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Engineering Report: AVDALSR087-1

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Subject: Procedure For Upgrading 12 Pole Alternator

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Issue	Details of Change
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2.1 General

At manufacture, the 12 pole stator assembly was wound with 2 circuits in parallel. This reduces the effective length of the windings, limiting the output at low engine RPM. By re-connecting the wound coils on the stator in series, the effective length of the windings are increased, with a corresponding increase to the output voltage. The procedure given below details how the change may be carried out to engines in service.

This change will increase alternator voltage at low RPM. This means that at idle or low RPM more power will be available to the aircraft, reducing the tendency to drain the battery during low RPM operations. In turn this will benefit engine starting by tending to increase battery voltage at shut-down.

Note that while the output is increased, operators must continue to minimise power use during low RPM operation (such as taxi and descent/landing) and to avoid prolonged periods of low RPM operation with high power consumption – for example, while holding clear of the runway leave landing lights OFF to save power.

2.2 Applicability

The following procedure is applicable and approved by Jabiru Aircraft Pty Ltd to be carried out to Jabiru Engines operating in the following categories:

- Special Light Sport Aircraft
- Experimental Light Sport Aircraft
- Other Experimental categories – including “Experimental – Amateur-Built”.
- International equivalents to these Australian categories.
- International categories allowing modifications approved by the manufacturer.

2.3 Voltage Readings and Limits

Typically the point at which the alternator generated sufficient voltage to charge the battery was around 1800 RPM. After the change this point is typically reached at around 900 RPM.

When altered as detailed in this report the specifications of the alternator will vary from those noted in the current approved revision of the Jabiru Engine Overhaul Manual (JEM0001-4):

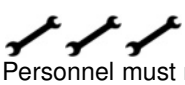
Coil resistance:	1.4 Ω to 1.9 Ω
A.C. output:	Up to 40 VAC at 3000 RPM

This will be addressed in future revisions of the Overhaul Manual.

2.1 Before You Start

The following procedure involves making modifications to the stator assembly wiring connections. The procedure is relatively simple, however there is potential to severely damage the electrical circuit and components.

In the context of the “Spanner Scale” used in the current engine maintenance and overhaul manuals, this is considered a “3-spanner” task: *“Straightforward, but requires special tools, training and/or judgement. Sound basic knowledge guidance and a careful approach are required.”*



Personnel must realistically assess their skills and equipment before carrying out this task. If in doubt, professional assistance must be sought. Personnel must hold current maintenance approvals appropriate to the aircraft’s operating category.

2.2 Recording

On completion of the work the aircraft or engine’s maintenance logbook must be annotated to indicate completion of the work in accordance with Jabiru Aircraft Procedure AVDALSR087.

3 Procedure for modification

The procedure to increase the alternator voltage is as follows.

1. A schematic showing the current and altered wiring is shown in Figure 7.
2. Disconnect the battery before you commence any work.
3. Disconnect stator wiring terminals and harness wire ties, then remove retaining bolts holding the rear plate and stator assembly from the engine, as shown in Figure 1.

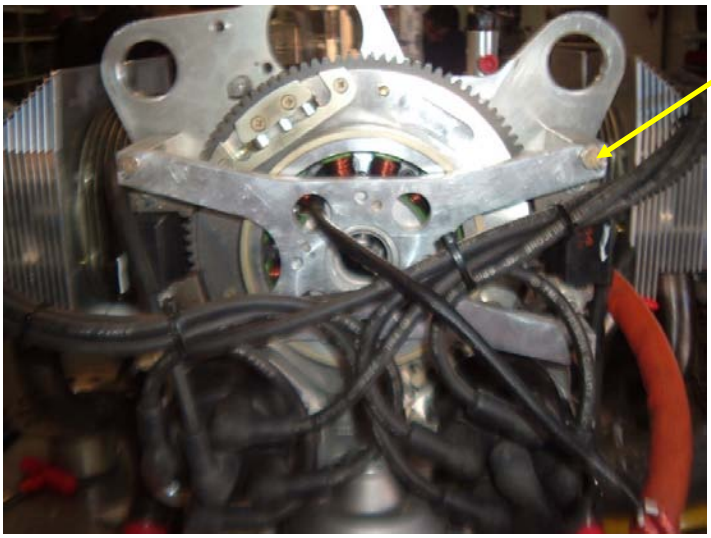


Figure 1 – Rear plate removal

4. With the assembly on the bench, use a heat gun to soften the Loctite on the 4 screws holding the stator assembly. Take care not to snap screws or damage threads: apply more heat of the screws are hard to turn.
   Remove stator. Note harness exit hole on rear plates so you can assemble in the correct orientation, see Figure 2.

