

**SECTION 7  
SYSTEMS DESCRIPTION  
CONTENTS**

	<b>Page</b>
General . . . . .	7-1
Rotor Systems . . . . .	7-2
Drive System . . . . .	7-3
Powerplant Installation . . . . .	7-4
Flight Controls . . . . .	7-5
Removable Flight Controls . . . . .	7-6
Hydraulic System . . . . .	7-7
Control Friction Adjustment . . . . .	7-8
Engine Controls . . . . .	7-8
Engine Anti-Ice . . . . .	7-9
Starter and Ignition System . . . . .	7-10
Fuel System . . . . .	7-11
Electrical System . . . . .	7-12
Lighting System . . . . .	7-16
External Power Receptacle . . . . .	7-17
Instrument Panel . . . . .	7-17
Annunciator Panel . . . . .	7-20
Audio Alerts . . . . .	7-21
Audio System . . . . .	7-22
Optional Avionics . . . . .	7-23
Dual Tachometer . . . . .	7-23
Pitot-Static System . . . . .	7-24
Engine Monitoring Unit . . . . .	7-24
Cabin Heating and Ventilation . . . . .	7-25
Seats, Belts, and Baggage . . . . .	7-26
Heated Seats (Optional) . . . . .	7-27
Landing Gear . . . . .	7-27
Rotor Brake . . . . .	7-28
Emergency Locator Transmitter (Optional) . . . . .	7-29
Accessory Mounts (Optional) . . . . .	7-30

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## **SECTION 7**

### **SYSTEMS DESCRIPTION**

#### **GENERAL**

The R66 is a five-place, single main rotor, single engine helicopter constructed primarily of metal and equipped with skid-type landing gear.

The primary fuselage structure is welded steel tubing and riveted aluminum sheet. The tailcone is a monocoque structure in which aluminum skins carry most primary loads. Fiberglass and thermoplastics are used in secondary cabin structure and in various ducts and fairings. The cabin doors are also constructed of fiberglass and thermoplastics.

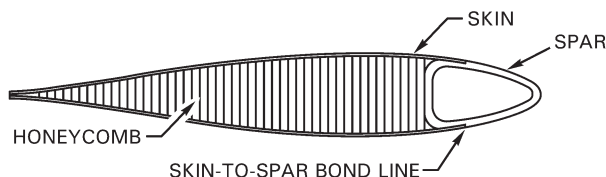
Several cowl doors provide access to the drive system, engine, engine oil tank, fuel filler cap, and fuel sump drain. A right-side door provides access to the main baggage compartment. Additional access to controls and other components for maintenance is provided by removable panels and cowlings.

The engine is located aft of the main baggage compartment. The engine compartment is isolated from the rest of the airframe by firewalls in front of and above the engine.

The four cabin doors are removable. Refer to Section 8 for removal and installation procedures.

## **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. Aluminum 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 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**

The engine is mounted in a 37° nose-up attitude. A sprag-type overrunning clutch mates directly to the splined engine power take-off (PTO) shaft. The clutch is connected to a shaft with flexible couplings at both ends to transmit power to the main gearbox. A ring and pinion spiral bevel gearset at the main gearbox input reduces speed to tail rotor driveline RPM. A second ring and pinion stage reduces speed from tail rotor driveline RPM to main rotor RPM.

The tail rotor drive line consists of an intermediate shaft running aft from the main gearbox and a long tail rotor driveshaft which runs the length of the tailcone. Flexible couplings are located at both ends of the intermediate shaft. The long tail rotor driveshaft has a support bearing at its front end and a damper bearing approximately one-third of the way aft on the shaft. The cooling fan is mounted to the intermediate shaft. The tail gearbox contains a single 90° splash-lubricated spiral-bevel gearset which increases speed to tail rotor RPM.

The main gearbox is pressure lubricated. The oil is pumped through an airframe-mounted filter and cooled by an oil cooler which receives its airflow from the cooling fan. The main gearbox also drives the flight control hydraulic pump.

## **POWERPLANT INSTALLATION**

One Rolls-Royce model 250-C300/A1 (commercial designation RR300) free-turbine turboshaft engine powers the helicopter. The engine is equipped with an ignition exciter, igniter, starter-generator, two tachometer senders, and additional powerplant instrument senders. See sections 1 and 2 for power plant specifications and limitations.

A direct-drive, squirrel-cage style cooling fan is mounted to the intermediate shaft and supplies cooling air to the engine and gearbox oil coolers.

Induction air enters through multiple openings in the upper fuselage cowlings and flows into a plenum forward of the firewall. The plenum contains a radial-flow air filter at the engine compressor inlet. The standard filter element is foam. A high-efficiency filter element with pleated media is optional. The high-efficiency filter includes a sight gage inside the upper left cowl door which provides an indication of filter dirt load.

### ***NOTE***

The high-efficiency filter is recommended for operating in dusty conditions. The standard filter may not filter fine sand or dust, resulting in reduced engine life.

If the air filter becomes blocked, spring-loaded doors at the front of the filter housing open, allowing unfiltered air to the engine. The AIR FILTER annunciator illuminates when filter bypass is occurring.

### ***NOTE***

Periodically performing power assurance checks may provide indication of engine deterioration or air filter blockage. Maintenance actions such as air filter cleaning and compressor wash should be performed if aircraft fails power assurance check (see Section 5 for power assurance check and Maintenance Manual for maintenance procedures).

