

MODEL R182 AND TR182 SERVICE MANUAL

SECTION 13

PROPELLER AND GOVERNOR

WARNING

When performing any inspection or maintenance that requires turning on the master switch, installing a battery, or pulling the propeller through by hand, treat the propeller as if the ignition switch were ON. Do not stand, nor allow anyone else to stand, within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to rotate.

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- 13-1. PROPELLER DESCRIPTION. The constant-speed propeller is a single acting unit, where governor regulated oil pressure opposes the centrifugal twisting moment of the rotating blades and spring force to obtain the correct blade pitch for engine load. Engine lubricating oil is supplied to the power piston in the propeller hub through the engine crankshaft. The amount and pressure of the engine oil used is controlled by the propeller governor. An increase or decrease in throttle setting or a change in aircraft attitude will affect the balance to maintain the most efficient and economical RPM, which the pilot has previously selected. If the throttle is opened more, or the aircraft speed is increased, the engine RPM will also begin to increase. This change is sensed by the propeller governor, and it directs oil pressure to the forward side of the piston. The blades will move to a higher pitch to load the engine, thereby maintaining constant RPM. Conversely, if the throttle is closed somewhat, or aircraft speed is decreased, the engine RPM will try to decrease. The governor senses this, and it allows oil to drain from the forward side of the piston. Spring tension and centrifugal twisting moment will move the propeller blades to a lower pitch to maintain selected engine speed.

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13-2. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
FAILURE TO CHANGE PITCH.	Governor control disconnected or broken.	Check visually. Connect or replace control.
	Governor not correct for propeller. (Sensing wrong.)	Check that correct governor is installed. Replace governor.
	Defective governor.	Refer to paragraph 13-10.
	Defective pitch changing mechanism inside propeller or excessive propeller blade friction.	Propeller repair or replacement is required.
FAILURE TO CHANGE PITCH FULLY.	Improper rigging of governor control.	Check that governor control arm and control have full travel. Rig control and arm as required.
	Defective governor.	Refer to paragraph 13-10.
SLUGGISH RESPONSE TO PROPELLER CONTROL.	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
STATIC RPM TOO HIGH OR TOO LOW.	Improper propeller governor adjustments.	Perform static RPM check. Refer to Section 11 and 11A for procedures.
ENGINE SPEED WILL NOT STABILIZE.	Sludge in governor.	Refer to paragraph 13-10.
	Air trapped in propeller actuating cylinder.	Trapped air should be purged by exercising the propeller several times prior to take-off after propeller has been reinstalled or has been idle for an extended period.
	Excessive friction in pitch changing mechanism inside propeller or excessive blade friction.	Propeller repair or replacement is required.
	Defective governor.	Refer to paragraph 13-10.

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13-2. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
OIL LEAKAGE AT PROPELLER MOUNTING FLANGE.	Damaged O-ring and seal between engine crankshaft flange and propeller.	Check visually. Remove propeller and install O-ring seal.
	Foreign material between engine crankshaft flange and propeller mating surfaces or mounting nuts not tight.	Remove propeller and clean mating surfaces; install new O-ring and tighten mounting nuts evenly to torque value in figure 13-1.
OIL LEAKAGE AT ANY OTHER PLACE.	Defective seals, gaskets, threads, etc., or incorrect assembly.	Propeller repair or replacement is required.

- 13-3. **REPAIR.** Metal propeller repair is a two step operation. First, the damage must be evaluated. Second, a determination of degree of the damage must be made under criteria contained in Federal Aviation Regulations, Part 43 (FAR 43) and Federal Aviation Agency Advisory Circular No 43.14 (FAA AC 43.13). These instructions must be served anytime repairs or alterations are being made, because they authorize the level of repair for each action.

NOTE

For information not covered in this section, refer to the applicable McCauley Service Manual and supplements thereto.

- 13-4. **REMOVAL.** (THRU R18201313) (See figure 13-1.)

