

R22 SERVICE LETTER SL-74A

(supersedes R22 SL-74)

R44 SERVICE LETTER SL-61A

(supersedes R44 SL-61)

DATE: 21 July 2017

REV A: 20 December 2017

TO: R22-series & R44-series Owners, Operators, and Maintenance Personnel

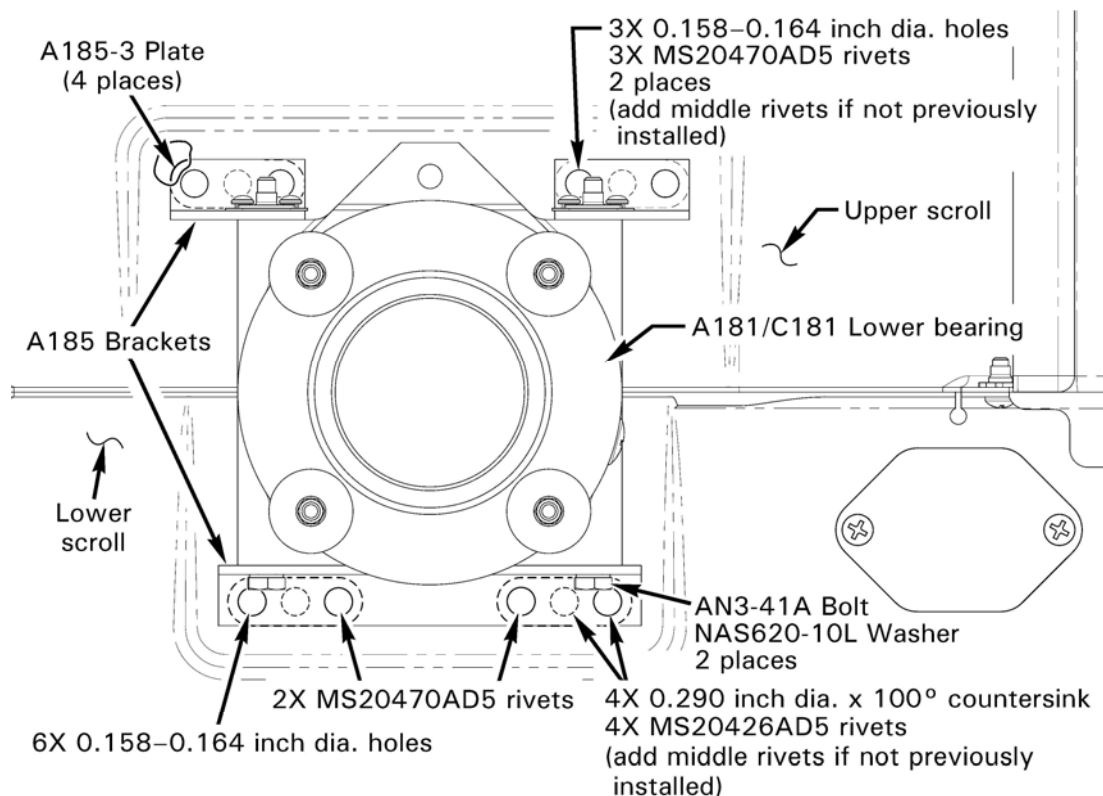
SUBJECT: A185 Brackets Installation & Fiberglass Scroll Repair

BACKGROUND: Perform whenever looseness of an A185 bracket is detected or suspected, and whenever upper or lower scroll is removed. Refer to R22 SB-112 & R44 SB-94.

COMPLIANCE PROCEDURE:

1. If any A185 bracket is suspected to be loose, remove scroll per Maintenance Manual (MM) Chapter 6.
2. Inspect security of A185 brackets on scroll.
 - a. If none of three A185 brackets are loose on scroll:
 - i. Refer to Figure 1. Count rivets attaching three A185 brackets to scroll. If less than 3 rivets at any location (4 places), install center rivets between existing rivets as shown and replace existing 1/8-inch diameter rivets with 5/32-inch diameter rivets. Proceed to step 16.
 - b. If only one of three A185 brackets is loose on scroll:
 - i. Mark orientation of associated A185-3 plate. Remove loose bracket and plate by drilling out attaching rivets.
 - ii. Verify rivet holes in scroll, bracket, and plate do not exceed 0.164 inch diameter. Enlarge rivet holes in bracket and associated plate by match drilling to 0.164 inch diameter.
 - iii. Refer to Figure 1. Assemble upper & lower scroll halves with screws. Position an A181/C181 bearing housing on scroll between three A185 brackets and secure housing to brackets with AN3-41A bolts and washers. Verify rivet holes in unriveted A185 bracket align with rivet holes in scroll. If hole alignment is satisfactory, attach loose A185 bracket & associated plate to scroll with three solid rivets per Figure 1 and proceed to step 15.
 - iv. Remove AN3-41A bolts and bearing housing and disassemble scroll halves.