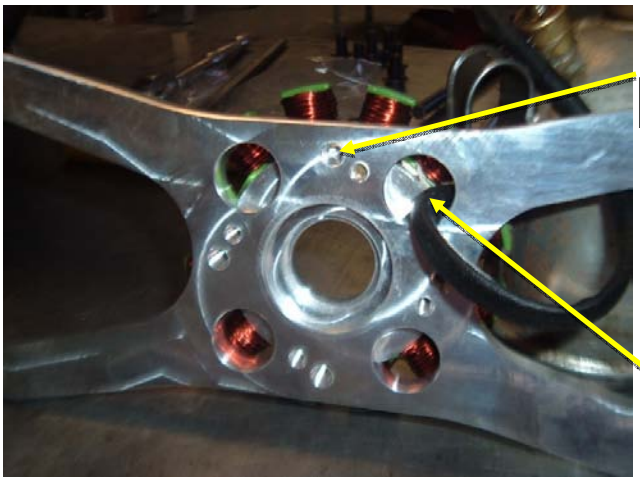


Figure 2 – Stator assembly removal

5. Cut string holding the harness to the stator assembly and straighten out the lead assembly. Slide back the black and while layers of insulation to expose the 2 terminals connecting the coil wires.

6. Unsolder coil wires from both terminals, as shown in Figure 3. Due to the size of these parts a large soldering iron or a small gas burner is recommended to get enough heat into the connection. Take care not to damage the insulating lacquer on the wires.

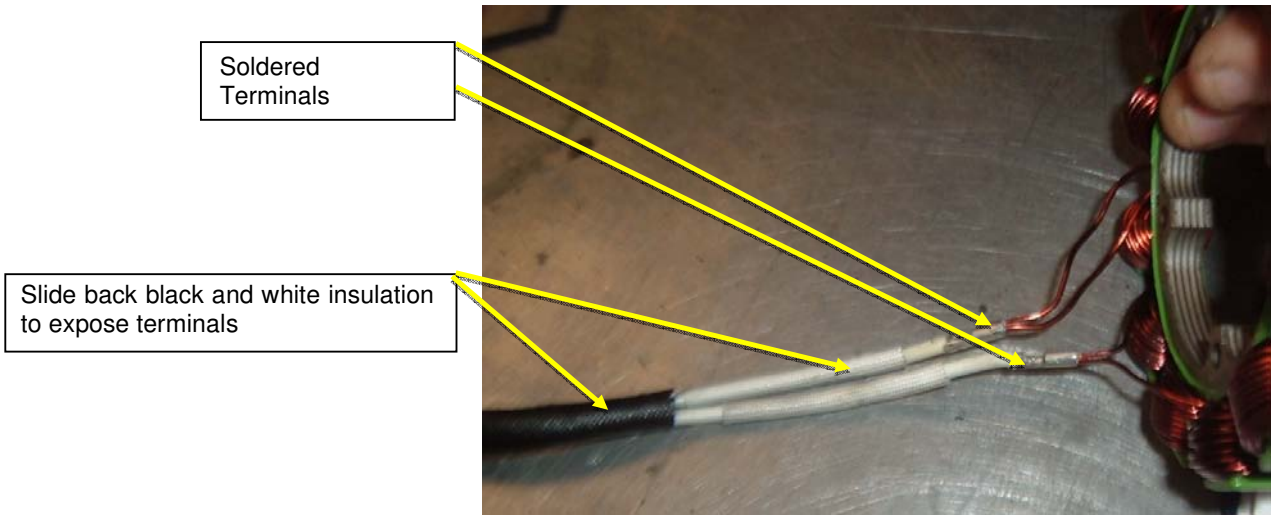


Figure 3 – Terminal exposure

7. With the coil wires exposed, use a multimeter to identify which wires have continuity and those that don't, a typical reading for each continuous wire will be 1.3 – 1.4 ohms. Multimeters equipped with continuity test features (beepers) can also be used, provided that the resistance threshold is set appropriately.