WARNING

Be sure magneto is grounded before turning propeller.

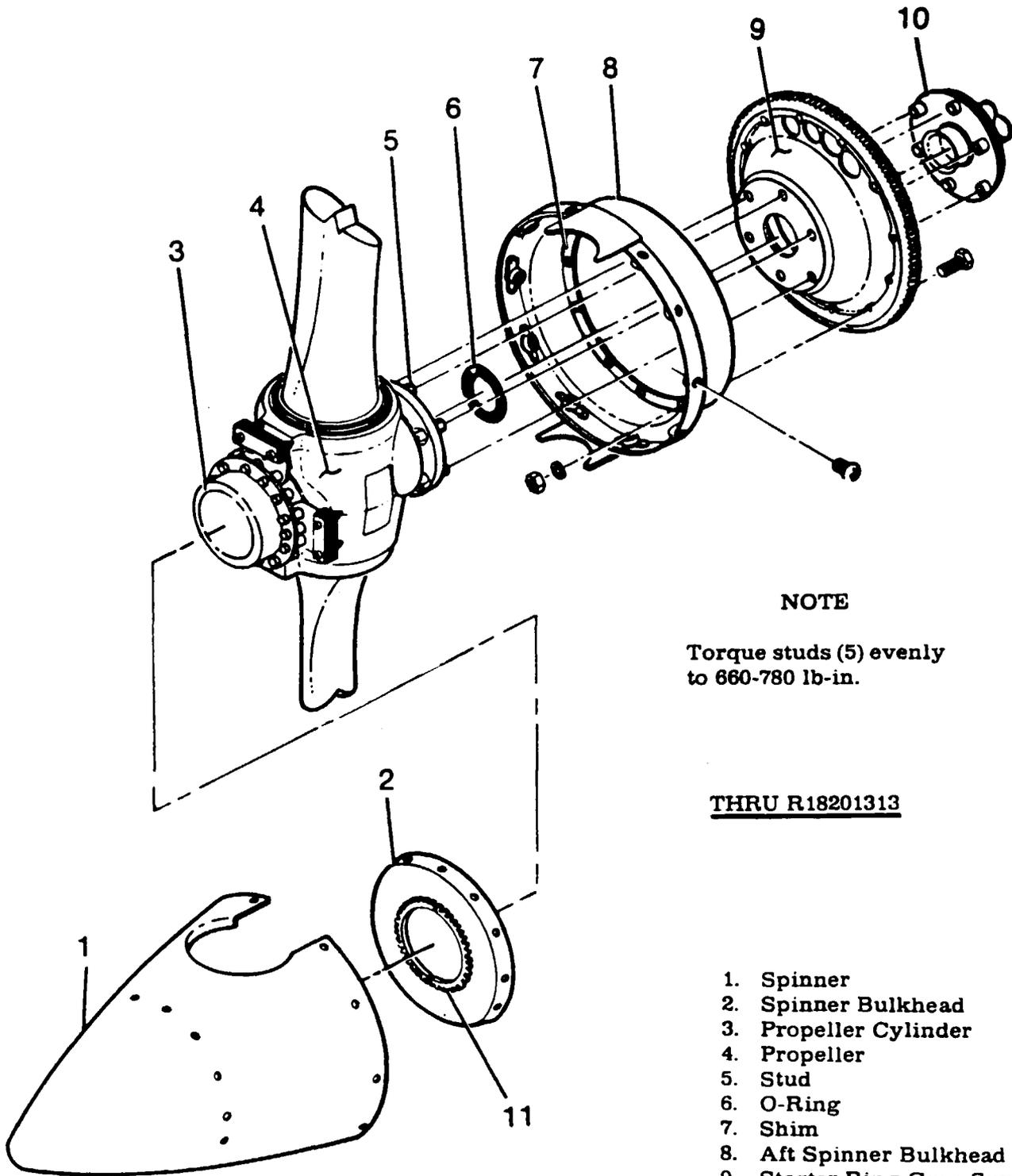
- a. Remove spinner dome.
- b. Remove safety wire, back off bolts attaching propeller to engine crankshaft about one-fourth inch, and pull propeller forward.