(OVER)

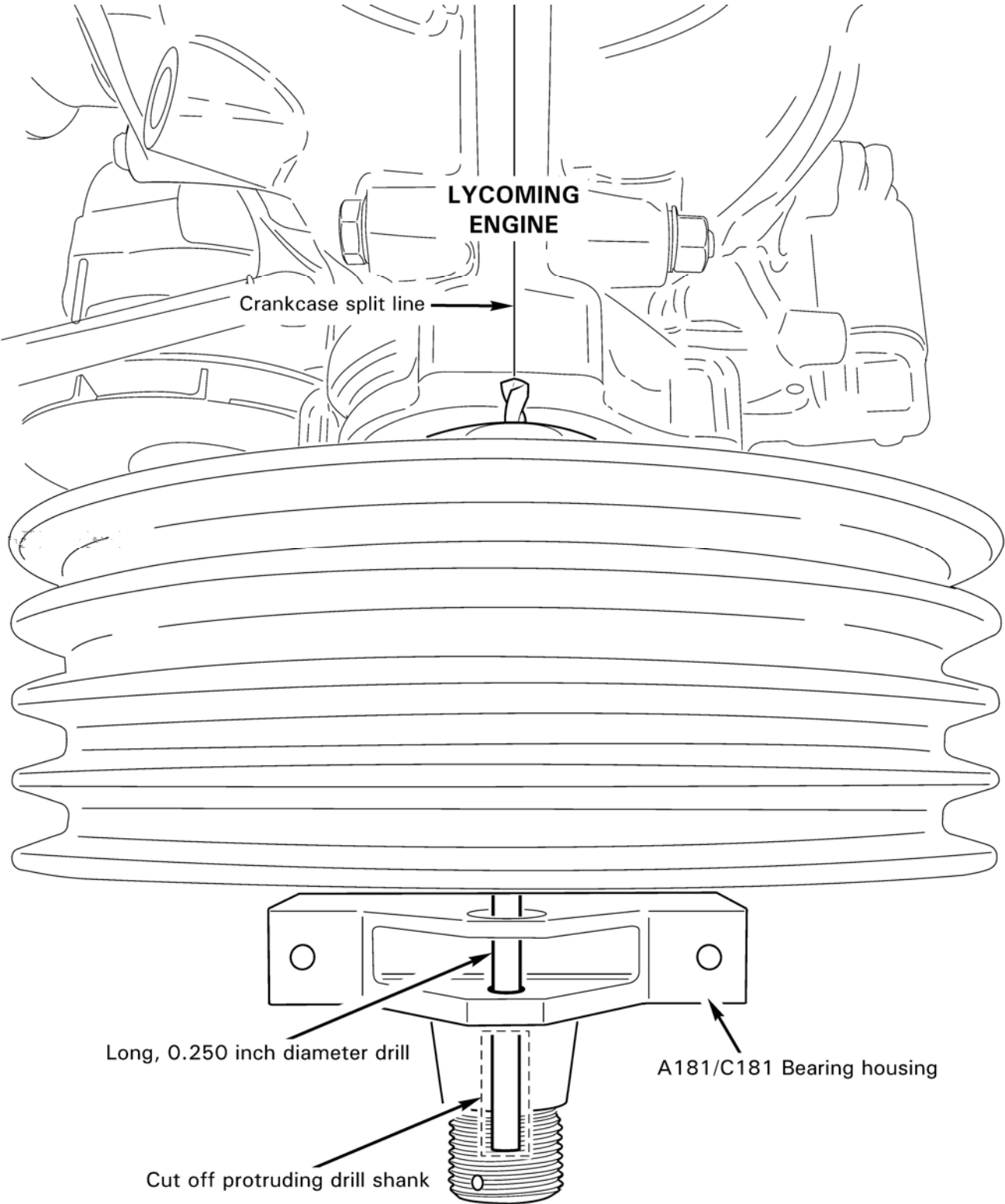
**FIGURE 1****CAUTION**

Use proper personal protective equipment when handling fiberglass.