## **POWERPLANT INSTALLATION (cont'd)**

A temperature switch is mounted to the firewall above the engine to detect a fire in the engine compartment. Abnormally high temperature causes the ENGINE FIRE annunciator to illuminate.

## **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.

The collective stick has a twist grip to provide input to the engine fuel control. Raising or lowering collective provides power turbine governor inputs via an interconnecting linkage.

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.

Left-side pedals are not adjustable. However, optional pedals designed for shorter pilots (Robinson part nos. F755-9 and -10) may be installed in place of the standard pedals.

## **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. 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. A cover which is stowed under the floor scuff plate may be rotated up to cover the floor openings when the pedals are removed.



## **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 to the aft end of the main gearbox and includes a filter, pressure relief valve, and pilot-controlled pressure shut-off valve.

A sight glass for pre-flight fluid level checks is incorporated in the reservoir and accessible via a left 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.

## **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 stick. Turning the knob clockwise applies friction to both longitudinal and lateral cyclic.

### ***CAUTION***

Control friction must be used with caution in 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.

## **ENGINE CONTROLS**

A twist grip throttle control is located on each collective stick. The controls are interconnected and actuate the engine fuel control input lever via a push-pull cable. The throttle is normally not used for control but is set either fully closed (idle position) or fully open.

The engine incorporates a hydromechanical governor which attempts to maintain 100% engine output shaft RPM when the throttle is in the open position. A linkage provides the power turbine governor with collective inputs to help anticipate changing power demands.

Large power changes or varying environmental conditions may cause the governor RPM setting to vary by a few percent. A momentary toggle switch (beep switch) on the collective stick is provided to trim, or "beep", the governor setting to the desired RPM. The switch controls an actuator which adjusts the linkage between the collective and power turbine governor. Holding the beep switch up or down will change rotor RPM approximately one percent per two seconds.

### **ENGINE CONTROLS (cont'd)**

The governor controls RPM under normal conditions. It may not prevent over- or under-speed conditions generated by aggressive flight maneuvers or rapid power changes.

Other engine controls include a push-pull fuel cutoff control on the console face, a start button on pilot's collective, a key-type igniter switch, and an anti-ice switch.

### **ENGINE ANTI-ICE**

A solenoid-actuated valve controlled by the anti-ice switch allows hot compressor discharge air to flow to the compressor nose bearing support. The green ANTI-ICE annunciator is activated by a pressure switch in the anti-ice air line, indicating when anti-ice is ON and functioning. Because compressor discharge air is used, some performance degradation occurs with anti-ice ON (see Section 5).

Switch anti-ice ON in conditions conducive to icing. Anti-ice must be ON for operation in certain conditions per Section 2.

#### **NOTE**

Electrical power to the anti-ice solenoid is required to switch anti-ice OFF (system is fail-safe ON).

## **STARTER AND IGNITION SYSTEM**

A single starter-generator is used for engine starting and electrical power generation. A generator control unit (GCU) controls starter-generator function. During a start, the GCU latches the starter on until  $N_1$  reaches 58 percent RPM. Therefore, the pilot is not required to hold the start button down throughout the start sequence. Above 58 percent  $N_1$  RPM, the GCU automatically switches out of start mode, but the generator switch should not be switched ON until idle RPM stabilizes to prevent the generator load from bringing the RPM down.

When the igniter key switch is in the enable position, depressing the start button causes a normal start sequence with the starter latching on and the igniter firing. Above 58 percent  $N_1$  RPM, the igniter will fire while the start button is depressed.

When the igniter switch is OFF, the engine can be motored by the starter by depressing the start button without the starter latching or the igniter firing. This is useful for performing a compressor wash or rinse. If the igniter is switched OFF during a start, the starter will disengage. If the igniter is switched OFF while the engine is running, the engine will continue to run; however, this is not recommended.

### **NOTE**

Start button is active when battery switch is ON, even if igniter switch is OFF. Rotor brake may be left engaged after shutdown to disable start button.

## **FUEL SYSTEM**

A single bladder-type crash-resistant fuel cell supplies fuel via gravity flow to the engine. The fuel cell incorporates vent fittings, a filler port, a fuel gage sender, a low-fuel sender, a sump drain, and a finger strainer at the fuel outlet.

The low-fuel sender is a float switch which activates the LOW FUEL annunciator, indicating approximately five gallons of usable fuel remaining. On later aircraft, a second float switch activates the <12 GAL FUEL annunciator, indicating approximately 12 gallons of usable fuel remaining. At moderate to high power settings, the 12 gallon annunciator will illuminate approximately 15 to 20 minutes prior to the LOW FUEL annunciation.

### ***NOTE***

Due to fuel tank geometry, the level at which the <12 GAL FUEL annunciator illuminates varies with helicopter pitch and roll attitude and is therefore affected by helicopter CG. 12 gallon annunciation is accurate in a level attitude but may be inaccurate by as much as four gallons if helicopter is loaded to CG limits. Aft, left loadings cause annunciation with less than 12 gallons remaining and forward, right loadings cause annunciation with more than 12 gallons remaining.

The fuel cell is secured inside an aluminum structure. The filler cap is located under a cowl door. The left and right vent fittings are interconnected and are vented through two risers within the mast fairing. The vent fittings each have a rollover valve to prevent fuel leakage in any attitude. A fuel valve is located on the forward side of the firewall and is controlled by a push-pull cable control at the base of the pilot's collective stick.