NOTE

Bolts will have to be backed out evenly so propeller can be pulled forward (approximately 1/4 inch each time) until all bolts are disengaged from engine crankshaft flange. As the propeller is separated from the engine crankshaft, oil will drain from the propeller and engine crankshaft cavities.

- c. Pull propeller from engine crankshaft.
- d. If necessary to remove the aft spinner bulkhead, remove bolts, washers, and nuts attaching bulkhead to starter ring gear support, but retain shims for use in reinstallation.

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NOTE

Torque studs (5) evenly to 660-780 lb-in.

THRU R18201313

1. Spinner
2. Spinner Bulkhead
3. Propeller Cylinder
4. Propeller
5. Stud
6. O-Ring
7. Shim
8. Aft Spinner Bulkhead
9. Starter Ring Gear Support
10. Engine Crankshaft
11. Grommet

Figure 13-1. Propeller Installation (Sheet 1 of 3)

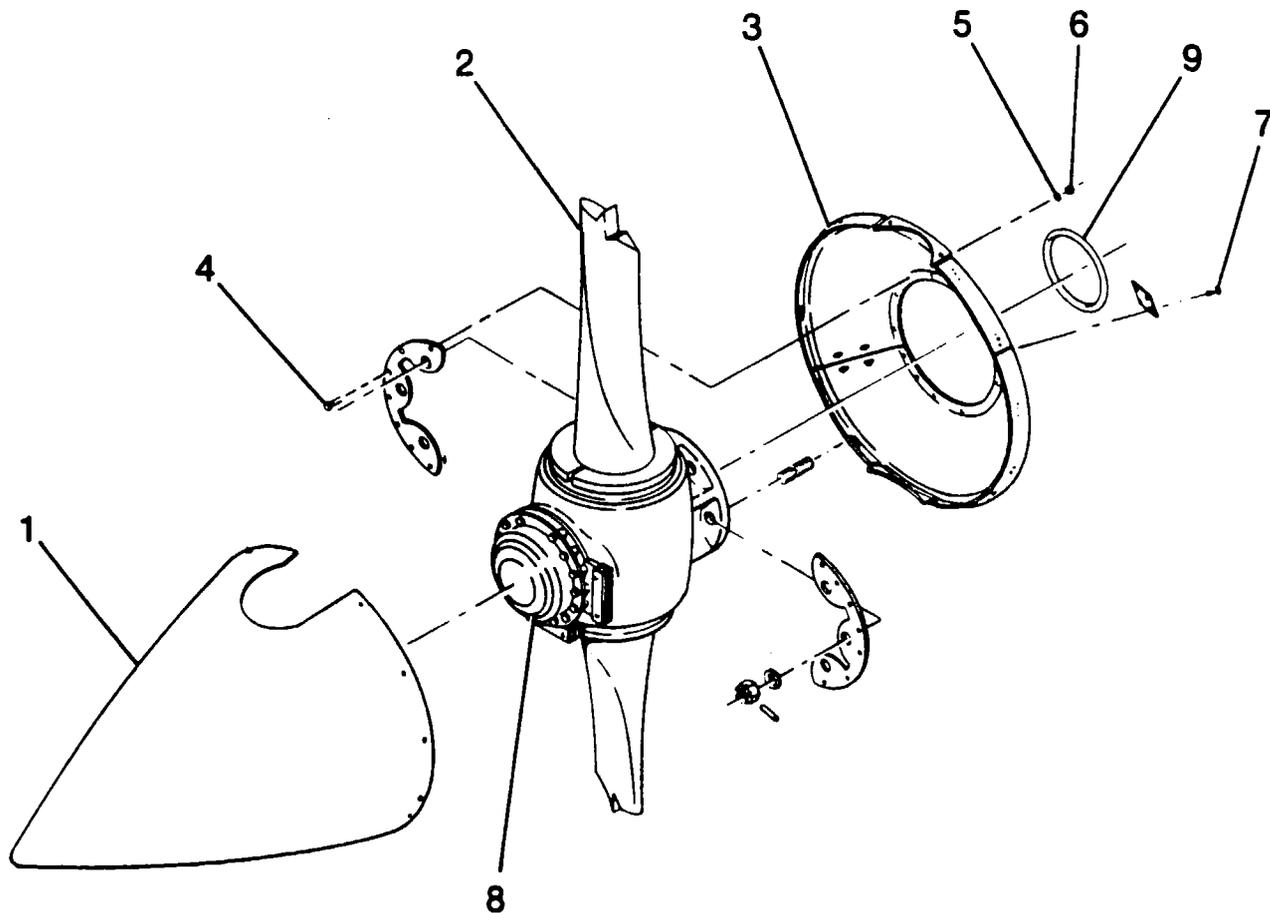
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NOTE

