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W98AB, W96JB, W90T6JB PROPELLERS
INSTALLATION & MAINTENANCE INSTRUCTIONS

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The W98AB & W96JB series propellers are designed for assembly in a splined hub, JACOBS 90205 with 41/64" diameter mounting bolts. Your Sensenich wood propeller was manufactured from aircraft quality selected lumber. The laminations are bonded with high-strength waterproof resorcinol glue, and were assembled under closely controlled factory conditions. Propeller balance was strictly maintained during manufacture and verified before shipment from the factory. Assembly of Type Certificated propeller / engine / aircraft must be accomplished by personnel holding the appropriate FAA license.

I. PROPELLER / HUB ASSEMBLY

1) If the propeller and hub are already assembled when delivered, proceed to the instructions furnished by the hub supplier for mounting the assembly on the engine crankshaft (Item III)

2) If the propeller and hub must be assembled the following procedure is recommended.

a. Position the propeller on a bench with the blades horizontal. Insert the hub into the hub bore from rear so that the double width spline is at one o'clock or seven o'clock as you look at the front face of the propeller, and assemble the front face plate. Insert the attaching bolts through the rear hub face, propeller, and front face plate (so that the nuts will be on the front face plate), using a soft head hammer to tap them into place. Tighten the nuts lightly and evenly (the threads must be clean and free from oil).

b. Place the assembly on a propeller stand and tighten the attaching bolts in small increments (moving diagonally across the bolt circle). See **Table 1.** for final torque values. It is permissible to increase wrench torque to the maximum value to allow insertion of cotter keys. If a conventional propeller stand is not available, the assembly may be temporarily mounted on the engine crankshaft while the propeller attaching bolts are tightened (it is recommended that a spark plug be removed from each cylinder to facilitate checking of blade track, and to prevent possible engine firing as it is turned.)

c. The propeller blade tips should track within 1/8 inch of each other when propeller hub assembly is completed. This can be checked by rotating the blade tips past a fixed reference point. Slight adjustments of bolt torque on opposite sides of the hub is usually sufficient to correct blade track.

d. The propeller attaching bolts must be cotter keyed after proper bolt torque and proper track (within 1/8 inch at blade tips) are obtained.

Table 1.
ATTACHING BOLT INSTALLATION TORQUE

Recommended Bolt Torque	
Minimum	Maximum
300 (in-lbs)	350 (in-lbs)
25 (ft-lbs)	29 (ft-lbs)
34 (N-m)	40 (N-m)

II. PROPELLER BALANCE

1) Propellers are carefully balanced when manufactured. After assembly with a hub, a final balance check is recommended so that changes which may have occurred during storage can be corrected. To check balance, a rigid knife edge balance, with an arbor which seats in the hub cone-seats, or a suspension type balance can be used – **IN A ROOM FREE FROM AIR CURRENTS.** When properly balanced, there should be no persistent tendency for the assembly to rotate from any position on a knife edge balance, or tilt on a suspension balance.

2) Sheet metal balance weights, installed under Bolt pairs on the light side, may be used to correct either horizontal or vertical balance.

III. INSTALLATION OF PROPELLER ON ENGINE CRANKSHAFT

1) INSTALLATION:

a. The spacer, rear cone, propeller hub, front cone, and hub retaining nut should be assembled on the engine shaft in that order. Parts should be lightly coated with grease before assembly.

b. The hub retaining nut should be tightened to 450 ft-lb. wrench torque. This may be applied by a man of approximately 175 lb., using a 31 inch rod. If 450 ft-lb. will not allow the lock pin holes to align, a maximum of 500 ft-lb. is permissible to achieve alignment.

c. Secure the retaining nut by inserting the clevis pin and cotter.

2) REMOVAL:

To remove the propeller hub from the engine shaft, the clevis pin securing the hub retaining nut must first be removed. The hub nut may then be unscrewed drawing the hub nut off the shaft. The front cone and nut may be removed from the hub by removing the snap ring.

