Propeller Owner/Operator Information Manual

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(3) Following is a breakdown of each of the propeller assemblies:
   (a) Propeller Hub Assembly
      1 The propeller hub is a single-piece hollow forged aluminum assembly incorporating three, four or five propeller blade sockets. The propeller blade sockets are O-ring sealed to prevent leakage. The rear hub face has threaded studs and dowel holes for alignment and proper mounting to the engine propeller shaft flange. The cylinder is mounted to the hub face using screws and is O-ring sealed to prevent leakage.
   (b) Propeller Blades
      1 The propeller blades are made of solid forged aluminum. A set of steel split retainers (inside the hub) secures each blade in the hub at the propeller blade sockets. Each blade rotates about its axis on a bearing assembly during pitch change and is match-balanced to the other blades. The propeller assembly is static balanced, using balance weights mounted with screws to the blades.
   (c) Piston and Cylinder Assembly
      1 The piston and cylinder assembly (through the feather springs, counterweights, and oil pressure transferred through the piston rod) provide the forces necessary to accomplish propeller blade pitch changes.
   (d) Counterweights
      1 Counterweights are attached to the blades to assist the feathering spring (located in front of the piston and cylinder assembly) in feathering the propeller blades by means of centrifugal force whenever the propeller is rotating and oil pressure in the cylinder is removed.
   (e) Internal Lubrication
      1 The propeller hub cavity is partially filled with turbine oil which is sealed in the hub and isolated from engine oil. This oil provides lubrication and corrosion protection to blade bearings and other internal parts. The oil is dyed red on some models to aid in the troubleshooting of suspected propeller leaks.

         NOTE: Periodic maintenance of the lubrication is NOT normally required.

   (f) Propeller Start Lock (C600, C650, and C1100 Series only).
      1 The propeller has a start lock mechanism installed within the cylinder. The mechanism includes latching weights which will engage a fixed stop to block movement of the piston in the direction of increasing blade pitch beyond a predetermined start lock blade angle. Latch engagement is possible only when the engine is shut off on the ground. When the propeller is rotating, the latch weights move out by centrifugal force so as to offer no interference to operation of the control system in flight. During all normal operating conditions, the weights are in a disengaged position and offer no resistance to feathering, unfeathering, or reversing of the propeller.

         NOTE: Special tools (McCauley part number B-5021/2) are required to release start locks manually for maintenance purposes.

B. Description of Turbine Propeller Operating Principles
   (1) Propellers are a single acting unit in which hydraulic pressure opposes the forces of springs and counterweights to obtain the correct pitch for engine load. Hydraulic pressure urges blades toward low pitch (increasing RPM), while springs and counterweights urge blades toward high pitch (decreasing RPM).

C. The propeller is designed to operate in two modes of operation - beta mode and governor mode:
   (1) Governor Mode - Oil is metered to and from the propeller (by governor control valve as positioned by flyweights), increasing and decreasing blade angle (changing pitch) as required when the propeller speed control setting is altered, or increasing and decreasing pitch to control and stabilize engine speed with varying power conditions or flight attitudes with a fixed speed setting.
   (2) Beta Mode - The pilot may select beta mode for ground reversing or taxi operation by means of the aircraft engine mechanical linkage. The linkage repositions the propeller reversing lever and beta valve to provide access for high pressure oil to reach the propeller piston and move the blades toward reverse pitch.

D. A Crack is an irregularly shaped separation within a material at a location of excessive stress and usually is visible as a thin line across the surface of the material.

E. A Cut is a mechanical loss of metal (e.g., by saw blade, chisel, or glancing blow of a sharp-edge stone), usually extending to a significant depth over a relatively long, narrow area.

F. A Dent is a depression in a metal surface caused by an object striking the surface with force.

NOTE: The surface around the dent usually will be sightly deformed.

G. Distortion or bending is the alteration of a component's original size or shape.

H. Erosion is the gradual wearing away or deterioration of a material due to action of the elements.

I. Exposure is leaving a material open to action of the elements.

J. Fretting is the occurrence of shallow, spherical surface depressions, usually caused by vibratory ("chattering") action or by a part which has a small radius in contact under high load with the material.

K. Galling (or burnishing) is the breakdown (or buildup) of a metal surface resulting from excessive friction between two moving parts.

NOTE: Particles of the softer metal tear loose (breakdown) and weld to the surface of the harder metal (buildup).