The engine incorporates a fuel pump assembly with an inlet filter. A differential pressure switch illuminates the FUEL FILTER annunciator if the filter becomes contaminated.

### **FUEL SYSTEM (cont'd)**

A single drain allows fuel sampling from the low point in the fuel cell. The drain tube is accessible via a left side cowl door. The drain is opened by extending the plastic tube clear of the aircraft and pushing up on the drain. On later helicopters, a glass tube stowed inside the upper left cowl door is provided which may be used to catch fuel samples.

### **ELECTRICAL SYSTEM**

A 28-volt DC electrical system is standard. Primary system components are a sealed lead-acid battery, a starter-generator, and a generator control unit. The battery is located in a compartment in the left side of the baggage compartment.

The circuit breaker panel is on the ledge just forward of the left front seat. Breakers are marked to indicate function and amperage. Inflight reset of circuit breakers is not recommended.

The battery switch controls the battery relay which connects the battery to the electrical system. A wire protected by a fuse near the battery bypasses the battery relay to allow the tachometers and clock to receive battery power with the battery switch OFF.

The avionics switch controls power to avionics. This allows avionics to be switched OFF by a single switch. Having sensitive electrical equipment off when the generator is switched ON protects against voltage spikes.

An ammeter indicates total generator output. A digital voltmeter which reads main bus voltage at the circuit breaker panel is incorporated as part of the OAT indicator. Normal indication is 27.3 to 28.7 volts with the generator ON.

**ELECTRICAL SYSTEM (cont'd)**

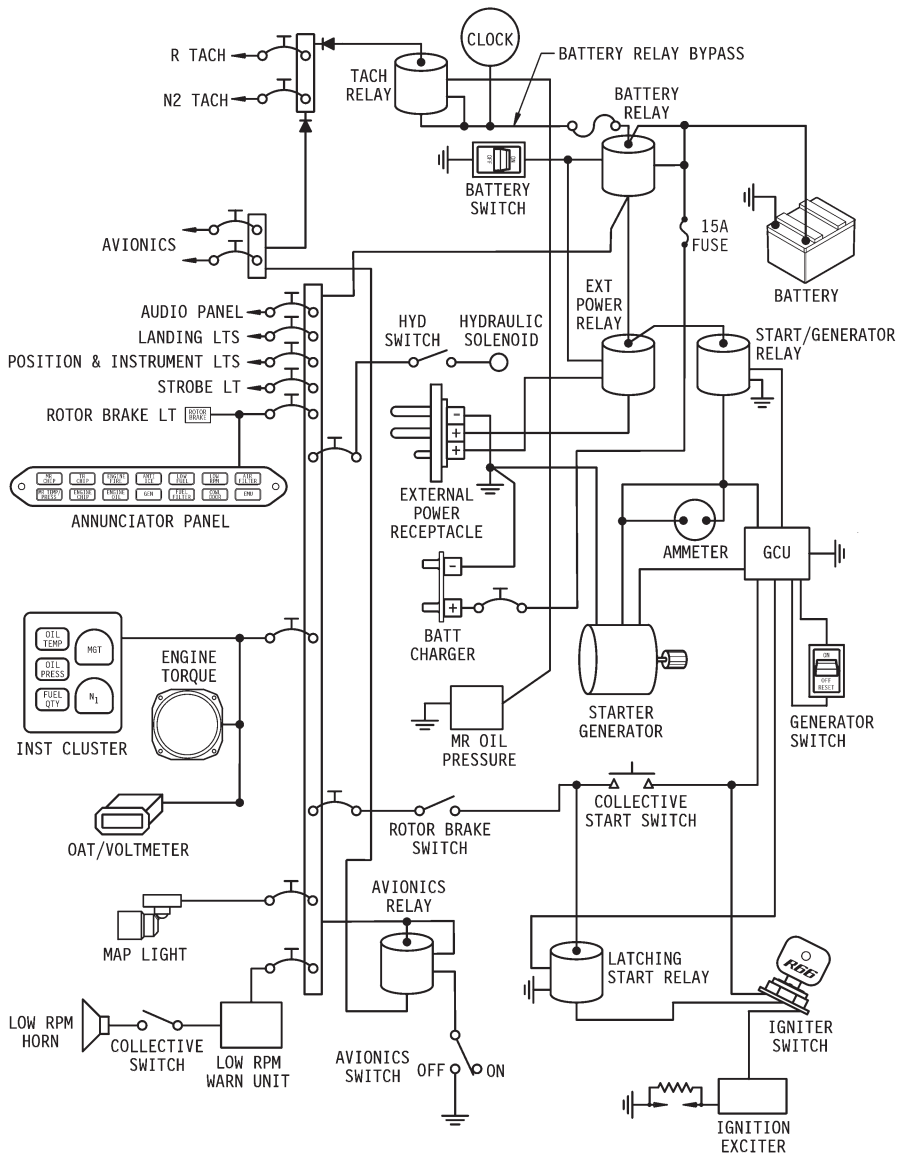
A generator control unit (GCU) controls starter-generator function. Below 58 percent  $N_1$  RPM, the GCU is in start mode regardless of generator switch position. Above 58 percent, the GCU automatically switches to generate mode. The generator switch should normally be off for starting to prevent applying generator load to the engine before reaching idle RPM.

If the GEN annunciator illuminates in flight, turn off non-essential electrical equipment and switch generator to reset and then ON. If the GEN annunciator remains illuminated, land as soon as practical.