2. b. v. Repair (fill) oversize and/or misaligned rivet holes in scroll per U.S. FAA AC 43.13-1B para 3-3.a (online at www.faa.gov). Scroll material is Style 7533, plain weave, 18x18 threads/inch, 5.8 ounce/sq.yard, fiberglass cloth with polyester resin; for repair purposes, epoxy resin is recommended instead of polyester resin.
- c. If two or three A185 brackets are loose on scroll:
 - i. Mark locations and orientation of associated A185-3 plates. Remove all brackets and inner plates by drilling out attaching rivets.
 - ii. Fill all rivet holes per step 2.b.v.
3. Clean upper scroll. Apply a light coating of layout dye (or contrasting lacquer paint) in area where A181/C181 bearing resides.
4. Remove lower sheave per MM § 7.290.

5. Rotate crankshaft using starter ring-gear support until largest diameter bushing in crankshaft flange (typically stamped "0" adjacent) is at 12 o'clock position and bushing bore is visually aligned with crankcase split line.
6. Without moving crankshaft, loosen alternator belt and remove starter ring gear support.
7. Install (3) NAS1149F1290P (AN960-1216) washers on each crankshaft flange bushing at 2-, 6-, & 10-o'clock positions (washers substitute for thickness of removed starter ring gear support).
8. Without moving crankshaft, install lower sheave and fan shaft & bearing assy on crankshaft using bolts at 2-, 6-, & 10-o'clock positions. Hand tighten bolts.
9. Refer to Figure 2. Visually align actuator mounting holes in A181/C181 bearing housing with upper empty bolt hole in crankshaft. Insert a sufficiently long & straight 0.250-inch diameter drill (or straight, pointed-screwdriver shank) thru holes in bearing housing until drill point contacts crankcase, then rotate bearing housing as required until drill point aligns with crankcase split line. Prevent bearing housing rotation with duct tape. Cut-off portion of drill shank which protrudes beyond bearing housing.
10. Position upper scroll on engine and secure corners to cooling panels with at least 6 screws & nuts.
11. Using suitable scribe, trace outline of A181/C181 bearing housing into layout dye on upper scroll. Verify drill point in bearing housing remains aligned with crankcase split line.
12. Remove drill, duct tape, upper scroll half, fanshaft & bearing assembly, lower sheave, and washers.
13. Refer to Figure 1. Assemble upper & lower scroll halves with screws. Assemble and secure (3) A185 brackets to A181/C181 bearing housing with AN3-41A bolts and washers. Align bearing housing and attached brackets with scribed lines on upper scroll.
14. Using A185 brackets as a guide, progressively drill twelve 0.158/0.164 inch diameter holes thru brackets, scroll, and plates, and install solid rivets per Figure 1.
15. Remove AN3-41A bolts, disassemble scroll halves, and clean up debris. Remove layout dye and paint scroll as required.
16. Install alternator belt (a new alternator belt is recommended), starter ring gear support, lower sheave and fanshaft & bearing assembly per MM § 7.290.
17. On lower A185 bracket, apply torque seal in a vertical stripe across both outboard rivets to lower scroll to facilitate future inspections.
18. Make appropriate maintenance record entries.

(OVER)



VIEW LOOKING DOWN
(R22 shown, R44 is similar)

FIGURE 2

R22 SERVICE BULLETIN SB-112

R44 SERVICE BULLETIN SB-94

DATE: 8 June 2017

TO: R22-series & R44-series Owners, Operators, and Maintenance Personnel

SUBJECT: Actuator Lower Bearing A185 Brackets

ROTORCRAFT AFFECTED: R22-series & R44-series Helicopters with initial airworthiness certificate issued prior to 1 July 2017.

TIME OF COMPLIANCE: At next 100-hour inspection or annual inspection, whichever occurs first.

BACKGROUND: RHC has received reports of loose A185 brackets. Loose brackets may have allowed lower bearings to misalign resulting in belt-tension actuator damage.

