



Airmaster Propellers Ltd

Variable Pitch Constant Speed Propellers for Light Aircraft

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SERVICE BULLETIN

APL-SB-8

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Applicability: Propeller Models: All AP308
Serial Numbers: All up to No. 88

Compliance: Initial: At Operator's Discretion.
Subsequent: Nil.

**SUBJECT: UPGRADE OF PITCH CHANGE MOTOR
BRUSHES AND SPRINGS**

Reason

1. The commutator brushes and springs contained within the pitch change motor of the propeller have exhibited the following characteristics in some situations:
 - a. The braided copper leads to the brushes may fail in service after a period of time on some engine types, due to the high vibration environment and the light gauge of the leads. This leads to a failure of the pitch change motor.
 - b. The brushes may lift off the motor commutator due to a centrifugal effect combined with low tension springs, when the propeller is operated at high rotational speeds. This can lead to a loss of pitch control at high rotational speeds (ie above approximately 3000rpm propeller speed).
2. An alternative brush and spring assembly has been developed incorporating a brush with a substantially more robust lead, and a spring with higher tension. This assembly may be retrofitted to the same pitch change motor, while the motor is still on the propeller hub.

Materials and Parts Required

3. Included in the service bulletin kit are the following:
 - a. Replacement pitch change motor brush holder assembly, including brush holder, brushes, leads and springs.

- b. Two 'Permaseal' wire crimp sealed butt-splices (22-18AWG).
 - c. 50mm(2") length of 50mm(2")OD black heat-shrink.
4. The following additional materials are required:
- a. A neutral cure, flexible, non-slumping sealant. Suitable products include RTV silicone rubber sealant such as Dow Corning 737 or Dow Corning 3145.

Caution: Do not use an acid cure sealant such as some bathroom sealants. Acid cure sealants produce acetic acid as they cure, causing corrosion.

- b. General purpose medium strength thread-locking compound. Loctite product 'Threadlocker 243' is recommended.

Special Tooling required

5. Wire insulation stripping tool.
6. Crimping tool such as used by auto-electricians.
7. Heat-gun for use on heat-shrink. A blow-drier used on full heat may be satisfactory.

Action

8. Remove spinner and spinner front support.
9. Remove the motor pre-load screw (item 107) at the top of the motor housing.

Note: Item numbers refer to the item numbers used the AP308 Operator's Manual.

10. Remove the motor housing (item 55) from the propeller hub.
11. Carefully inspect the layout of the motor assembly found under the motor housing.
12. Remove the tape or heatshrink that is holding the two wires from the motor to the side of the motor body.
13. Remove the motor top support (item 56) from the top of the motor. This may be difficult due to the sealant applied to this part during manufacture. By using a hammer and a drift, and carefully tapping upwards around the lower edge of the motor top support, the part may be slowly removed.
14. Remove excess sealant from the inside of the motor top support and the top of the motor by carefully scraping it away.
15. Cut the two wires where they enter the motor.
16. Remove the black plastic end-cap from the end of the motor by unscrewing the two long motor assembly screws. Take care with this component, as it is delicate.
17. Carefully note the position of the components found under the motor end-cap, particularly the paper gasket and the thrust washers on the end of the motor shaft. Put the paper gasket to one side.

18. Using a small instrument such as tweezers, pull the existing brushes from between the springs and commutator. Remove the brushes and their leads from the brush holder. Then lift out the brush holder assembly complete with the springs.

Note: Some examples of pitch change motors were modified with flyweights used to supplement the action of the springs. Remove these also.

19. Take replacement brush holder assembly and fit to motor in same location as original. Note orientation of brush holder; lug on brush holder matches notch on motor body, and red wire protrudes from this same side.

20. Using tweezers, pull back spring, and position brush against commutator and in slot of new brush holder. Note the correct orientation; the brush should be positioned so that the lead exits the brush at the side furthestmost from the propeller hub, and the end of the spring should lie in the slot at the rear of the brush.