***NOTE***

A GEN light may indicate a broken generator shaft. With a broken shaft, it will not be possible to re-start the helicopter after shutdown.

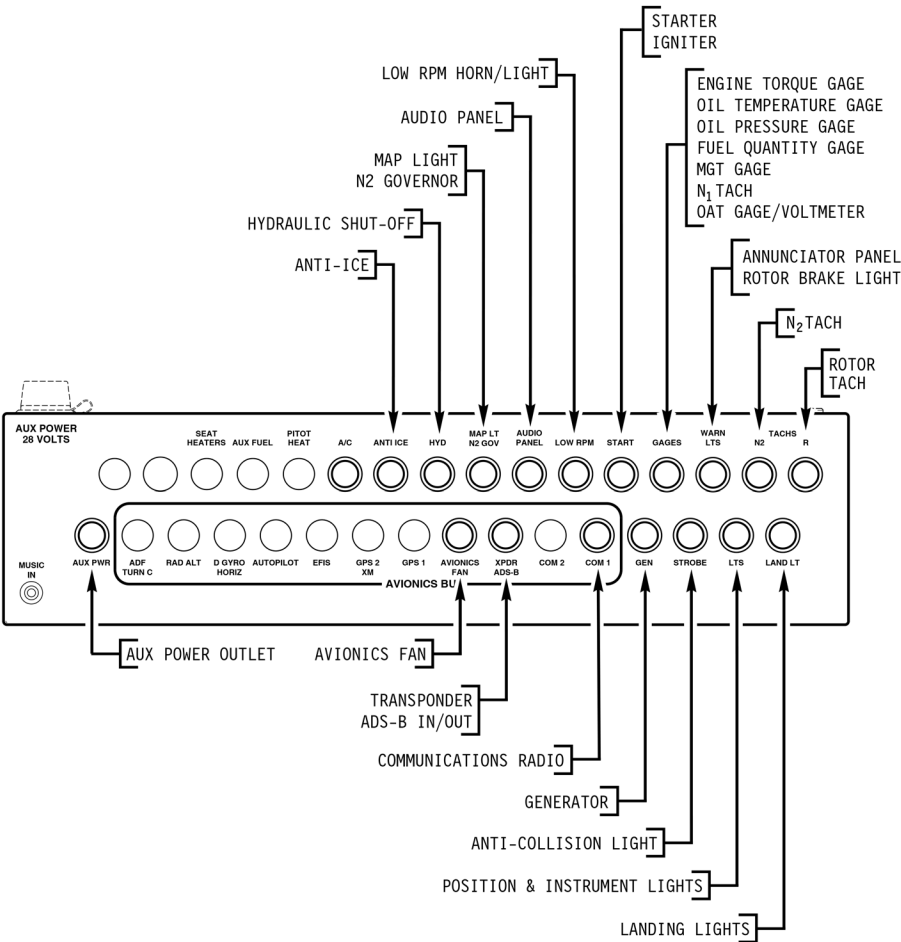
ELECTRICAL SYSTEM (cont'd)



ELECTRICAL SYSTEM



ELECTRICAL SYSTEM (cont'd)



CIRCUIT BREAKER PANEL – TYPICAL

## **LIGHTING SYSTEM**

A red anti-collision light is installed on the tailcone and is controlled by the strobe switch. Position lights are installed on each side of the cabin and in the tail and are controlled by the nav lights switch. A light at the top of the windshield and post lights illuminate the instrument panel. Panel lighting is active when the nav lights switch is on and lighting is dimmed via the knob above the nav lights switch. An overhead map light mounted on a swivel is controlled by an adjacent switch with high and low settings. The map light may be used for emergency lighting of the instrument panel. An additional cabin light with an adjacent switch is located just aft of the map light. The map and cabin lights are not connected to the dimmer circuit.

Two long-life, high intensity discharge (HID) landing lights are installed in the nose. One wide-angle and one narrow-beam light are used to increase lighted area. One landing light switch controls both lights and is located on the cyclic center post.

### ***NOTE***

Continuous operation of landing and position lights in flight is recommended to promote collision avoidance.

An optional flashing light may be mounted on the tailcone in addition to the standard anti-collision light. On earlier aircraft, the optional light is controlled by an additional position on the strobe switch. On later aircraft, the optional light is controlled by a separate switch.