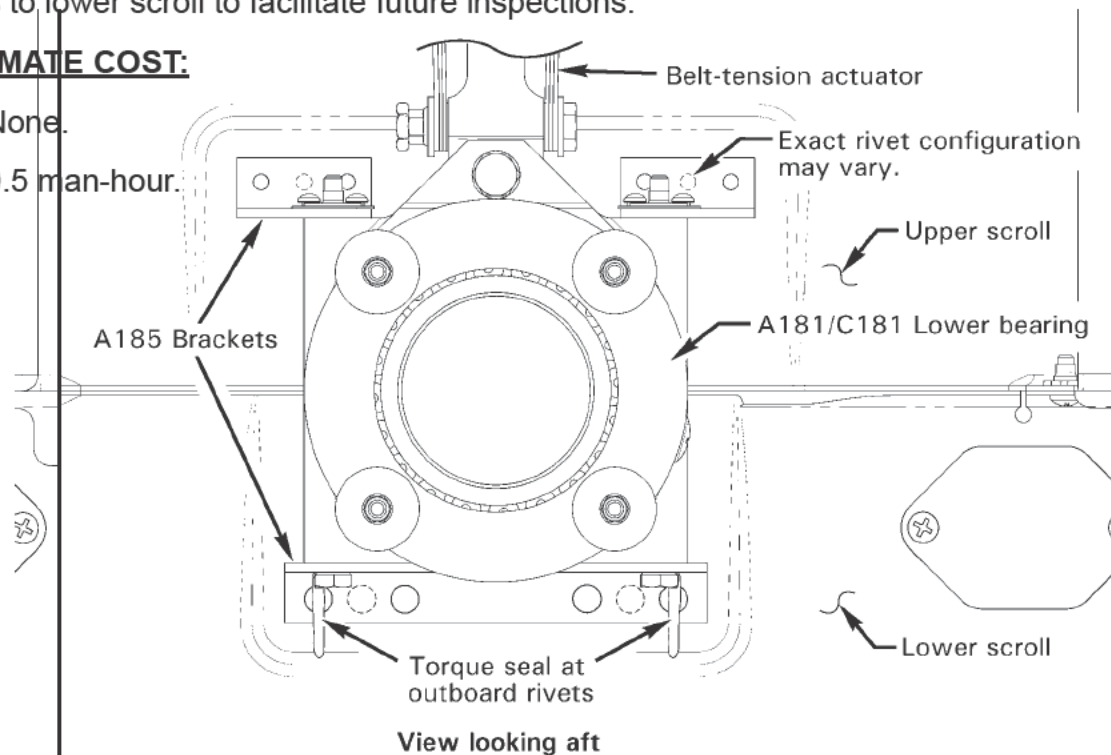
COMPLIANCE PROCEDURE:

1. Visually inspect A185 brackets and attaching rivets for evidence of fretting or looseness. If evidence of looseness is found, contact RHC Technical Support for repair instructions.
2. On lower A185 bracket, apply torque seal in a vertical stripe across both outboard rivets to lower scroll to facilitate future inspections.

APPROXIMATE COST:

Parts: None.

Labor: 0.5 man-hour.



THE DESIGN ENGINEERING ASPECTS OF THIS BULLETIN HAVE BEEN SHOWN TO COMPLY WITH APPLICABLE FEDERAL AVIATION REGULATIONS AND ARE FAA APPROVED.

SECTION 3

EMERGENCY PROCEDURES

DEFINITIONS

Land Immediately – Land on the nearest clear area where a safe normal landing can be performed. Be prepared to enter autorotation during approach, if required.

Land as soon as practical – Landing site is at pilot's discretion based on nature of problem and available landing areas. Flight beyond nearest airport is not recommended.

POWER FAILURE – GENERAL

A power failure may be caused by either an engine or drive system failure and will usually be indicated by the low RPM horn. An engine failure may be indicated by a change in noise level, nose left yaw, an oil pressure light, or decreasing engine RPM. A drive system failure may be indicated by an unusual noise or vibration, nose right or left yaw, or decreasing rotor RPM while engine RPM is increasing.

In case of power failure, immediately lower collective to enter autorotation and reduce airspeed to power-off V_{ne} or below.

CAUTION

Aft cyclic is required when collective is lowered at high airspeed.

CAUTION

Do not apply aft cyclic during touchdown or ground slide to prevent possible blade strike to tailcone.

