SECTION 5. INSPECTION OF PROPELLERS

8-91. GENERAL. All propellers, regardless of the material from which they are made, should be regularly and carefully inspected for any possible defect. Any doubtful condition, such as looseness of parts, nicks, cracks, scratches, bruises, or loss of finish should be carefully investigated and the condition checked against repair and maintenance specifications for that particular type of propeller. Any propeller that has struck a foreign object during service should be promptly inspected for possible damage in accordance with the propeller manufacturer's prescribed procedures and, if necessary, repaired according to the manufacturer's instructions. If the propeller is damaged beyond the repair limits established by the propeller manufacturer, and a replacement is necessary, install the same make/model approved or alternate as specified in the equipment list, applicable FAA Aircraft Specification, Type Certificate Data Sheet (TCDS), or Supplemental Type Certificate (STC). A sample manufacturer's propeller inspection checklist is shown in table 8-2. It shows the items to be inspected and the inspection intervals.

8-92. WOOD OR COMPOSITION PROPELLERS AND BLADES. Wood propellers are usually found on low-power, reciprocating engines while composition (Carbon fiber, Kevlar) propellers are used on high horsepower reciprocating and turbine engines. Due to the nature of wood, these propellers should be inspected frequently to assure airworthiness. Inspect for defects such as cracks, dents, warpage, glue failure, delamination defects in the finish, and charring of the wood between the propeller and the flange due to loose propeller mounting bolts. Composition propellers should be inspected in accordance with the propeller manufacturer's instructions.

a. Fixed-pitch propellers are normally removed from the engine at engine overhaul periods. Whenever the propeller is removed, visually inspect the rear surface for any indication of cracks. When any defects are found, disassemble the metal hub from the propeller. Inspect the hub bolts for wear and cracks at the head and threads, and if cracked or worn, replace with new equivalent bolts. Inspect for elongated bolt holes, enlarged hub bore, and for cracks inside the bore or anywhere on the propeller. Repair propellers found with any of these defects. If no defects are found, the propeller may be reinstalled on the engine. Before installation, touch up with varnish all places where the finish is worn thin, scratched, or nicked. Track and balance the propeller, and coat the hub bore and bolt holes with some moisture preventive such as asphalt varnish. In case the hub flange is integral with the crankshaft of the engine, final track the propeller after it is installed on the engine. In all cases where a separate metal hub is used, make a final balance and track with the hub installed on the propeller.

b. On new, fixed-pitch propeller installations, inspect the bolts for proper torque after the first flight and after the first 25 hours of flying. Thereafter, inspect and check the bolts for proper torque at least every 50 hours. No definite time interval can be specified, since a bolt's proper torque is affected by changes in the wood caused by the moisture content of the air where the airplane is flown and stored. During wet weather, some moisture is apt to enter the propeller wood through the holes drilled in the hub. The wood then swells, and because expansion is limited by the bolts extending between the two flanges, some of the wood fibers become crushed. Later, when the propeller dries out during dry weather or due

TABLE 8-2. Sample manufacturer's propeller inspection checklist.

Nature of Inspection	Engine Operating Hours			
PROPELLER GROUP	50	100	500	1000
1. Inspect spinner and back plate for cracks	0	0	0	0
2. Inspect blades for nicks and cracks	0	0	0	0
3. Check for grease and oil leaks	0	0	0	0
4. Lubricate propeller per Lubrication Chart	0	0	0	0
5. Check spinner mounting Brackets for cracks		0	0	0
6. Check propeller mounting bolts and safety (Check torque if safety is broken)		0	0	0
7. Inspect hub parts for cracks and corrosion		0	0	0
8. Rotate blades of constant speed propeller and check for tightness in hub pilot tube		0	0	0
9. Remove constant speed propeller; remove sludge from propeller and crankshaft			0	0
10. Inspect complete propeller and spinner assembly for security, chafing, cracks, deterioration, wear and correct installation		0	0	0
11. Check propeller air pressure (at least once a month)	0	0	0	0
12. Overhaul propeller				0

to heat from the engine, a certain amount of propeller hub shrinkage takes place, and the wood no longer completely fills the space between the two hub flanges. Consequently, the hub bolts become loose.

