Manufacturer's Warranty Provision

Effective January 1, 1948

Manufacturer warrants all new propeller assemblies and all parts manufactured by it, to be free from defects in material and workmanship under normal use and service. Manufacturer's obligation is limited to the replacement or repair of any part or parts which its examination shall disclose to its satisfaction to have been thus defective and which are returned, with transportation charges prepaid, either to the manufacturer or to an authorized AEROMATIC service station within 90 days after such propeller has been installed by the original purchases or before such propeller has been flown 50 hours, whichever period is shorter. Any part so replaced or repaired will be installed without charge at either the factory or the authorized AEROMATIC service station and shipped transportation charges collect. With respect to parts not manufacturer by it incorporated in the propellers or sold separately, Manufacturer makes no warranty except that it will extend such warranties as the respective manufacturers of the parts permit. This warranty is expressly in lieu of all other warranties, express, implied or created by law, and any other obligations or liabilities on the part of the Manufacturer, and it neither assumes, nor authorizes any dealer or other person to assume for it, any other liability in connection with such propeller, parts, equipment and accessories.

Koppers Company, Inc.
Aeromatic Propeller Dept.
Baltimore 3, Maryland

Next: General Description

General Description

1. General Description

The Aeromatic propeller is a two-blade variable-pitch unit which is entirely self-contained.

The single-piece hub of chrome-nickel-moly steel retains blades flanges on large ball thrust bearings. A synchronizer gear between the blade flanges co-ordinates their movements. Adjustments for pitch range, balance and lubrication are all accessible externally.

Blades for the Aeromatic are made of thin lamination of maple or birch bonded with thermal-setting resin to provide a structure stronger than a natural wood blade. AEROLOID plastic sheeting is pressure bonded to the exterior of the blade for protection against abrasion and moisture absorption.

Monel leading edge tipping is applied over the AEROLOID plastic to protect the leading edge of the blades. Threaded ferrules are affixed to the blade butts by the standard lag screw method of blade retention. The threaded feature allows the blades to be removed from the hub without disassembly.

Next: Operating Characteristics

Operating Characteristics

II. Operating Characteristics

The fully automatic operation of the AEROMATIC propeller eliminates the use of any controls from the pilot or engine on the model 220. The natural, physical forces acting on the blades and counterweights are utilized to accomplish the desired pitch change. Substantial performance advantages are made possible with the Aeromatic due to the greatly increased propeller and engine efficiencies afforded by automatic operation. Prevention of engine damage as well as maximum operating economy is attained through automatic response to changing conditions of flight.

The airplane-engine-propeller combination has previously been flight tested to determine the proper angular relationship of blade and counterweight arm for any particular C.A.A. approved installation. This setting is held permanently by the use of the counterweight arm clamping action around the blade flange and blade ferrule. A counterweight arm locating screw passes through this entire assembly to insure the proper reassembly when the propeller has been disassembled.

Take-off -- At take-off the blades move to low pitch automatically permitting the engine to develop full take-off power.

Climb -- Best climb power is maintained as the propeller automatically adjusts pitch to correspond to correct climbing speed.

Cruise -- Economical cruise power is maintained as the Aeromatic selects the most advantageous pitch at all normal altitudes.

Landing -- In the event of overshooting during landing, full throttle will locate the blades in low pitch, making take-off power immediately available.

Models 220-1 and 220H are modified versions of the Model 220 with Aeromatic Hi-Cruise control assemblies. The model 220-1 Hi-Cruise control is actuated manually through a control cable and bell crank.

The Model 220H Hi-Cruise pitch change mechanism is actuated by a hydraulic cylinder, which is operated by engine oil pressure controlled through a special control valve.

The Hi-Cruise control unit permits a selective pitch change range of several hundred RPM. This feature is of exceptional value when the airplane is flown at altitudes above 5000 feet. This feature also permits the choice of using the propeller as a standard Aeromatic or as a selective RPM propeller.

Next: RPM Regulation

RPM Regulation

III. RPM Regulation

Adjustment of the Aeromatic propeller for control of engine speed is termed "regulation." This regulation is accomplished as outlined in the following paragraphs.

1. Static RPM

The ground (static) RPM of the engine is adjusted by the addition or removal of laminated shims between the head of the low-pitch stop bolt and the stop bolt boss on the side of the hub barrel. These shims are laminated so that the thickness may be reduced in increments of .002 inch at a time. The low-pitch stop bolts and bosses are stamped "1L" for the No. 1 blade and "2L" for the No. 2 blade. Corresponding marks "1H" and "2H" indicate high-pitch stops for No. 1 and No. 2 blades. These stops are located diagonally from each other on the same side of the hub.