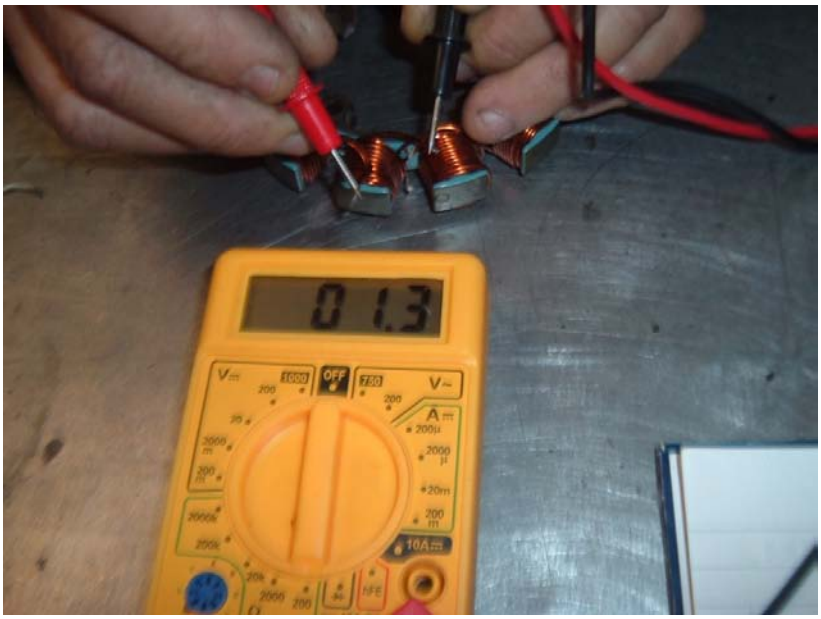


Figure 4 – Circuit identification

8. Twist any 2 wires together that do not have continuity, solder and insulate with heat shrink. Fold down between the coils. Take care that the connection is appropriately insulated, restrained and positioned: over time parts rubbing are likely to eventually damage the insulating lacquer on the wires and produce a short. Note that loads and vibrations applied to the alternator assembly from the magnets of the rotor are of relatively high magnitude and parts must be treated appropriately.

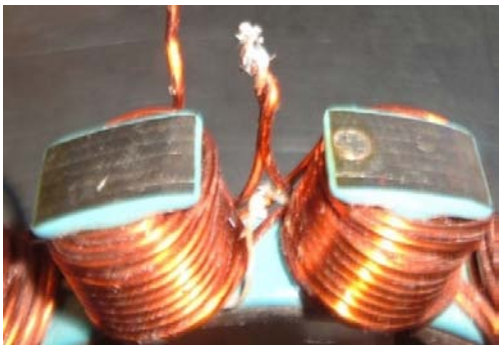


Figure 5 – Twisted wire connection

9. Insert the other 2 wires, one into each lead terminal and re-solder. Slide the white and black insulation back down over the soldered terminals and fold down between the coils over the previously joined pair of wires, as shown in Fig 6