c. In-flight tip failures may be avoided by frequent inspections of the metal cap, leading edge strip, and surrounding areas. Inspect for such defects as looseness or slipping, separation of soldered joints, loose screws, loose rivets, breaks, cracks, eroded sections, and corrosion. Inspect for separation between the metal leading edge and the cap, which would indicate the cap is moving outward in the direction of centrifugal force. This condition is often accompanied by discoloration and loose rivets. Inspect the tip for cracks by grasping it with the hand and slightly twisting about the longitudinal blade centerline and by slightly bending the tip backward and forward. If the leading edge and the cap have separated, carefully inspect for cracks at this point. Cracks usually start at the leading edge of the blade. A fine line appearing in the fabric or plastic may indicate a crack in the wood. Check the trailing edge of the propeller blades for bonding, separation, or damage.

d. Examine the wood close to the metal sleeve of wood blades for cracks extending outward on the blade. These cracks sometimes occur at the threaded ends of the lag screws and may be an indication of internal cracking of the wood. Check the tightness of the lag screws, which attach the metal sleeve to the wood blade, in accordance with the manufacturer's instructions. Inspect and protect the shank areas of composition blades next to the metal sleeve in the same manner as that used for wood blades.

8-93. METAL PROPELLERS AND BLADES. These propellers and blades are generally susceptible to fatigue failure resulting from the concentration of stresses at the bottoms of sharp nicks, cuts, and scratches. It is necessary, therefore, to frequently and carefully inspect them for such injuries. Propeller manufacturers publish SB's and instructions which prescribe the manner in which these inspections are to be accomplished. Additional information is also available in AC 20-37D, Aircraft Metal Propeller Maintenance.

a. Steel Blade Inspection. The inspection of steel blades may be accomplished by either visual, fluorescent penetrant (see chapter 5), or magnetic particle inspection. The visual inspection is easier if the steel blades are covered with engine oil or rust-preventive compound. The full length of the leading edge, especially near the tip, the full length of the trailing edge, the grooves and shoulders on the shank, and all

dents and scars should be examined with a magnifying glass to decide whether defects are scratches or cracks.

b. Aluminum Propellers and Blades. Carefully inspect aluminum propellers and blades for cracks and other flaws. A transverse crack or flaw of any size is cause for rejection. Multiple deep nicks and gouges on the leading edge and face of the blade is cause for rejection. Use dye penetrant or fluorescent dye penetrant to confirm suspected cracks found in the propeller. Refer any unusual condition or appearance revealed by these inspections to the manufacturer.

c. Limitations.

(1) Corrosion may be present on propeller blades in varying amounts. Before performing any inspection process, maintenance personnel must examine the specific type and extent of the corrosion. (See chapter 6, and/or refer to AC 43-4A, Corrosion Control For Aircraft.)

(2) Corrosion, other than small areas (6 square inches or less) of light surface type corrosion, may require propeller removal and reconditioning by a qualified propeller repair facility. When intergranular corrosion is present, the repair can be properly accomplished only by an appropriately certificated propeller repair facility. Corrosion pitting under propeller blade decals should be removed as described in the propeller manufacturer's SB's and applicable airworthiness directives (AD).