ADD SHIMS TO INCREASE RPM
REMOVE SHIMS TO DECREASE RPM

For instance, a shim .030 inch thick will change the RPM approximately 100 when added or removed. Correspondingly, thinner or thicker shims will cause proportionate speed changes.

Note: On the geared Lycoming engine Model GO-435-C series all the RPM values will be approximately 1/2 of those given in this booklet. This concerns regulation only.

2. Flight RPM

This flight RPM of the engine is adjusted by the addition or removal of counterweights on the counterweight arms.

REMOVE WEIGHTS TO INCREASE RPM
ADD WEIGHTS TO DECREASE RPM

To Pick Up	Remove Counterweight
25 RPM	(1) No. 2965-1
50 RPM	(1) No. 2965-2
100 RPM	(1) No. 2965-3

For instance, removal of counterweight No. 2965-1 will cause an increase of approximately 25 RPM, while removal of counterweight No. 2965-2 will effect a change of 50 RPM. Determination of flight RPM is conducted with full throttle at level flight position with maximum air speed as close to field elevation as practical.

Note: Always add or remove the same amount of weights from both counterweight arms.

When the Hi-Cruise control is installed on either Model 220-1 or 220H, the following additional flight test should be made after the propeller is completely adjusted as an Aeromatic:

1. All Aeromatic regulation should be made with the pitch control handle in full aft position.
2. With the control handle full forward, make a flight holding best climb speed immediately after take off. At this airspeed the engine RPM should be the manufacturer's full throttle rated RPM. The full throttle climb RPM should be adjusted to maximum RPM regardless of the field elevation at point of take-off.

If the climb RPM is too low, the thrust button screws located on the counterweight arm should be lengthened - that is, screwed outward from the bracket and toward the engine. If the RPM is too high with control handle full forward at best climb speed, shorten the thrust button adjustment.

One complete turn of this thrust button screw will make approximately 100 RPM change.

3. Caution

Your Aeromatic propeller is a precise and well-made mechanism and should be treated as such to insure long life and high performance. Its makers, in cooperation with your aircraft manufacturer, have determined the correct adjustments to provide you maximum performance. These adjustments must not be altered except for certain minor RPM changes. When these adjustments are necessary, follow instructions carefully. Remember:

Static RPM is adjusted by stop bolt shims
Flight RPM is adjusted by counterweights.

Shims and counterweights may be obtained from your local dealer or distributor or by writing directly to the Aeromatic Service Section in Baltimore, Maryland.

Next: Adjustment for Continued High Altitude Airport Operation

Adjustment for High Altitude Airport Operation

IV. Adjustment For Continued High Altitude Airport Operation - For Model 220

Whenever the Aeromatic is to be operated from a field located at 5,000 feet altitude or over, a readjustment of counterweights should be made in order to increase the power made available by adjusting RPM to slightly under rated engine speed. This adjustment is accomplished by removing counterweights to compensate for power losses in addition to the natural function of the Aeromatic to drop off slightly in RPM with altitude.

To pick up RPM losses sustained by increased altitude, consult the following data:

To Pick Up	Remove Counterweight
50 RPM	(1) No. 2965-2
100 RPM	(1) No. 2965-3
200 RPM	(1) No. 2965-4

Propeller regulation should be conducted as close to the field elevation as practical at full throttle level flight maximum air speed.

2. Adjustment for High to Low Airport Operation

If operation is to be resumed at a lower altitude airport after the above adjustment for high altitude operation has been made, it is necessary to add the weights previously removed in order to prevent over-speeding of the engine. Do not allow engine RPM to exceed the manufacturer's rated RPM at lower altitudes.

Next: Lubrication

Lubrication

V. Lubrication

The Aeromatic propeller is lubricated by a special lubricant which has been tested to assure good lubrication, also to protect the hub seals. This 5M lubricant is available at all Aeromatic Service Stations, or a lubricant of equal quality may be obtained from your local Shell dealer, known as AeroShell oil 5M.

The Aeromatic propeller Models 220, 220-1, and 220H must be checked for lubricant every fifty (50) hours.

To check the lubricant or to add lubricant, turn the propeller to a horizontal position with the filler plug on the top side of the hub. Remove the plug and fill with lubricant, using the special spout provided with each can of Aeromatic 5M lubricant.