NOTE

Torque propeller mounting bolts to 660-780 lb-in.

Additional spacers, 0752620-3, may be required when installing a new spinner (1) on 2 or 3 bladed propellers to ensure a snug fit between spinner and support. Do NOT USE more than 6 spacers in these installations.



1. Spinner Dome
2. Propeller
3. Aft Spinner Bulkhead
4. Screw
5. Washer
6. Nut
7. Screw
8. Propeller Hub
9. O-Ring

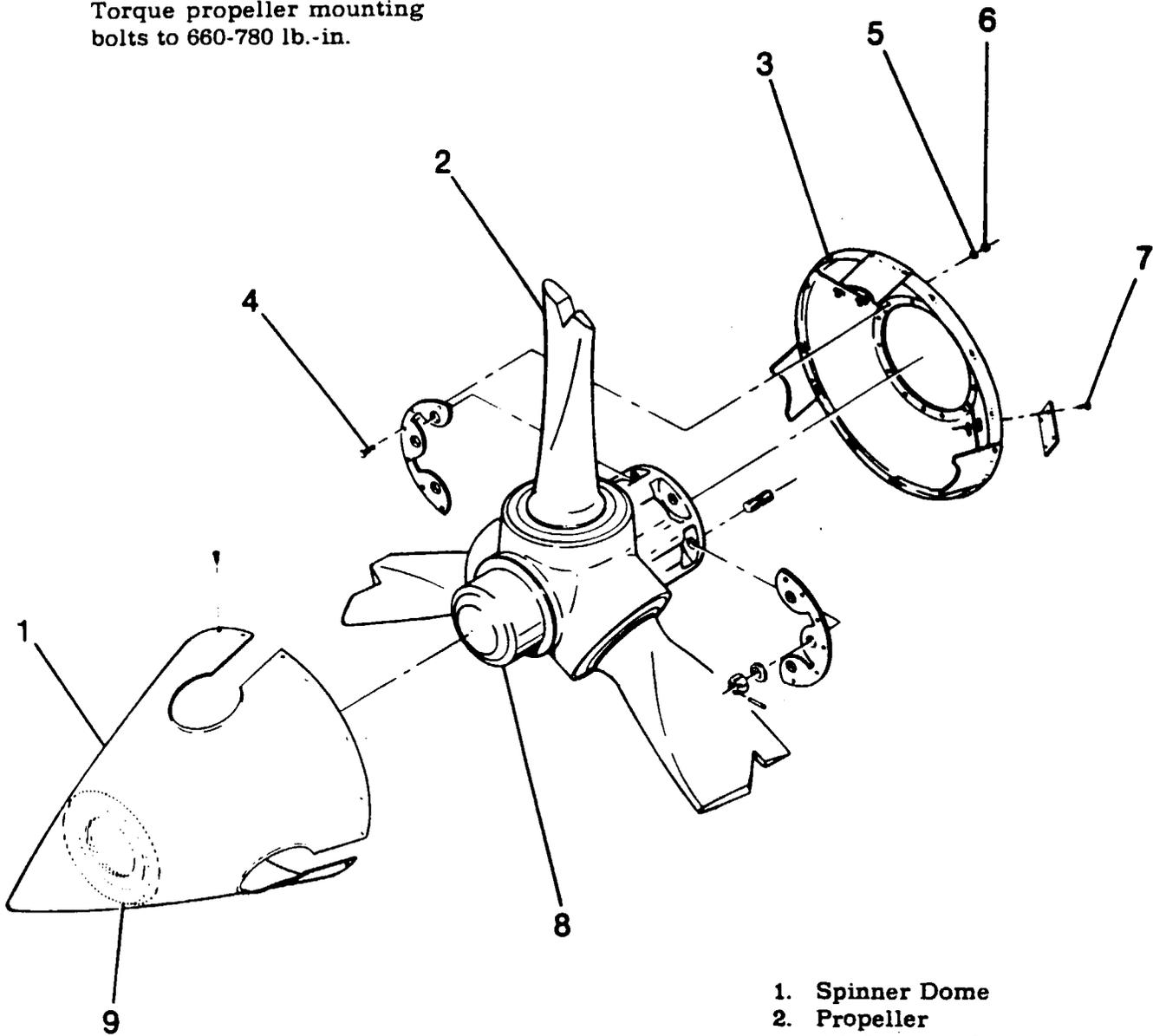
R18201314 & ON

Figure 13-1. Propeller Installation (Sheet 2 of 3)

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NOTE

Torque propeller mounting bolts to 660-780 lb.-in.



OPTIONAL 3-BLADED

1. Spinner Dome
2. Propeller
3. Aft Spinner Bulkhead
4. Screw
5. Washer
6. Nut
7. Screw
8. Propeller Hub
9. Forward Support

Figure 13-1. Propeller Installation (Sheet 3 of 3)

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NOTE

After removing the propeller, the starter ring gear assembly may be removed from the engine crankshaft to allow easier access to the aft spinner bulkhead attaching bolts. Loosen alternator adjusting arm and disengage drive belt from pulley on aft face of starter ring gear support assembly.

13-5. INSTALLATION. (THRU R18201313) (See figure 13-1.)

WARNING

Be sure magneto is grounded before turning propeller.

- a. If aft spinner bulkhead was removed, reinstall on ring gear support, using bolts, nuts, and shims, as shown in figure 13-1.
- b. If starter ring gear support and aft spinner bulkhead were removed, clean mating surfaces of support assembly and engine crankshaft flange.