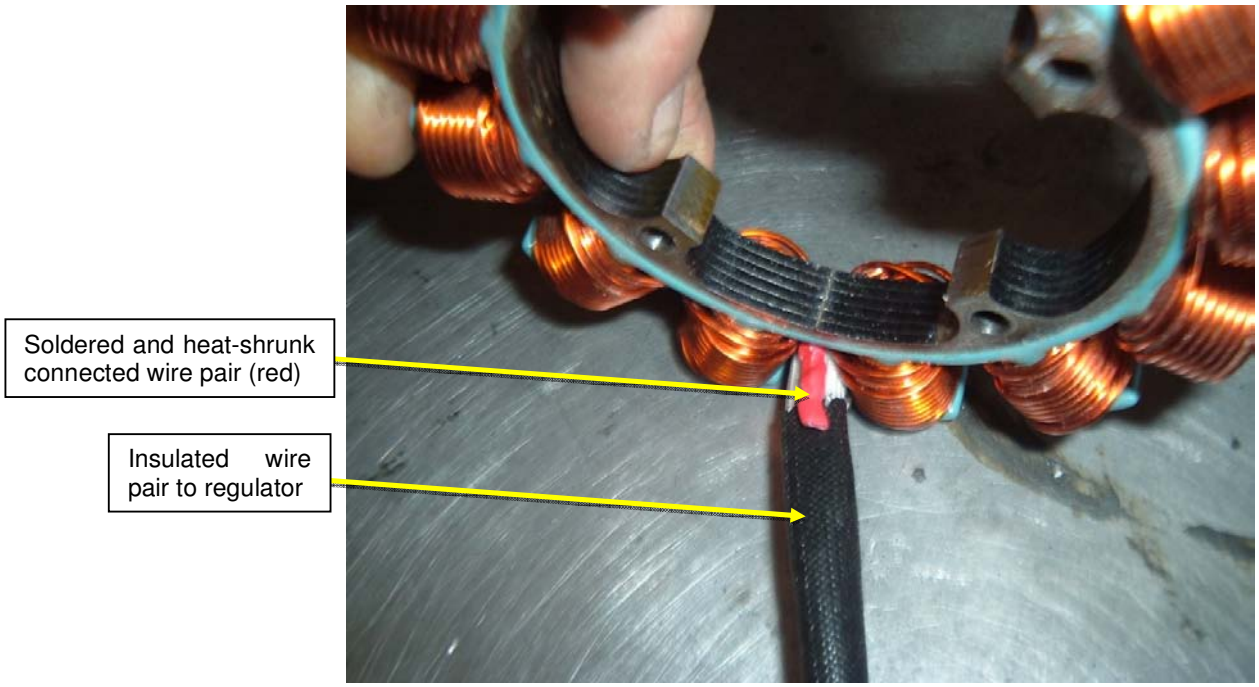


Figure 6 – Harness location

10. With some light string, tie down the harness to the adjacent coil windings as on the original assembly.

11. Check the resistance between the 2 terminals. Acceptable readings are 1.4 – 1.9 ohms.

12. Clean screws using a wire brush to remove Loctite residue. Clean threads in rear plate using a suitably sized thread tap to remove Loctite residue.

13. Refit stator assembly to rear plate of the engine in the same orientation as it was before removal. Use Loctite 620 sparingly (approx. 0.5 - 1 match-head per screw) on 4 securing screws as per the engine manual.

14. Assemble rear plate and stator to the engine. Replace wire ties and connect both harness terminals to the aircraft harness. Check that the terminals are a tight fit and secure when connected. If in doubt, fit new terminals: this connection is a common cause of charging issues and radio noise resulting from loose or poorly conductive connections. Insulate connection using heat shrink or good quality insulation tape.

15. Ensure ignitions are both in the OFF position and rotate the propeller by hand while monitoring the alternator assembly for any noise, rubbing or similar.

16. Reconnect battery.

17. Refer to manufacturer specifications and allow Loctite to cure before starting engine. Note that this may be accelerated using Loctite 7471 Cure Accelerator Spray or equivalent.

18. To check for correct operation, insert multimeter probes into the spade terminals of the stator harness while it is connected to the regulator. Place the multimeter inside the cockpit with the operator before starting the engine. Do not attempt to carry out this operation from outside the cockpit, or with any persons in the near vicinity of the spinning propeller.

19. An indication of 12 V AC at around 900 RPM indicates correct operation.

20. Remove the multi-meter and re-assemble the aircraft.

21. Refer to item 2.2 and complete the required log book entries.

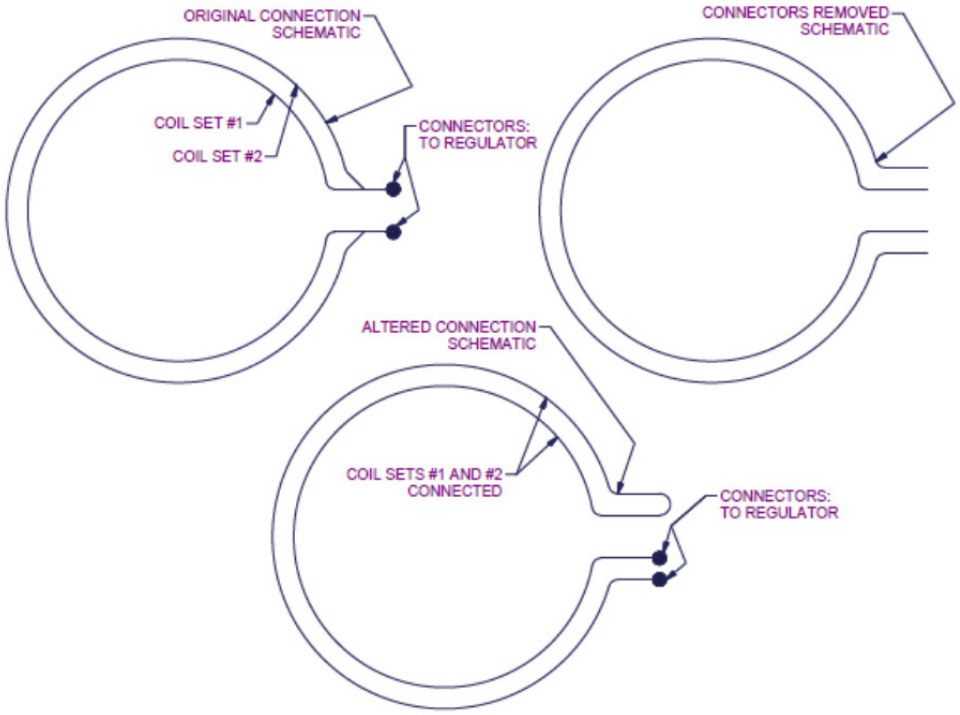


Figure 7 – Wiring Schematics