CAUTION

Be sure that when the propeller hub nut is fully torqued, it has not run out of threads but that the hub is firmly seated on the cones. This can be ascertained by turning the bare nut down on the crankshaft and counting the tunes to bottom (usually 9 to 10). Count turns of the nut during propeller/hub installation. When the retaining nut is fully torqued at least one turn, but not more than 3, must be remain on the crankshaft threads.

Installation, and removal, of a propeller/hub must be accomplished by personnel holding the appropriate FAA license.

NOTE: These instructions were supplied to SENSENICH WOOD PROPELLER CO. to accompany propeller/hub assembly instructions as applicable to CONTINENTAL W-670 and JACOBS R-755 engines. Recommendations may differ for installation on other engines.

IV. PROPELLER MAINTENANCE (BOLT TORQUE):

Maintaining proper bolt torque is the most important maintenance item for a wooden propeller. Loss of proper bolt torque will result in the decrease or loss of hub compression and thus the loss of drive friction between the propeller mounting hub face and the engine or spool drive flange. At this point the torque is transferred only by the engine flange drive bushings which will begin to elongate the counterbores in the rear face of the wooden propeller. This can eventually cause cracking in the hub and or failure of the attaching bolts and possible separation of the propeller from the aircraft.

The main factor that leads to the loss of propeller bolt torque is the variation of the wood hub thickness. The hub thickness will vary with (a) Wood moisture content changes and (b) Temperature Changes. Even though your propeller has been sealed and/ or painted, changes in wood moisture content can occur and can significantly change the thickness of the hub. Moisture content changes are not immediate and can span several weeks or months, depending on many factors such as temperature and operating schedules.

Operating temperature changes have similar effects but are not as severe.

For the above reasons, it is important to follow the maintenance schedule below:

1. **After First Flight** – After the first flight, recheck the bolt torque. Refer to Bolt Torque Check Procedure and **Table 2.**

2. **After First 25 Hours** – After the first 25 hours, recheck the propeller bolt torque. Refer to Bolt Torque Check Procedure and **Table 2.**

3. **Every 50 Hours** – After the first 25 hour recheck, it is **Mandatory** that the propeller bolt torque be rechecked every 50 hours. Refer to Bolt Torque Check Procedure and **Table 2.**

4. **Environment Changes** - Should the operating environment change significantly in temperature and/or humidity for a long period of time, the propeller bolt torque must be rechecked.

V. BOLT TORQUE CHECK PROCEDURE:

1. Be certain that magneto switch is off, and that both magnetos are grounded.

2. With a calibrated dial type torque wrench, check nut torque by applying the torque in a tightening direction until the nut begins to turn. Check torque limits are given in **Table 2.**

IMPORTANT! Improper torque values will be obtained by measuring the breaking torque in a loosening direction. The torque should be checked in a tightening direction and adjusted as needed.

TABLE 2.
BOLT TORQUE CHECK VALUES / ACTIONS

Actual Torque	Required Action
Below 280 (in-lbs) 23 (ft-lbs) 32 (N-m)	**Remove Propeller** Inspect hub for damage (see propeller hub inspections section)
Between 280 - 300 (in-lbs)	**Adjust torque, see Table 1.**
Between 300 - 350 (in-lbs)	**No further action Required**
Above 350 (in-lbs)	**Loosen Bolts, re-torque see Table 1**

VI. PROPELLER HUB INSPECTIONS

1) Remove hub assembly from engines shaft following removal instructions in section III.

2) Loosen and remove nuts, then remove bolts and front face plate.

3) Remove propeller from splined hub.

4) Clean both propeller hub faces using light grit scotch pad and de-natured alcohol. It should be possible to remove most of any fretting marks and darkened areas.

5) Inspect the propeller rear hub face for cracks of the bolt holes.

(a) **Cracks** - If cracks are evident on the hub face, take a razor blade and very gently try to insert a corner of the blade. Most cracks will be paint cracks only, however, if the tip of the razor easily goes into a crack more than 1/16" then the propeller must be returned to the factory for closer inspection.

AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is FAA approved and specifies maintenance required under sections 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

Life limited components - None

VII. CONTINUED AIRWORTHINESS REQUIREMENTS:

The following practices will add to the service life of your wood propeller.

1) Check propeller attaching bolt torque at least every 50 hours according to the **Bolt Torque Check Procedure** and **Propeller Maintenance** sections. More frequent inspection is necessary when climatic changes are extreme, such as change of seasons.

2) Store propeller in a horizontal position and cover with a waterproof cover if exposed to the weather.

3) Do not use the propeller as a tow-bar to move your aircraft.

4) Protect your propeller from moisture and UV exposure by waxing with an automotive type paste wax at least once a year.

5) Avoid running-up in areas containing loose stones and gravel.

6) Finish loss off the leading edge is a normal wear item, and is dependent on the amount of operation in rain and grit.

7) Touch up worn finish areas and scratches with spar varnish. Return the propeller to the factory or approved repair station for total areas larger than 4x4" or scratches deeper than 1/32".

8) Inspect frequently for bruises, scars, or other damage to wood and blade leading edge protection. Damage to the wood or leading edge that is 1/16" deep or less without breaking the finish is acceptable.

9) Assume that your propeller is un-airworthy after any kind of impact until it has been inspected by qualified personnel.

10) All wood and metal tipping repairs must be made by an FAA approved propeller repair station or at the factory.

NOTE: The saw slots in metal tipping are designed to crack across after several hours of use. This prevents cracks from occurring at other locations.

11) Check propeller balance whenever there is evidence of roughness on operation. For new propeller installations, rotating the propeller 180 degrees and reinstalling will often help.

12) If your propeller begins to show any of the following damage, it should be removed from service and inspected by a rated repair station before next operation:

- **a.** Cracks in hub bore, bolt holes or counter bores,
- **b.** A deep cut across the wood grain,
- **c.** A long, wide, or deep crack parallel to the grain,.
- **d.** A separated wood lamination,
- **e.** Oversize or elongated hub bore or bolt holes,
- **f.** Fabric tipping tears, delaminations or blisters totaling 2x2" or greater,
- **g.** An appreciable warp (discovered by inspection or through rough operation),
- **h.** More than 1" of the tips broken or an appreciable portion of wood missing,
- **i.** Obvious damage or wear beyond economical repair.

NOTE: There is no specified overhaul time. The propeller is removed from service when it does not meet the Continued Airworthiness Requirements.

Factory repairs are done in accordance with process specification SP-123.

Refer to the latest FAA publication AC43.13 for further information on fixed-pitch wood propeller maintenance.

These instructions are generally applicable for installation of wood aircraft propellers in JACOBS 90205 or equivalent splined hubs.

PROPELLER PERFORMANCE

In selecting a propeller, keep in mind that operators may want different performance characteristics. For instance, one person may require a high climb rate while another seeks maximum cruising efficiency.

STANDARD PITCH / NORMAL FLYING

For normal or cross country flying, a fixed pitch propeller that turns between rated engine RPM and 50 RPM over rated at full throttle level flight at sea level will give best all-around performance.

A cruise propeller will turn 50 to 100 RPM under rated engine RPM at full throttle level flight. While cruise pitches will provide 4-6 mph higher airspeeds at cruise power rpm's, maximum level flight speeds are no better than climb or standard pitches, and the take-off and climb performance will noticeably suffer.

CLIMB PITCH / HIGH ALTITUDE OPERATION

For improved take-off and climb performance, use a climb pitch propeller that will turn 100 to 150 RPM over rated engine RPM at full throttle level flight *(refer to your particular aircraft Type Certificate for propeller limitations)*. Climb pitches will typically reduce flight speeds by 4-6 mph at cruise power RPM's. A climb pitch is also recommended for aircraft operating from high density altitude runways.