- c. Place alternator drive belt in pulley groove of starter ring gear support. Fit starter ring gear over propeller flange bushings on crankshaft.

NOTE

Make sure bushing hole in ring gear support, marked O, is assembled adjacent to O mark on crankshaft flange bushing. The starter ring gear must be located correctly to assure proper alignment of the timing mark on the ring gear.

- d. Clean propeller hub cavity and mating surfaces of propeller hub and ring gear support.
- e. Lightly lubricate new O-ring and crankshaft pilot with clean engine oil, and install O-ring in the propeller hub.
- f. Align propeller mounting bolts with proper holes in engine crankshaft flange, and slide propeller carefully over crankshaft pilot until bolts can be started in crankshaft flange bushing. Position propeller blades to extend through aft spinner bulkhead with ample clearance.
- g. Tighten bolts evenly, and work propeller aft on crankshaft flange. Torque bolts per figure 13-1.
- h. Install .040 inch diameter corrosion resistant safety wire through bolts in pairs.
- i. Adjust alternator drive belt tension as outlined in Section 16.
- j. Install spinner dome.

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13-6. REMOVAL. (R18201314 & ON)

WARNING

Be sure magneto is grounded before turning propeller.

- a. Remove spinner dome (1).
- b. Remove safety wire, back off bolts attaching propeller to engine crankshaft about one-fourth inch, and pull propeller forward.