## **EXTERNAL POWER RECEPTACLE**

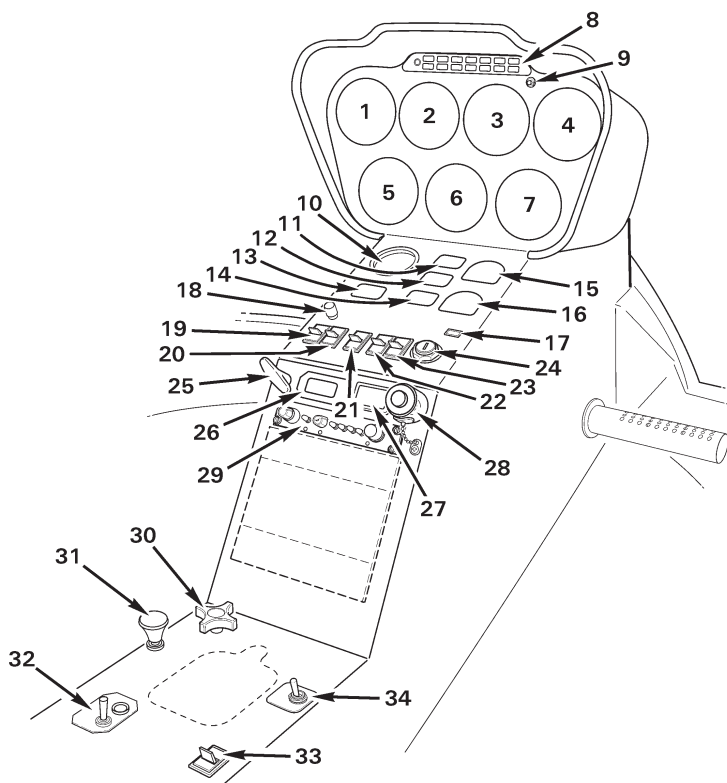
A 28-volt SAE AS35061-style receptacle is provided for external power. On earlier aircraft, the receptacle is located inside the right engine cowl door. On later aircraft, the receptacle is located in the cabin outboard of the pilot's seat. When the battery is switched on, the external power relay and the battery relay both close, connecting external power to the aircraft electrical system and battery. The external power relay will not close if reverse polarity is sensed by the receptacle.

Provisions are provided to allow battery charging when the battery switch is off. See Section 8 for charging procedures.

## **INSTRUMENT PANEL**

Standard primary instruments include an airspeed indicator, engine ( $N_2$ ) and rotor dual tachometer, altimeter, torque meter, and magnetic compass. Engine gages include an  $N_1$  tachometer, measured gas (turbine) temperature, oil pressure, oil temperature, and fuel quantity. Also standard are a clock, an ammeter, a digital outside air temperature gage/voltmeter, and an hourmeter. An additional hourmeter is located outboard of the pilot's seat. Both hourmeters require main gearbox oil pressure to activate. The outboard hourmeter is collectively activated and may be used to determine time in service.

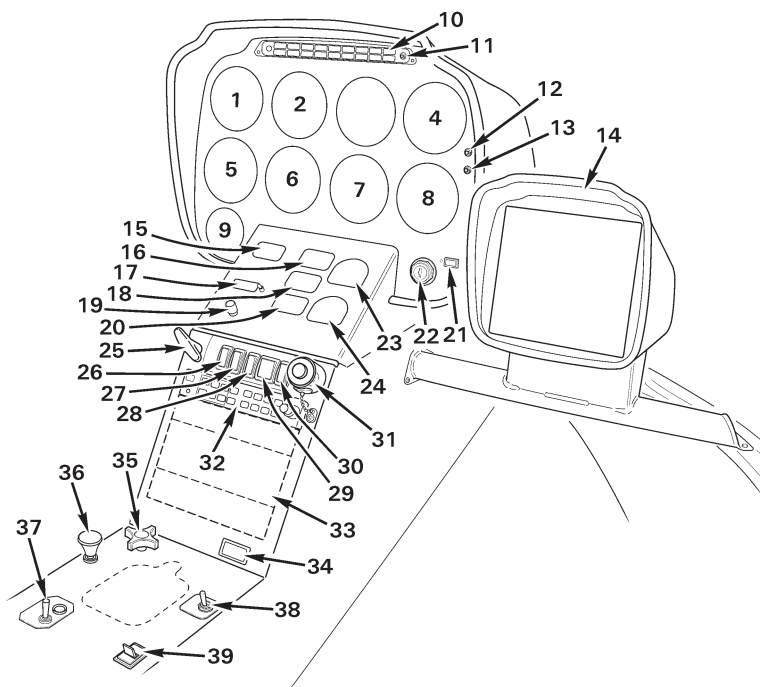
Views of typical instrument panels are given on the following pages. Additional views of panels with electronic flight displays are found in the Optional Avionics Supplement in Section 9. Pilots should familiarize themselves with panel layout and equipment installations for each specific aircraft that they fly.



- |                                |                                 |
|--------------------------------|---------------------------------|
| 1. VERTICAL SPEED INDICATOR    | 18. PANEL LIGHTS DIMMER         |
| 2. OPTIONAL INSTRUMENT         | 19. NAVIGATION LIGHTS SWITCH    |
| 3. AIRSPEED INDICATOR          | 20. STROBE LIGHT SWITCH         |
| 4. $N_2$ AND ROTOR TACHOMETERS | 21. AVIONICS MASTER SWITCH      |
| 5. ALTIMETER                   | 22. GENERATOR SWITCH            |
| 6. OPTIONAL INSTRUMENT         | 23. BATTERY SWITCH              |
| 7. TORQUEMETER                 | 24. IGNITER SWITCH              |
| 8. ANNUNCIATOR PANEL           | 25. CABIN AIR                   |
| 9. ANNUNCIATOR TEST BUTTON     | 26. OUTSIDE AIR TEMP/VOLTMETER  |
| 10. CLOCK                      | 27. HOURMETER                   |
| 11. ENGINE OIL TEMP GAGE       | 28. FUEL CUTOFF WITH GUARD      |
| 12. ENGINE OIL PRESSURE GAGE   | 29. AUDIO CONTROL PANEL         |
| 13. AMMETER                    | 30. CYCLIC FRICTION             |
| 14. FUEL GAGE                  | 31. CABIN HEAT                  |
| 15. MGT GAGE                   | 32. ELT SWITCH (OPTIONAL)       |
| 16. $N_1$ TACHOMETER           | 33. ENGINE ANTI-ICE SWITCH      |
| 17. ROTOR BRAKE LIGHT          | 34. HEATED PITOT SWITCH (OPT'L) |

### INSTRUMENT PANEL – TYPICAL (EARLIER AIRCRAFT)

(Exact panel configuration may vary with optional equipment and date of helicopter manufacture.)