POWER FAILURE ABOVE 500 FEET AGL

1. Lower collective immediately to maintain rotor RPM.
2. Establish a steady glide at approximately 70 KIAS. (For maximum glide distance or minimum rate of descent, see page 3-3.)
3. Adjust collective to keep RPM between 97 and 108% or apply full down collective if light weight prevents attaining above 97%.
4. Select landing spot and, if altitude permits, maneuver so landing will be into wind.
5. A restart may be attempted at pilot's discretion if sufficient time is available (See "Air Restart Procedure", page 3-3).
6. If unable to restart, turn unnecessary switches and fuel valve off.
7. At about 40 feet AGL, begin cyclic flare to reduce rate of descent and forward speed.
8. At about 8 feet AGL, apply forward cyclic to level ship and raise collective just before touchdown to cushion landing. Touch down in level attitude with nose straight ahead.

POWER FAILURE BETWEEN 8 FEET AND 500 FEET AGL

1. Lower collective immediately to maintain rotor RPM.
2. Adjust collective to keep RPM between 97 and 108% or apply full down collective if light weight prevents attaining above 97%.
3. Maintain airspeed until ground is approached, then begin cyclic flare to reduce rate of descent and forward speed.
4. At about 8 feet AGL, apply forward cyclic to level ship and raise collective just before touchdown to cushion landing. Touch down in level attitude and nose straight ahead.

POWER FAILURE BELOW 8 FEET AGL

1. Apply right pedal as required to prevent yawing.
2. Allow rotorcraft to settle.
3. Raise collective just before touchdown to cushion landing.

MAXIMUM GLIDE DISTANCE CONFIGURATION

1. Airspeed approximately 90 KIAS.
2. Rotor RPM approximately 90%.
3. Best glide ratio is about 4.7:1 or one nautical mile per 1300 feet AGL.

MINIMUM RATE OF DESCENT CONFIGURATION

1. Airspeed approximately 55 KIAS.
2. Rotor RPM approximately 90%.
3. Minimum rate of descent is about 1350 feet per minute. Glide ratio is about 4:1 or one nautical mile per 1500 feet AGL.

CAUTION

Increase rotor RPM to 97% minimum when autorotating below 500 feet AGL.

AIR RESTART PROCEDURE

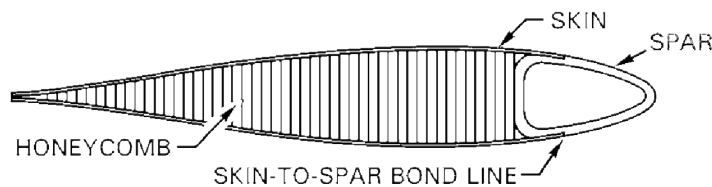
CAUTION

Do not attempt restart if engine malfunction is suspected or before safe autorotation is established.

1. Mixture - full rich.
2. Throttle- closed, then cracked slightly.
3. Actuate starter with left hand.

ROTOR SYSTEMS

The main rotor has two all-metal blades mounted to the hub by coning hinges. The hub is mounted to the shaft by a teeter hinge. The coning and teeter hinges use self-lubricated bearings. Droop stops for the main rotor blades provide a teeter hinge friction restraint which normally prevents the rotor from teetering while starting or stopping. Pitch change bearings for each blade are enclosed in a housing at the blade root. The housing is filled with oil and sealed with an elastomeric boot. Each blade has a thick stainless steel spar at the leading edge which is resistant to corrosion and erosion. The skins are bonded to the spar approximately one inch aft of the leading edge. Blades must be refinished if the paint erodes to bare metal at the skin-to-spar bond line. Bond may be damaged if bond line is exposed.



MAIN ROTOR BLADE CONSTRUCTION

The tail rotor has two all-metal blades and a teetering hub with a fixed coning angle. The pitch change bearings have self-lubricated liners. The teeter hinge bearings either have self-lubricated liners or are elastomeric. The tail rotor blades are constructed with aluminum skins and root fittings. Maintaining the paint finish will reduce corrosion and erosion.

DRIVE SYSTEM

A vee-belt sheave is bolted directly to the engine output shaft. Vee-belts transmit power to the upper sheave which has an overrunning clutch contained in its hub. The inner shaft of the clutch transmits power forward to the main rotor and aft to the tail rotor. Flexible couplings are located at the main gearbox input and at each end of the long tail rotor drive shaft.

The main gearbox contains a single-stage spiral-bevel gear set which is splash lubricated. Cooling ducts under the gearbox are connected to the top of the engine cooling scroll. The main gearbox is supported by four rubber mounts.