(3) Unauthorized straightening of blade, following a ground strike or other damage, can create conditions that lead to immediate blade failure. These unapproved major repairs may sometimes be detected by careful inspection of the leading edges and the flat face portion of the blade. Any deviation of the flat portion, such as bows or kinks, may indicate unauthorized straightening of the blade. Sighting along the leading edge of a propeller blade for any signs of bending can provide evidence of unapproved blade straightening. Blades should be examined for any discoloration that would indicate unauthorized heating. Blades that have been heated for any repair must be rejected, since only cold straightening is authorized. All blades showing evidence of unapproved repairs should be rejected. When bent propellers are shipped to an approved repair facility for inspection and repair, the propeller should never be straightened by field service personnel to facilitate shipping, because this procedure can conceal damage. Propeller tip damage will sometimes lead maintenance personnel to consider removing damaged material from the blade tips. However, propellers are often manufactured with a particular diameter to minimize vibration. Unless the TCDS and both the engine and propeller manufacturers specifically permit shortening of the blades on a particular propeller, any shortening of the blades would probably create an unairworthy condition. When conditions warrant, inspect the blade tips for evidence of shortening and, if necessary, measure the propeller diameter to determine if it has been changed by an unauthorized repair.

8-94. PROPELLER HUB.

a. Fixed Pitch.

(1) Inspection procedures require removal of the propeller spinner for examination of the prop hub area. Cracks may be present in the hub area between or adjacent to bolt holes and along the hub pilot bore. Cracks in these areas cannot be repaired and require immediate scrapping of the propeller.

(2) Propeller attach bolts should be examined for looseness or an unsafetied or cracked condition. Cracked or broken bolts are usually the result of overtorquing. Correct

torquing procedures require all bolt threads to be dry, clean, and free of any lubrication before torquing.

b. Controllable Pitch.

(1) Inspect controllable pitch propellers frequently to determine that all parts are lubricated properly. It is especially recommended that all lubrication be accomplished in accordance with the propeller manufacturer's instructions.

(2) Complete inspection/servicing requires the removal of the spinner for examination and servicing of the propeller hub and blade clamp area. All inspections and servicing of the pitch control mechanism should follow the recommendations of the propeller, engine, and airframe manufacturers. Propellers must be in compliance with applicable AD's and manufacturer's SB's.

(3) The hub, blade clamps, and pitch change mechanisms should be inspected for corrosion from all sources, including rain, snow, and bird droppings that may have entered through the spinner openings. Examine the hub area for oil and grease leaks, missing grease-fitting caps, and leaking or missing grease fittings.

(4) Propeller domes should be checked for leaks, both at the seals and on the fill valve (if so equipped). The dome valve may be leak-tested by applying soapy water over the fill valve end. Domes should be serviced only with nitrogen or dry air in accordance with the manufacturer's recommendations. When propeller domes are inspected and found filled with oil, the propeller should be removed and inspected/repaired by an appropriately-rated repair facility.

(5) It is especially recommended that all lubrication be accomplished at the periods and in the manner specified by the propeller manufacturer. On makes and models with a grease fitting on the hub, before greasing the hub remove the grease fitting opposite the one to which you are going to add grease. This will allow the excess grease and pressure to exit through the grease fitting hole rather than the hub seal.

(6) Fiber-block, pitch-change mechanisms should be inspected for deterioration, fit, and the security of the pitch-clamp forks.

(7) Certain models of full-feathering propellers use spring-loaded pins to retain the feathered blade position. Spring and pin units should be cleaned, inspected, and relubricated per the manufacturer's recommendations and applicable AD's.

(8) Pitch change counterweights on blade clamps should be inspected for security, safety, and to ensure that adequate counterweight clearance exists within the spinner.

8-95. TACHOMETER INSPECTION. Due to the exceptionally high stresses that may be generated by particular propeller/engine combinations at certain engine revolutions per minute (RPM), many propeller and aircraft manufacturers have established areas of RPM restrictions and other restrictions on maximum RPM for some models. Some RPM limits do not exceed 3 percent of the maximum RPM permitted, and a slow-running tachometer can cause an engine to run past the maximum RPM limits. Since there are no post-manufacture accuracy requirements for engine tachometers, tachometer inaccuracy could lead to propeller failure, excessive vibration, or unscheduled maintenance. If the tachometer exceeds 2 percent (plus or minus) of the tested RPM, replace it.

8-96.—8-106. [RESERVED.]