- |   |                                 |
|---|---------------------------------|
| 1. VERTICAL SPEED INDICATOR             | 21. ROTOR BRAKE LIGHT           |
| 2. OPTIONAL INSTRUMENT                  | 22. IGNITER SWITCH              |
| 3. AIRSPEED INDICATOR                   | 23. MGT GAGE                    |
| 4. N <sub>2</sub> AND ROTOR TACHOMETERS | 24. N <sub>1</sub> TACHOMETER   |
| 5. OPTIONAL INSTRUMENT                  | 25. CABIN AIR                   |
| 6. OPTIONAL INSTRUMENT                  | 26. NAVIGATION LIGHTS SWITCH    |
| 7. ALTIMETER                            | 27. ANTI-COLLISION LIGHT SWITCH |
| 8. TORQUEMETER                          | 28. AVIONICS MASTER SWITCH      |
| 9. CLOCK                                | 29. GENERATOR SWITCH            |
| 10. ANNUNCIATOR PANEL                   | 30. BATTERY SWITCH              |
| 11. ANNUNCIATOR TEST BUTTON             | 31. FUEL CUTOFF WITH GUARD      |
| 12. HIGH RPM ALERT TEST BUTTON          | 32. AUDIO CONTROL               |
| 13. HIGH TORQUE ALERT TEST BUTTON       | 33. AVIONICS STACK              |
| 14. PILOT'S SIDE CONSOLE (OPT'L)        | 34. HOURMETER                   |
| 15. AMMETER                             | 35. CYCLIC FRICTION             |
| 16. ENGINE OIL TEMP GAGE                | 36. CABIN HEAT                  |
| 17. OUTSIDE AIR TEMP/VOLTMETER          | 37. ELT SWITCH (OPTIONAL)       |
| 18. ENGINE OIL PRESSURE GAGE            | 38. PITOT HEAT SWITCH (OPT'L)   |
| 19. PANEL LIGHTS DIMMER                 | 39. ENGINE ANTI-ICE SWITCH      |
| 20. FUEL GAGE                           |                                 |

### **INSTRUMENT PANEL – TYPICAL (LATER AIRCRAFT)**

(Exact panel configuration may vary with optional equipment and date of helicopter manufacture.)

**ANNUNCIATOR PANEL**

The annunciator panel consists of illuminated segments located at the top of the main instrument panel. If a caution or warning condition occurs, the appropriate segment(s) illuminate indicating the nature of the problem. A later annunciator panel is shown below. Earlier panels do not include the four left-most segments.



**TYPICAL ANNUNCIATOR PANEL**

The CHIP segments are illuminated by magnetic chip detectors in each gearbox which collect metallic particles in order to complete an electric circuit. The engine gearbox has two chip detectors, either of which can illuminate the ENGINE CHIP segment.

The MR TEMP/PRESS segment is illuminated by either the temperature switch or oil pressure switch at the main gearbox. The ENGINE FIRE segment is illuminated by a temperature switch in the engine compartment. The ENGINE OIL segment is activated by a pressure switch which is independent of the oil pressure sender. The ANTI ICE segment illuminates via a pressure switch in the engine anti-ice air line. The GEN segment illuminates when the generator is disconnected from the main electrical bus.

The LOW FUEL segment is illuminated by a float switch in the tank which is independent of the fuel quantity sender. On later aircraft, a second float switch illuminates the <12 GAL FUEL segment. The FUEL FILTER segment illuminates when a pressure switch detects excessive pressure drop across the fuel filter.

The LOW RPM segment is illuminated by a sensor measuring driveline speed at the aft end of the main gearbox. A horn sounds simultaneously with illumination of the LOW RPM segment when rotor speed is below 95% RPM.

### **ANNUNCIATOR PANEL (cont'd)**

The COWL DOOR segment is illuminated when the fuel filler cowl door or baggage door is not closed. On later aircraft, the COWL DOOR segment also illuminates when an engine cowl door is not closed. The AIR FILTER segment illuminates when pressure drop across the filter opens bypass doors, allowing unfiltered air to the engine.

On later aircraft, the HYD segment illuminates when the hydraulic system is switched off.

The EMU (Engine Monitoring Unit) segment indicates the EMU status with either steady, flashing, or no illumination. The EMU segment will illuminate only when the test button is depressed.

The test button at the annunciator panel should cause all segments on the panel, as well as the ROTOR BRAKE light, to illuminate when depressed. The LOW FUEL and < 12 GAL FUEL segments take approximately two seconds before they illuminate due to a time delay in the circuit. (The time delay prevents sloshing fuel from giving a false indication.) If the LOW FUEL segment illuminates immediately after the test button is depressed, a fault is indicated and should be investigated by a qualified mechanic. The EMU segment takes approximately ten seconds to perform a self-test after the battery is switched ON before it will illuminate. The test button may be used on the ground or in flight to verify all circuits are functioning.

### **AUDIO ALERTS**

All R66 helicopters have a low-RPM horn which sounds when rotor RPM is below 95%. The horn is muted when the collective is fully down. On earlier aircraft, the horn is provided by speakers in the side of the instrument console. On later aircraft, a tone generator in the audio system provides the horn through crew headsets.