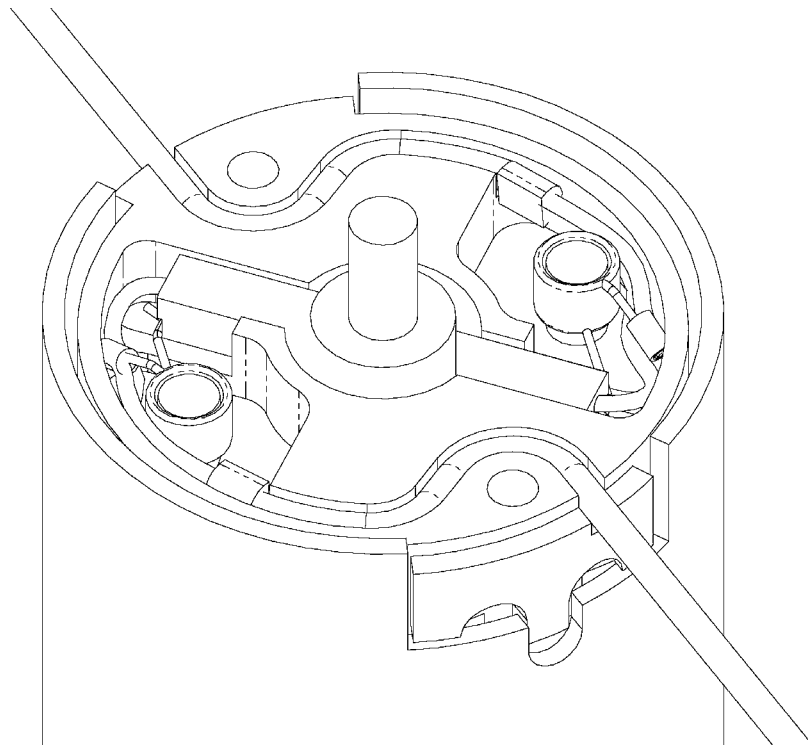


Figure 1 - Illustration of Replacement Brush Holder Assembly, with leads, brushes and springs positioned correctly

21. Ensure that the wires, brushes and springs are all positioned well, and do not protrude above the plastic brush holder. Push parts down into cavities provided if required.

22. Take black plastic motor end-cap that was previously removed from the motor. Modify this component by removing the protruding semi-circular lugs on the inner surface of the end-cap that previously mated with the spring posts of the old brush holder. This may be done by carefully cutting, sanding, grinding or filing away the lugs. If possible, avoid removing the small lug at one side of the end-cap that corresponds to the positive lead of the motor.

23. Replace the paper gasket in the same position. Ensure that the thrust washers on the end of the motor shaft are in the same position as previously.

24. Replace the motor end-cap (now modified as above). Note orientation; the positive marking and corresponding lug goes on the side of the red lead. Install the two long motor assembly screws with thread-locking compound. Only tighten these screws gently, as the motor end-cap is delicate and prone to cracking if these screws are over-tightened.
25. Temporarily connect the pitch change motor to the control system by twisting together the new leads from the motor and the previously cut leads from the pitch feedback micro-switches (remember to match the colours of the wires). Using the manual mode of the control system, operate the pitch change motor and pitch change mechanism in both directions through the full range of movement. Ensure that the motor operates correctly, and at a normal pitch change rate, without producing a laboured sound from the motor. Ensure that the pitch change mechanism operates in the correct sense or direction.
26. As the mechanism is moved through the pitch range during the previous step, observe the movement of the two stainless steel pitch feedback rods that act on the two micro-switches. Note the space that the rods may occupy, to ensure clearance later.
27. Prepare the wires for joining. The new leads from the motor should be terminated approximately 1.5in(38mm) from where they exit the motor. The previously cut leads from the pitch feedback micro-switches should be terminated approximately 3.0in(76mm) from where they leave the micro-switches. Strip the insulation on the wires to approximately 0.2in(5mm) from the end of the wires.
28. Use the wire crimp splices provided to join the red wires together and the black wires together. The splices are covered by heat-shrink material, and this should be shrunk to complete the splice by the application of heat from a heat-gun.
- Note: On early examples of the AP308 propeller, insufficient room may exist under the motor housing to accommodate the splices provided. These housings are identified by the step transition from large to small diameter occurring approximately half way along the length of the housing, compared with more recent examples where this transition occurs approximately 3/4 of the way along the length of the housing.
- Note: In this case an alternative wire joining method that uses less room such as soldering may be used. Ensure that the joint is well protected by using heat-shrink.
29. Place a small amount of sealant on the inner cylindrical surface of the motor top support, where it mates with the body of the motor.
30. Refit the motor top support, taking care to align the slots in the support with the wires protruding from the motor. The support should be carefully slid over both the end of the motor and the wires.
31. Arrange the joined wires and splices about the body of the motor so as not to interfere with the movement of the pitch feedback rods. The splices should be orientated parallel to the axis of the motor. A small amount of tape may be used to position the wires and splices correctly in preparation for the next step.
32. Use the band of heat-shrink provided to secure the splices and wires to the body of the motor.

33. Using the manual mode of the control system, operate the pitch change motor and pitch change mechanism in both directions through the full range of movement. Ensure that the motor operates correctly, and that wires do not interfere with the movement of the pitch feedback rods.
34. Refit the motor housing to the propeller hub with the six screws. Lock the six screws with 0.024" lock-wire.
35. Re-fit and tighten the motor pre-load screw at the top of the motor housing. To do this, wind the screw in until it bottoms out and will turn no further. (Note that the screw will have some resistance to turning, as it is installed in a locking type wire thread insert.) Then back the screw out one half of a turn.
36. Refit spinner front support and spinner.

Recording

37. Record completion of service bulletin APL-SB-8 'Upgrade of Pitch Change Motor Brushes and Springs' in propeller logbook.