Note: Do not use high pressure lubricant guns because the seals may be damaged by excess pressure.

The Hi-Cruise thrust bearing should be lubricated every 25 hours with ANG-25 grease, Lubriplate No. 105 or Aero Shell grease No. 6 or No. 11. A small amount of this lubricant should also be placed on the bronze hub bushing at the thrust plate.

Rotate the thrust bearing housing so that the cam slots on the mounting flange are exposed. Apply a liberal amount of rocker arm grease to these cam slots.

During the first few hours of flight, white or gray streaks may appear on the blade shanks. This does not indicate grease leakage; it is caused by assembly lubricant which was applied to the blade ferrules. Wipe off with a soft cloth.

Next: Propeller Removal and Blade Maintenance

Propeller Removal and Blade Maintenance

1. Propeller Removal

To remove the propeller, release the safety locking clevis pin and turn the propeller nut in a counterclockwise direction with a conventional propeller bar until the propeller nut is free of the threads on the crankshaft. Then remove the propeller in a conventional manner as there are no other attachments between the propeller and the engine.

2. Blade Maintenance

(a) Field maintenance of blades consists of principally of repairing any scars or nicks in the plastic AEROLOID covering. Such nicks and scars as developed may be repaired by using a Plastic Repair Kit, Part No. 2001, obtained from your local airplane dealer, distributor or directly from the Aeromatic Service Section, Baltimore, Maryland. Complete instructions are included with the kit. It is recommended that particular care of blade surfaces be maintained in order to receive efficient propeller and airplane performance.

(b) Blades that have been in service for several years may show an apparent grain structure through the Aeroloid plastic covering. This is due to the glue lines of the 1/16 inch laminated wood used in the blade construction and in no way indicates a defect or weakness in the propeller blade.

3. Blade Replacement

Aeromatic blades are match-balanced in pairs. One damaged blade can be rematched with a new one at any Aeromatic authorized service station or at the factory.

Due to special tools and equipment required, blade replace will be confined to service stations and to the factory.

Aeromatic Tips

This is a collection of operational tips I've run across for Aeromatic propellers.

Good Overhaul Shops and Advice

There are very few folks in the world who understand Aeromatic propellers. The two I've had experience with are:

- Kent Tarver, who currently owns the Aeromatic type certificate. Mr. Tarver is working to get FAA approval for manufacturing new parts for Aeromatics. He's very helpful. Mr. Tarver's contact information is at http://www.aeromatic.com.

- Aero Propeller in Hemet California is known for overhauling Aeromatics. They overhauled the one that I have in 1996. Recently, however, many folks have been having bad experiences with Aero Propeller. I recommend that you ask around before sending them your prop.

For info, try some of the type clubs of aircraft that use Aeromatics, such as Globe Swifts, Fairchild 24s, and the occasional Stinson 108.

Modern Equivalent for Hub Fluid

The Aeromatic manuals call for Aeromatic 5M fluid. Since this Aeromatic company no longer exists you cannot get this fluid. Kent Tarver says that the modern equivalent is SAE 70 to 90 gear oil. Specific brands include Chevron RPM Universal Gear Lubricant 80W-90, or Shell SPIRAX S Gear Oil 75S-90

Leaking Fluid

Aeromatics just leak. This is the verdict from everybody I've ever talked to. You can try to replace the seals by completely disassembling the hub, but it will probably start to leak again within a few hours of service.

Service Bulletin for Wood Rot

Aeromatic propeller blades are made out of wood cores covered with a plastic coating. Wood propeller blades are quite strong and reliable, as wood does not fatigue and tends not to have the vibration resonance problems that metal propellers can have.

Wood will, however, rot if subjected to too much or too little moisture. On the Aeromatic it is also possible for the attachment lag screws that hold the wooden blade cores to the metal blade butt flanges to corrode. Because the Aeromatic wooden core is covered in plastic it can be difficult to inspect the condition of the material. Severely neglected propellers have been known to depart the airplane while in operation. Tarver issued a service bulletin in 2000 with inspection procedures.

Prop Nut Torque

On a Cessna Airmaster, you get good at installing and removing the propeller since that's the only way to get the propeller off. The manuals are unclear on the proper torque for the prop nut. The correct torque seems to be in the range of 400 ft/lbs. I use a 3 foot bar, which then requires 133 lbs of force.

Field Service Manual

See also the Aeromatic Field Service Manual.