DRIVE SYSTEM (cont'd)

The long tail rotor drive shaft has no support bearings but has a lightly-loaded damper bearing. The tail gearbox contains a splash-lubricated spiral-bevel gear set. The tail gearbox output shaft is stainless steel to prevent corrosion.

POWERPLANT

One Lycoming O-540 six-cylinder, horizontally-opposed, overhead-valve, air-cooled, carbureted engine with a wet sump oil system powers the helicopter. The engine is equipped with a starter, alternator, shielded ignition, two magnetos, muffler, oil cooler, and induction air filter. See Sections 1 and 2 for powerplant specifications and limitations.

A direct-drive, squirrel-cage fan mounted to the engine output shaft supplies cooling air to the cylinders and oil cooler via a fiberglass and aluminum shroud.

Induction air enters through an opening on the right side of the aircraft and passes through a flexible duct to the carburetor air box. A second flexible duct passes heated air from an exhaust-mounted scoop to the air box. A sliding valve controlled by the carburetor heat control adjusts the mix of cool and heated air, which then flows through the radial-flow air filter and up into the carburetor.

The pilot should read and adhere to procedures recommended in the Lycoming Operator's Manual to obtain maximum engine life and efficiency.

FLIGHT CONTROLS

Dual controls are standard equipment and all primary controls are actuated through push-pull tubes and bellcranks. Bearings used throughout the control system are either sealed ball bearings which do not require lubrication or have self-lubricated liners.

Flight control operation is conventional. The cyclic is center mounted with the left and right control grips mounted to a cross tube which pivots on the center cyclic post. On later aircraft, the pilot's cyclic grip angle can be adjusted fore and aft relative to the cross tube by a mechanic to achieve the most comfortable hand position. The most forward position provides the most control clearance at aft cyclic for larger pilots. Pilots should always verify the ability to apply full control travel prior to flight.

Collective operation is conventional. The engine throttle is correlated to collective inputs through a mechanical linkage. When the collective is raised, the throttle is opened and when the collective is lowered, the throttle is closed. The collective stick also incorporates a twist grip throttle control which is described in the Engine Controls section.

CAUTION

Above 4000 feet, throttle-collective correlation and governor are less effective. Therefore, power changes should be slow and smooth.

CAUTION

At high power settings above 4000 feet, the throttle is frequently wide open and RPM must be controlled with collective.

On later aircraft, right-side tail rotor pedals are adjustable. To adjust, remove quick-release pin on each pedal by depressing button and pulling. Slide pedal fore or aft to most comfortable of three adjustment positions and reinstall quick-release pin. Verify pins are secure before flight.

REMOVABLE FLIGHT CONTROLS

Left seat pilot controls may be removed and installed by maintenance personnel or pilots as follows:

1. To remove cyclic grip, remove quick-release pin by depressing button and pulling, then pull outward on left grip while supporting cyclic center post. On aircraft with hydraulic controls, rotate right-side cyclic cross tube clockwise to stop, depress stop pin under cyclic pivot, and continue clockwise rotation one turn to wind up balance spring. To install removable cyclic grip, use reverse procedure.

NOTE

Later aircraft have a knurled ring next to the quick-release pin which may be hand tightened to eliminate freeplay. The ring must be loose (rotate counterclockwise looking inboard) to remove pin.

CAUTION

Overrotating cyclic cross tube in either wound or unwound direction will damage balance spring.

CAUTION

After removing cyclic grip, place plastic cap on exposed cyclic cross tube to prevent possible injury to left seat passenger.

2. To remove collective, push boot aft to expose locking pins. Depress locking pins and pull forward on stick. To install, use reverse procedure. It may be necessary to rotate stick slightly to allow pins to snap into place.

CAUTION

When collective is installed, ensure that both locking pins are fully engaged through holes on each side.

3. To remove tail rotor pedals, depress locking pin while twisting pedal counterclockwise, then pull up. To install, use reverse procedure. On later aircraft, a cover which is stowed under the floor scuff plate may be rotated up to cover the floor openings when the pedals are removed.

CONTROL FRICTION ADJUSTMENT

Cyclic and collective controls are equipped with adjustable friction devices. The collective friction lever is located near the aft end of the pilot's collective. It is actuated aft to increase friction and forward to release it.

The cyclic friction knob is located left of the cyclic center post. Turning the knob clockwise applies friction to both longitudinal and lateral cyclic.

CAUTION

Control friction must be used with caution during flight. Excessive friction may make the helicopter difficult to control.