**AUDIO ALERTS (cont'd)**

Later aircraft also have audio alerts in the headsets for high rotor RPM and high engine torque/MGT. For high RPM, a warble tone (high/low tone) indicates rotor RPM above 105%. For high engine torque/MGT, a beeping tone indicates torque above 100% or MGT above 782°C (5-minute limits). High torque is indicated by four beeps per second, increasing to 12 beeps per second if torque exceeds 108%. High MGT is indicated by 12 beeps per second. The beep tone will also come on during start if MGT exceeds 860°C, indicating an abnormally hot start.

Test buttons on the instrument panel permit pre-flight or in-flight tests of the high RPM and high torque/MGT tones. For high torque/MGT, depressing the test button give four beeps per second for two seconds followed by 12 beeps per second.

Additional audio alerts may my be provided in the headsets depending on optional equipment installed, such as terrain warnings, traffic warnings, and autopilot modes.

**AUDIO SYSTEM**

A five-place audio system is standard. An audio control panel allows control of communication radios, intercom, and music (or other external audio) input.

Audio control panels from several manufacturers are offered. Pilots should consult the manufacturer's operating instructions for the specific brand of audio panel in the aircraft they fly.

Headset jacks are located in the ceiling near each seat. Pilot and copilot intercom and transmit are controlled by trigger switches on the cyclic grips. The trigger has two detents; the first detent activates the intercom and the second detent transmits. Additional intercom buttons are located on the forward side of the rear seats and on the left forward floor or seat support. Intercom may also be set to be voice activated. Music or other external audio may be plugged into a jack on the circuit breaker panel. For most installations and settings, this input is muted during radio communication.



## **OPTIONAL AVIONICS**

A wide range of optional avionics are available for the R66. It is not practical to provide a description of all equipment in this manual. All aircraft are delivered with the manufacturers' operating manuals for each piece of installed equipment. Pilots are referred to the manufacturers' manuals for detailed operating instructions. Additional information for more complex options such as primary or multi-function displays (PFDs/MFDs) may be found in the Optional Avionics Supplement in Section 9. Good practice dictates becoming familiar with installed equipment before operating an aircraft.

## **DUAL TACHOMETER**

An electronic engine ( $N_2$ ) and rotor dual tachometer is standard. Engine tachometer signal is provided by a transducer on the engine gearbox. Rotor tachometer signal is provided by magnetic senders at the main gearbox tail rotor driveline yoke. Each tachometer is on a separate circuit with its own circuit breaker.

The tachometer bus receives power from the avionics bus or through the battery relay bypass circuit as long as the main rotor gearbox has oil pressure. Therefore, the tachometers will receive power through the bypass circuit whenever the rotors are turning even if the avionics bus is not powered. The bypass circuit is disconnected from the tachometer bus when the annunciator test button is depressed. Pressing the test button while the helicopter is running will confirm that the tachometers are receiving power from the avionics bus.

## **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 leading 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 aft inspection panel on the underside of the cabin. Draining lines should be required only if the airspeed indicator or altimeter appear erratic.

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

## **ENGINE MONITORING UNIT**

The Engine Monitoring Unit (EMU) is a digital recording device mounted behind the right rear seatback panel. The EMU continuously monitors  $N_1$ ,  $N_2$ , engine torque, and MGT. EMU status is indicated by the EMU segment on the annunciator panel. The EMU segment will only illuminate while the annunciator panel test button is depressed. The EMU requires approximately ten seconds to complete a self-test after the aircraft battery is switched on. Once the self-test is complete, steady illumination of the annunciator means normal EMU operation. A slowly flashing indication (once every two seconds) or no illumination means there is a fault in the EMU's senders or circuitry. A fast flashing indication (four times per second) is given if the EMU has detected an exceedance. A fault or exceedance indication should be investigated and reset by a qualified mechanic prior to the next flight.

The EMU records exceedances of Rolls-Royce engine limits. The EMU also records a start cycle when  $N_1$  exceeds 30% and MGT is at least 343°C. EMU data can be downloaded to a computer with the appropriate software.

The EMU is intended to be used only as a maintenance aid. It is the pilot's responsibility to report any observed exceedances and the operator's responsibility to maintain a record of engine starts and time in service.

## **CABIN HEATING AND VENTILATION**

Fresh air vents are located in each door and in the nose. Door vents are opened and closed using the knob near the vent door hinge. A rotating knob is provided to seal and lock vents closed. For maximum ventilation, open door vents wide during hover but only one inch or less during cruise. The rotating knob can be used to hold vents partially open.

The fresh air inlet in the nose is opened by pulling the vent handle on the console face. Rotating the vent handle clockwise will lock its position. Air from the nose inlet is directed along the inside surface of the windshield for defogging as well as for ventilation.

Bleed air from the engine compressor is used for cabin heat. Tubing routes hot air from the engine to outlets forward of the tail rotor pedals and in the rear footwells. A heater control knob located to the left of the cyclic stick actuates a valve in the aft end of the control tunnel through a push-pull cable to control cabin heat. Because the cabin heat uses engine compressor air, some performance degradation occurs with heat ON (see Section 5).

### ***CAUTION***

In case of engine fire, cabin heat should be turned OFF.