NOTE

Bolts will have to be backed out evenly so propeller (2) can be pulled forward (approximately 1/4 inch each time) until all bolts are disengaged from engine crankshaft flange. As the propeller is separated from the engine crankshaft, oil will drain from the propeller and engine crankshaft cavities.

- c. If necessary, the aft spinner bulkhead (3) can be removed by removing screws (4), washers (5), and nuts (6) attaching bulkhead to the propeller. Then remove screws (7) to separate bulkhead halves.
- d. Pull propeller from engine crankshaft.

13-7. INSTALLATION. (R18201314 & ON) (See figure 13-1.)

WARNING

Be sure magneto is grounded before turning propeller.

- a. If aft spinner bulkhead was removed, reinstall on ring gear support using bolts, nuts, and shims as shown on figure 13-1.
- b. If starter ring gear support and aft spinner bulkhead were removed, clean mating surfaces of support assembly and engine crankshaft flange.
- c. Place alternator drive belt in pulley groove of starter ring gear support. Fit starter ring gear over propeller flange bushings on crankshaft.

NOTE

Make sure bushing hole in right gear support, marked "O", is assembled adjacent to "O" mark on crankshaft flange bushing. The starter ring gear must be located correctly to assure proper alignment of the timing mark on the right gear.

- d. Clean propeller hub cavity and mating surfaces of propeller hub and ring gear support.
- e. On the standard 2 bladed propeller, lightly lubricate new O-ring (9) and crankshaft pilot with clean engine oil, and install O-ring in the propeller hub.
- f. Align propeller mounting bolts with proper holes in engine crankshaft flange, and slide propeller carefully over crankshaft pilot until bolts can be started in crankshaft flange bushing. Position propeller blades to extend thru aft spinner bulkhead with ample clearance.

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- g. Tighten bolts evenly, and work propeller aft on crankshaft flange. Torque bolts per figure 13-1.
- h. Install .040 inch diameter corrosion resistant safety wire through bolts in pairs.
- i. Adjust alternator drive belt tension as outlined in Section 16.
- j. Install 0752620-3 spacer (if required) and spinner support on propeller cylinder (8). If spacers are not centered mechanically (piloted), visually center and hold them until spinner support is forced firmly in place.
- k. Hold spinner (1) snug against spinner support and check alignment of holes in spinner (1) with holes in spinner bulkhead (3). Add or remove 0752620-3 spacers from propeller cylinder (8) until holes are within .050 of alignment.
- l. Push hard on spinner (1) to align holes and install screws and washers (if required) in three (3) or more equal spaces around the bulkhead (3). Relax pressure on spinner and install remaining screws and washers (if required) in spinner (1).
- m. Tighten all screws uniformly around the spinner.

NOTE

When replacing optional three bladed propeller assembly (2), apply Y8560 Polyurethane Film (3M Company), a minimum of one wrap on propeller hub (8), then as required to obtain as snug fit of forward support (9) to propeller hub (8).

- 13-8. **TIME BETWEEN OVERHAUL (TBO).** Propeller overhaul shall coincide with engine overhaul, but interval between overhauls of propeller shall not exceed 1500 hours. Refer to Section 11 & 11A for engine time between overhaul (TBO) periods.
- 13-9. **GOVERNOR DESCRIPTION.** The engine mounted, centrifugal, single-acting propeller governor is mounted on the upper left side of engine just forward of number two cylinder. The term "single-acting" refers to the way engine oil is directed to the propeller to effect pitch change. This governor directs oil pressure to increase blade pitch. Decreased blade pitch is caused by centrifugal twisting moment of rotating propeller blades and the force of an internal spring, as oil pressure is relieved. When oil is relieved by the governor, it returns to the oil sump through governor pilot spool valve action. Basically the governor consists of an engine driven gear pump, pressure relief valve, rotating flyweights, a pilot spool valve, and a control lever to vary spring load on flyweights, which presets engine load through blade pitch.