The pedals actuate push-pull controls connected directly to the tail rotor pitch control and do not incorporate any friction devices. An elastomeric trim spring provides a left pedal force to balance feedback forces in flight.

RPM GOVERNOR

The governor maintains engine RPM by sensing changes and applying corrective throttle inputs through a friction clutch which can be easily overridden by the pilot. The governor is active only above 80% engine RPM and can be switched on or off using the toggle switch on the end of the right seat collective.

The governor is designed to assist in controlling RPM under normal conditions. It may not prevent over- or under-speed conditions generated by aggressive flight maneuvers.

CAUTION

When operating at high density altitudes, governor response rate may be too slow to prevent overspeed during gusts, pull-ups, or when lowering collective.

HYDRAULIC SYSTEM

Hydraulically-boosted main rotor flight controls eliminate cyclic and collective feedback forces. The hydraulic system consists of a pump, three servos, a reservoir, and interconnecting lines. Normal operating pressure is 450 to 500 psi. The pump is mounted on and driven by the main gearbox. A servo is connected to each of the three push-pull tubes that support the main rotor swashplate. The reservoir is mounted on the steel tube frame behind the main gearbox and includes a filter, pressure relief valve, and pilot-controlled pressure shut-off valve.

A sight gage for pre-flight fluid level checks is incorporated in the reservoir and is visible by opening a right side cowl door. A vented filler cap is located on top of the reservoir.

The pressure shut-off valve is solenoid-actuated and controlled by the hydraulic switch on the pilot's cyclic grip. The switch should be left ON during helicopter shutdown and start up except during the hydraulic system check.

NOTE

Electrical power is required to switch hydraulics OFF. Pulling HYD circuit breaker will NOT turn off hydraulics but will disable hydraulic switch.

Without hydraulic pressure, a large pilot input force is required to increase collective. Collective inputs also cause longitudinal cyclic forces which makes it difficult to maintain a steady hover. The servos have an irreversible feature to prevent rotor feedback forces from moving the controls. This allows the pilot to relax pressure on the controls in steady cruise flight. However, any cyclic input will cause the collective to lower and therefore the collective will have to be increased periodically.

ENGINE CONTROLS

A twist-grip throttle control is located on each collective stick. The controls are interconnected and actuate the throttle valve through a mechanical linkage. The engine throttle is also correlated to collective inputs through a mechanical linkage. When the collective is raised, the throttle is opened and when the collective is lowered, the throttle is closed.

The electronic engine governor makes minor throttle adjustments by rotating the twist grip to maintain RPM within power-on limits. Manual manipulation of the twist grip is not typically required except during start up, shut down, autorotation practice, and emergencies.

An overtravel spring located in the throttle linkage allows the pilot to roll throttle off beyond the idle stop prior to a ground contact (run-on) autorotation landing. This prevents the throttle from opening when the collective is raised.

Correct throttle linkage adjustment may be verified during preflight by rolling the twist-grip through the overtravel spring and holding against the hard idle stop. The carburetor throttle arm should just barely start to move when the collective is raised full up.

Other engine controls include a mixture control located forward and to the right of the cyclic center post and a carburetor heat control located to the left of the cyclic. Later R44s are equipped with Carb Heat Assist which is described in Section 4.

CLUTCH ACTUATOR

After the engine is started, it is coupled to the rotor drive system through vee-belts which are tensioned by raising the upper drive sheave. An electric actuator, located between the drive sheaves, raises the upper sheave when the pilot engages the clutch switch. The actuator senses compressive load (belt tension) and switches off when the vee-belts are properly tensioned. The clutch caution light illuminates whenever the actuator circuit is energized, either engaging, disengaging, or retensioning the belts. The light stays on until the belts are properly tensioned or completely disengaged.

Belt slack during engine start should be adjusted such that blades begin turning within five seconds of clutch engagement. Excessive slack may cause belts to jump out of sheave grooves during start. Periodic readjustment by a mechanic may be required as belts wear in service.

A fuse located on the test switch panel prevents an actuator motor overload from tripping the clutch circuit breaker. If the fuse blows, the actuator motor will stop but the clutch caution light will remain illuminated. An open circuit breaker removes power from both the motor and the light. With an open circuit breaker, no belt tensioning will occur, and the light will not function to indicate an abnormal condition.

CAUTION

Never take off while clutch caution light is on.