  - viii) Alteration or modification of the engine by any party not authorised in writing by JABIRU
  - ix) The fitting of parts or accessories not marketed by JABIRU

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- x) Any work carried out on the engine by someone other than an Authorised JABIRU Service Centre or someone else authorised by JABIRU in writing,
- xi) The use of any engine oil or fuel additives or oil stabilisers

**BY JABIRU (or as otherwise decided by JABIRU) MAKING GOOD THE DEFECT BY REPAIR OR, AT THE OPTION OF JABIRU, BY REPLACEMENT.**

Excluded from this Limited, Express Warranty are service items such as engine tuning, adjustments, replacement of air and oil filters, spark plugs, etc which are required as part of normal engine maintenance.

This Limited, Express Warranty is given to the person who is entitled to possession of the engine whether as owner, lessee or otherwise and is given in addition to all right conferred by law on that person.

Limited, Express Warranty repairs do not extend the original Limited, Express Warranty. Due to the substantial number of problems that can arise due to installation errors, JABIRU shall not be liable for any labour and/or service charges for removal, reinstallation and adjustment which are the responsibility of the buyer and are not covered by this Limited, Express Warranty. Consequential damages and freight costs are also not covered by this Limited, Express Warranty.

JABIRU makes no representation that this engine is suitable for installation in any particular aircraft and the responsibility for determining such suitability rests with the Buyer.

Under no condition shall JABIRU or a JABIRU Authorised Service Centre be liable for any contingent costs through the engine or aircraft being out of service for whatever reason.

**SPECIAL NOTICE TO OWNERS**

**AVAILABILITY OF SERVICE AND PARTS**

JABIRU Aircraft Pty Ltd maintains a substantial stock of spare parts and operates a Service Exchange Programme in respect to some components. Every endeavor is made to ensure that JABIRU carries adequate stocks of service parts and that Authorised Service Agents are 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.

**UNAUTHORISED STATEMENTS IN RELATION TO JABIRU PRODUCTS**

No JABIRU Authorised Service Centre or other person 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.



**LIMITED, EXPRESS WARRANTY ON JABIRU REPLACEMENT 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 as exclusions above and is subject to the same general exclusions.





16 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 SPECIFYING 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: \_\_\_\_\_

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