## **SEATS, BELTS, AND BAGGAGE**

The seats are not adjustable but the pilot-side pedals are adjustable. Each helicopter is supplied with a cushion which can be placed behind the pilot to position him farther forward. This allows shorter pilots to reach the pedals, the cyclic grip in its most forward position, and the controls on the center console.

Each seat is equipped with a combined lap belt and inertia reel shoulder strap. The inertia reel is normally free but will lock if there is sudden movement as would occur in an accident.

Five-point harnesses are optional for the front seats. The lap belts on these harnesses should be adjusted to eliminate slack. The lower strap should be adjusted as necessary to ensure that the buckle does not interfere with the cyclic grip at aft cyclic. The harness is equipped with a webbing stop located above the inertia reel. The stop limits shoulder strap retraction and should be adjusted so the straps are comfortable without excessive slack.

The main baggage compartment is located between the cabin and the engine compartment. It is accessed via a large door on the aircraft right side. The cowl door annunciator illuminates to warn the pilot when the door is not latched. A light illuminates the compartment when the battery switch is ON. Tie down anchors are provided for securing items in the baggage compartment. Observe placarded weight limits.

Additional compartments are located under each seat except the center rear seat. Seat cushions hinge forward for access to these compartments. Do not load these compartments above the maximum fill lines. The lines indicate required crush space for the seats in an accident.

Optional anchor loops located in the cabin ceiling above the door posts provide attachment points for a safety tether for equipment or occupants during doors-off operation.

## **HEATED SEATS (OPTIONAL)**

Heated seat bottoms and backrests for the forward seats and outboard rear seats are an option. Switches to control low and high heat settings for all four heated seats are located on the panel above the right-side collective boot.

The seat heaters operate only when the generator switch is in the ON position to reduce the likelihood of inadvertently draining the battery before the engine is started.

## **LANDING GEAR**

A skid-type landing gear is used. Most hard landings will be absorbed elastically. However, in an extremely hard landing, the struts will hinge up and outward as the crosstube yields (becomes permanently bent) to absorb the impact. Slight crosstube yielding is acceptable. However, yielding which allows the tail skid to be within 38 inches of the ground (30 inches for extended gear) when the helicopter is sitting empty on level pavement requires crosstube replacement.

The four landing gear struts are fitted with aerodynamic fairings to reduce air drag. The helicopter is approved to fly with or without the fairings installed.

Abrasion-resistant wear shoes are mounted on the bottom of the skids. These shoes should be inspected periodically, particularly if autorotation landings with ground contact have been performed. Have skid shoes replaced whenever the thinnest point in the wear area is less than 0.06 inches (1.5 mm).

## **ROTOR BRAKE**

The rotor brake is mounted on the aft end of the main gearbox and is actuated by a cable connected to a pull handle located on the cabin ceiling. To stop the rotor, use the following procedure:

1. After pulling fuel cutoff, wait at least one minute.
2. Pull brake handle forward and down using moderate force (approximately 10 lb).
3. After rotor stops, it is recommended to use the rotor brake as a parking brake by hooking bead chain in slot in bracket.

An annunciator light near the igniter switch illuminates when the brake is engaged. The brake must be released before starting the engine. When the brake is engaged, the starter is disabled.

### ***CAUTION***

Applying rotor brake without waiting at least one minute after engine shutdown or using a force which stops rotor in less than ten seconds may damage brake shoes and gearbox oil seal.

### **EMERGENCY LOCATOR TRANSMITTER (OPTIONAL)**

The Emergency Locator Transmitter (ELT) installation consists of a transmitter with internal battery pack, an external antenna, and a remote switch/annunciator. The transmitter is mounted to the upper steel tube frame and is accessible through the spring loaded air intake door in the right-side cowl. The remote switch/annunciator is located left of the cyclic stick.

The ELT is operated by a switch on the transmitter and by the remote switch. The transmitter switch has been set in the ARM position at installation and should always be in this position for flight. The remote switch/annunciator is a three position switch with indicator light. This switch should be in the ARMED position for flight. With both switches set to armed, the ELT will begin transmitting when subjected to a high "G" load. When the unit is transmitting, the red indicator light illuminates.

Moving the remote switch to ON activates the transmitter. Use the ON position if an emergency landing is imminent and time permits.

If the ELT is inadvertently activated, use the momentary RESET & TEST position of the remote switch to stop transmission and reset the unit. The red indicator will extinguish when unit is reset.

For more detailed instructions on ELT operation, maintenance, and required tests, refer to manufacturer's manual supplied with the unit.

## **ACCESSORY MOUNTS (OPTIONAL)**

Provisions for mounting small, portable items are an option. The provisions use mounting bars located forward of the pilot's seat, the copilot's seat, or both. The bars are fitted with one or more clamp assemblies which are compatible with a variety of commercially available accessory mounts. There is a 10 lb total weight limit for items attached to each bar. USB and cigarette-lighter-style power outlets are installed near the inboard end of the mounting bars. The power outlets are protected by the Aux Power circuit breaker and in-line fuses and are placarded with voltage/current ratings. Wire clamps and a pocket for securing excess wire are also provided.

The accessory mounts are intended to provide a safe means of mounting small items such as portable electronic devices. The mounting bar, clamp assembly, and power outlets are approved as part of the aircraft type design, but any items attached are the responsibility of the pilot in command under appropriate operating rules. Ensure that any items attached are secure and do not interfere with flight controls or primary field of view. Route any wires through the wire clamps or secure them to the bar with cable ties or tape.

