CHAPTER 8

FLIGHT CONTROLS

8.000 Flight Controls

8.001 Introduction

This section covers removal and installation procedures for cyclic controls, collective controls, tail rotor controls, and related components.

WARNING

Assembly of flight controls is critical and requires inspection by a qualified person. If a second person is not available, the installer must take a 5-minute break prior to inspecting flight control connections he has assembled.

8.002 Description (see Figures 8-1 and 8-2)

Dual controls, which are removable on the left side, are standard equipment. All primary controls are actuated through push-pull tubes and bellcranks. Bearings used throughout the control system are either sealed ball bearings or have self-lubricated Teflon® liners.

R44 flight controls operate conventionally. The cyclic stick appears different, but the grip moves as in other helicopters. The cyclic grip is free to move vertically allowing the pilot to rest his forearm on his knee if he chooses. Electric trim-equipped aircraft include strain gages mounted to the cyclic stick to sense control forces, and electric trim motors at the base of the stick which automatically minimize these forces.

The collective stick is conventional with a twist grip throttle. When the collective control is raised, the engine throttle is opened automatically by an interconnecting linkage. Additionally, an electronic throttle governor adjusts throttle position to maintain RPM.

8.003 Hydraulic Flight Controls

The optional hydraulic flight control system consists of a pump mounted to the main rotor gearbox, a servo at each of the three push-pull control tubes supporting the main rotor swashplate, a reservoir assembly, interconnecting lines, A257-15 hydraulic fluid (see Section 1.470). An elastic cord replaces the collective trim spring and balances the weight of the collective stick.

Figure 8-1A shows the hydraulic control system. A schematic diagram of the system is given in Figure 8-1B.

WARNING

Except as instructed in this manual, service on the hydraulic system is limited to component removal and replacement.

CAUTION

Cleanliness of hydraulic fluid is vital to proper system operation. Use only clean fluid from sealed containers and avoid contamination from dirty funnels, tubing, etc. Do not use alcohol to clean hydraulic components.

8.230 RPM Governor System

The governor system senses engine RPM and applies corrective input forces to the throttle; when RPM is low, governor increases throttle and vice versa. Throttle inputs are through a friction clutch, which can be easily overridden by the pilot. The governor is active from 79% - 111% engine RPM and can be switched on or off by the pilot using the toggle switch on the end of the right seat collective control.

The governor system is designed to assist the pilot in controlling the RPM in the normal operating range. It may not prevent over- or under-speed conditions generated by aggressive flight maneuvers. Within the active range there is a 1%-wide deadband from 101% - 102% where the governor will not take action provided the rpm is steady.

The governor system consists of the following major components:

1. The D278 governor controller, a solid-state analog-circuit control unit mounted behind the left aft seat backrest. The controller senses engine RPM via tachometer points in the engine right magneto (helicopter left side) and provides a corrective signal to the governor assembly. All governor controllers operate on 14 volts; 28-volt ships utilize a 28- to 14-volt converter to power the controller.

2. The 14-volt B247-5 governor assembly, attached to the collective stick assembly behind the left front seat. When activated by the governor controller, the governor gearmotor and attached worm gear drives a friction clutch connected to the throttle.

3. Signal and power wiring.

8.231 Governor Controller Removal

1. Remove left, aft backrest to gain access to controller.

WARNING

No external adjustment of controller is available. If controller fails to operate correctly, remove and return it to RHC.

2. Disconnect electrical connector.

3. Remove four screws securing governor controller to shelf.

8.232 Governor Controller Installation

CAUTION

R44 helicopters require the D278-1 controller. R44 II helicopters require the D278-2 controller.

1. Secure governor controller to shelf.

2. Connect electrical connector.

3. Install backrest.

TACHOMETER FAILURE

If rotor or engine tach malfunctions in flight, use remaining tach to monitor RPM. If it is not clear which tach is malfunctioning or if both tachs malfunction, allow governor to control RPM and land as soon as practical.

NOTE

Each tach, the governor, and the low RPM warning horn are on separate circuits. A special circuit allows the battery to supply power to the tachs with the battery and alternator switches both OFF.

HYDRAULIC SYSTEM FAILURE

Hydraulic system failure is indicated by heavy or stiff cyclic and collective controls. Loss of hydraulic fluid may cause intermittent and/or vibrating feedback in the controls. Control will be normal except for the increase in stick forces.

1. HYD Switch – verify ON.
2. If hydraulics not restored, HYD Switch – OFF.
3. Adjust airspeed and flight condition as desired for comfortable control.
4. Land as soon as practical.

GOVERNOR FAILURE

If engine RPM governor malfunctions, grip throttle firmly to override the governor, then switch governor off. Complete flight using manual throttle control.

WARNING/CAUTION LIGHTS (cont'd)

ALT	Indicates low voltage and possible alternator failure. Turn off nonessential electrical equipment and switch ALT off then back on after one second to reset alternator control unit. If light stays on, land as soon as practical. Continued flight without functioning alternator can result in loss of power to tachometers, producing a hazardous flight condition.
BRAKE	Indicates rotor brake is engaged. Release immediately in flight or before starting engine.
STARTER-ON	Indicates starter motor is engaged. If light does not go out when starter button is released, immediately pull mixture off and turn battery switch off. Have starter motor serviced.
GOV-OFF	Indicates engine RPM throttle governor is off.
CARBON MONOXIDE	Indicates elevated levels of carbon monoxide (CO) in cabin. Shut off heater and open nose and door vents. If hovering, land or transition to forward flight. If symptoms of CO poisoning (headache, drowsiness, dizziness) accompany light, land immediately.
FULL THROTTLE (if installed)	Indicates engine near full throttle. The governor will be ineffective because it cannot increase throttle to maintain RPM. Lower collective as required to extinguish light.

LOW RPM HORN & CAUTION LIGHT

A horn and an illuminated caution light indicate that rotor RPM may be below safe limits. To restore RPM, immediately roll throttle on, lower collective and, in forward flight, apply aft cyclic. The horn and caution light are disabled when collective is full down.

PITOT-STATIC SYSTEM

The pitot-static system supplies air pressure to operate the airspeed indicator, altimeter, and vertical speed indicator. The pitot tube is located on the front edge of the mast fairing. The static sources are located on each side of the cabin aft of the rear doors.

Water can be drained from pitot-static lines by removing the plastic drain plugs which are accessible through the forward inspection panel on the underside of the cabin. Draining lines should be required only if the airspeed indicator or altimeter appears erratic.

Pitot and static sources should be inspected frequently to verify no bugs or other obstructions.

DUAL TACHOMETER

An electronic engine and rotor dual tachometer is standard. Engine tachometer signal is provided by magneto breaker points. Rotor tachometer signal is provided by two magnetic senders at the main gearbox drive yoke. Each tachometer is on a separate circuit with its own circuit breaker. With battery and alternator switches off, the tachometers continue to receive power from the battery through a bypass circuit as long as the clutch actuator switch is in the engage position.

NOTE

Do not stow helicopter with clutch switch engaged. The tachometers are powered with the clutch engaged and will discharge the battery.