NOTE

Outward physical appearance of specific governors is the same, but internal parts determine the action of oil pressure output: i.e., oil pressure to increase or decrease blade pitch. Always be sure the correct governor is used with the propeller.

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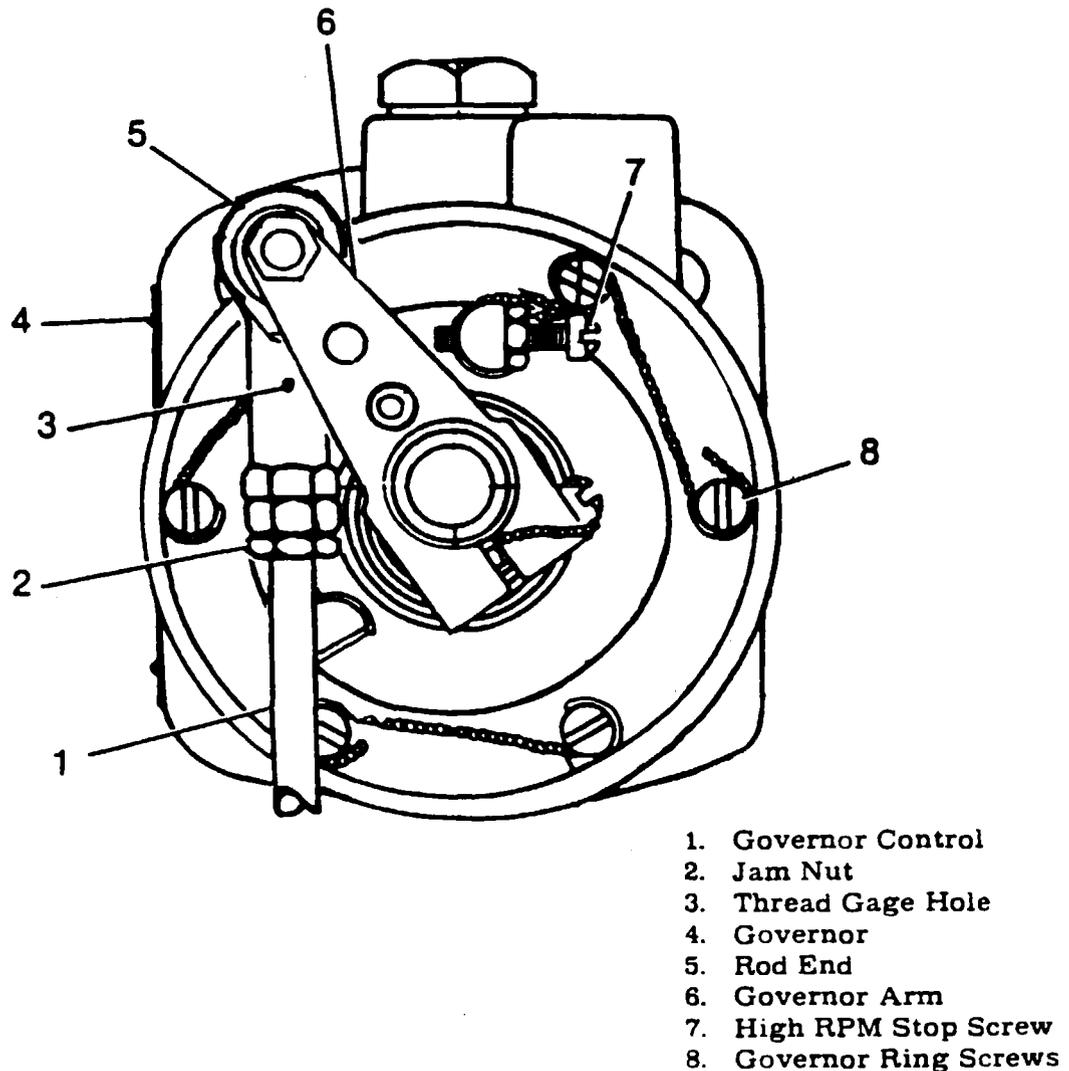