L. A Gouge is a small surface area where material has been removed by contact with a sharp object.

M. Impact damage occurs either in-flight or on the ground when a propeller blade or hub assembly strikes or is struck by an object.

N. An Inclusion is the presence of an unspecified material that was introduced into a portion of stock metal during manufacturing processes such as rolling or forging.

O. A Nick is a localized break or edge notch, usually with displacement of (rather than loss of) metal.

P. Pitting is seen as a number of extremely small (possibly deep) gouges, usually with defined edges, caused by wear and/or deterioration on the surface of a material.

Q. A Score is deeper than a gouge and may show discoloration from the temperature produced by friction from contact under pressure.

R. A Scratch is an elongated Gouge.

S. A Stain is a localized color change noticeably different from the surrounding surface area.

3. Daily or Preflight Inspection

A. Oil and Grease Leakage.
   (1) Look for red oil or engine lubricant leaks in unusual places, like the outside surfaces and seals.
   (2) Oil or grease leakage may be due to a seal failure or a crack in the hub or blade.
      (a) The source of the oil or grease leak should be determined before flight.
      (b) During maintenance, wipe the surfaces of the propeller after this inspection, not before, since oil leaking from a crack may assist in detecting it.
      (c) Red oil gives a positive warning of a crack in the hub or a damaged seal.

B. Blade inspection.
   (1) Wash the blades with a mild soap and water solution to remove all residue.

CAUTION: Do not use solvents to clean the blades.

      (a) Do not power wash as water may be forced past the O-rings. Water inside the hub will cause corrosion and may cause propeller failure.
      (b) Make sure the blade that you are cleaning is pointing down.
      (c) Do not spray into the blade retention area because water may be forced into the hub.

(2) Surface Damage.
  (a) Look for surface damage on both sides of the blades such as dents, nicks, scratches, and corrosion.
  (b) Surface imperfections can also be felt by running your fingernail along the blade leading edge. Damage should be repaired before flight.
  (c) Whenever a noticeable dent, nick, corrosion pit, or bump is observed, an appropriately rated mechanic should blend it out.
  (d) The mechanic should remove all corrosion products and make sure that the section thickness has not been reduced below allowable limits.

(3) Erosion.
  (a) Examine the blade for evidence of erosion.
    1 If blades appear to show erosion beyond limits, the propeller should be removed from service and evaluated by an appropriately rated propeller repair facility.
    2 Measure the area of the blade with the most erosion damage.
      a Damage that is located on the leading or trailing edges must not exceed 0.094 inch (2.39 mm) in depth.
      b Damage that is located on a repairable area of the face or camber side of the blade must not exceed 0.061 inch (1.55 mm) in depth.
    3 Erosion damage beyond these limits is not field repairable and the propeller should be removed from service and evaluated by an FAA approved Part 145 Propeller Repair Station or international equivalent repair facility.
  (b) Check the condition of the paint on blades and spinners that have protective paint.
    1 Paint protects the surface of the blade from erosion. The blade should be repaired before the paint wears through and the blade structure begins to erode.
    2 Do not apply excessive paint and do not paint propeller components unless it is in accordance with McCauley instructions since improper painting may affect propeller balance, operation, static electricity discharge, or have other unintended consequences.

(4) Straightness.
  (a) Sight down the edges to find any deformation.

(5) Looseness.
  (a) Feel the blades and move them to find unusual changes in looseness and unusual play.
    1 Blade-to-blade differences indicate that an internal problem may exist.

C. Spinner and Bulkhead.
(1) Externally check the spinner and bulkhead for security, missing fasteners, damage, and cracks. Cracks typically originate from the attachment screws.
  (a) Repair of cracks is not permitted.
(2) Check for looseness of the bulkhead. This could be an indication that the mounting bolts are loose.
(3) Wear depth on the inside of the spinner must not exceed 0.010 inch (0.25 mm).

NOTE: Wear inside the spinner can be caused by improper shimming of the spinner or by deice leads rubbing.

D. General Condition.

E. Control System.
(1) The control system (governor) should be checked to determine whether the system is operating properly and is not leaking.

F. Maintenance Records.
(1) Note any indications in the logbook for future reference to determine whether a condition is getting worse.

4. 100 Hour and Annual Inspection

A. At each 100 hours, Annual, or other approved inspection interval, examine the propeller in accordance with aircraft inspection manual. Inspection should include:
(1) Spinner Removal.