Figure 13-2. Propeller Governor

- 13-10. **TROUBLE SHOOTING.** Since governor action is directly related to propeller pitch, very few governor troubles can be isolated with governor installed and operated on the aircraft. Failure of propeller to change pitch correctly may be caused by the governor or propeller. Except for locating obvious troubles, it is best to install a governor known to be in good condition to check whether the propeller or the governor is at fault when trouble occurs in the propeller pitch change mechanism. If the trouble disappears the governor was at fault. If the trouble persists, the propeller may be at fault. Removal, installation, rigging of control, high-speed stop adjustment, desludging, and installation of governor mounting gasket are not major repairs and may be accomplished in the field. Repairs to propeller governors are classified as propeller major repairs in Federal Aviation Regulations, which also define who may accomplish such repairs.

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13-11. REMOVAL.

- a. Remove engine cowling as required for access.
- b. Disconnect control from arm or governor and from bracket.
- c. Remove nuts and washers securing governor to engine crankcase.
- d. Remove governor and mount gasket.

13-12. INSTALLATION.

WARNING

Be sure magneto is grounded before turning propeller.

- a. Wipe governor and adapter mounting pad clean.
- b. Install new gasket with screen facing governor (outward).
- c. Position governor on mount studs, aligning governor pump drive splines with engine drive splines, and install nuts and washers. Do not force spline engagement. Rotate crankshaft slightly, and splines will mesh smoothly when properly aligned.
- d. Install mount washers and nuts in removal sequence.
- e. Connect control bracket to engine, and control end to governor arm. Rig per paragraph 13-14.
- f. Install engine cowling previously removed for access in removal sequence.

13-13. HIGH RPM STOP ADJUSTMENT. (See figure 13-2.)

- a. Remove engine cowling as necessary for access.
- b. Loosen high-speed stop screw lock nut.
- c. Turn stop screw IN for decrease in RPM, and OUT to increase maximum RPM. One complete turn will cause a change of approximately 25 RPM.
- d. Tighten lock nut, and adjust linkage as necessary to maintain full travel. Insure that governor arm contacts stop screw in both maximum and minimum settings, and that a cushion exists on control in both positions.
- e. Install cowling and test-operate governor-propeller combination.

NOTE

It is possible for either the propeller low pitch stop or the governor high RPM stop to be the limiting factor. It is desirable for the governor high RPM stop to limit the engine speed at the maximum rated RPM for a particular aircraft. Due to climate conditions, field elevation, low pitch propeller blade angle, and other factors, an engine may not reach rated RPM on the ground. It may be necessary to readjust the governor stop after test flying to obtain maximum rated RPM when airborne.

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13-14. RIGGING.

NOTE

The result of rigging of the governor control is full travel of the governor control arm (bottomed out against both high and low pitch stops) with some "cushion" at both ends of the control travel.

- a. Disconnect control from governor arm.
 - b. Place control, in cockpit, full forward, then pull back approximately 1/8" and lock in this position. This will allow "cushion" to assure full contact with governor high RPM stop screw.
 - c. Place governor arm against high RPM stop screw.
 - d. Loosen jam nuts on control rod end, and adjust rod end to align with arm. Be sure sufficient thread engagement is maintained, it may be necessary to adjust control in mount bracket, to achieve proper alignment and thread engagement.
 - e. Attach control rod end to governor arm, tighten previously loosened jam nuts, and safety wire.
 - f. Operate the propeller control to see that governor arm has full travel, and contacts stops in both directions with proper "cushion".
- 13-15. TIME BETWEEN OVERHAUL (TBO). Propeller governor overhaul shall coincide with engine overhaul, but interval between governor overhauls shall not exceed 1800 hours. Refer to Section 11 for engine overhaul frequency requirements. The McCauley Service Manual is available from Cessna Service Parts Center.