# R44 II

# PILOT'S OPERATING HANDBOOK

## AND FAA APPROVED ROTORCRAFT FLIGHT MANUAL

## RTR 462

THE R44 II IS FAA APPROVED IN NORMAL CATEGORY BASED ON FAR 27 AND FAR 21. THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY FAR 27 AND FAR 21 AND MUST BE CARRIED IN THE HELICOPTER AT ALL TIMES.

HELICOPTER SERIAL NO. _____

HELICOPTER REGISTRATION NO. _____

SECTIONS 2, 3, 4, 5, AND 9
FAA APPROVED BY: _____

MANAGER, FLIGHT TEST BRANCH, ANM-160L
FEDERAL AVIATION ADMINISTRATION
LOS ANGELES AIRCRAFT CERTIFICATION OFFICE
TRANSPORT AIRPLANE DIRECTORATE

DATE: October 3, 2002

**ROBINSON HELICOPTER COMPANY**
**TORRANCE, CALIFORNIA**

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CLASS V
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ROBINSON HELICOPTER COMPANY
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Los Angeles Aircraft Certification Office
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# SECTION 1

# GENERAL

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# SECTION 1

# GENERAL

## INTRODUCTION

This Pilot's Operating Handbook is designed as an operating guide for the pilot. It includes material required to be furnished to the pilot by FAR 27 and FAR 21. It also contains supplemental data supplied by the helicopter manufacturer.

This handbook is not designed as a substitute for adequate and competent flight instruction or for knowledge of current airworthiness directives, applicable federal aviation regulations, and advisory circulars. Nor is it intended to be a guide for basic flight instruction or a training manual. It should not be used for operational purposes unless kept in a current status.

Assuring that the helicopter is in airworthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the helicopter is safe for flight. The pilot is also responsible for remaining within operating limitations as outlined by instrument markings, placards, and this handbook.

Since it is very difficult to refer to a handbook while flying a helicopter, the pilot should study the entire handbook and become very familiar with limitations, performance, procedures, and operational handling characteristics of the helicopter before flight.

This handbook has been divided into ten numbered sections. Limitations and emergency procedures have been placed ahead of normal procedures, performance, and other sections to provide easier access to that information. Provisions for expansion of the handbook have been made by deliberate omission of certain paragraph numbers, figure numbers, item numbers, and pages noted as being intentionally left blank.

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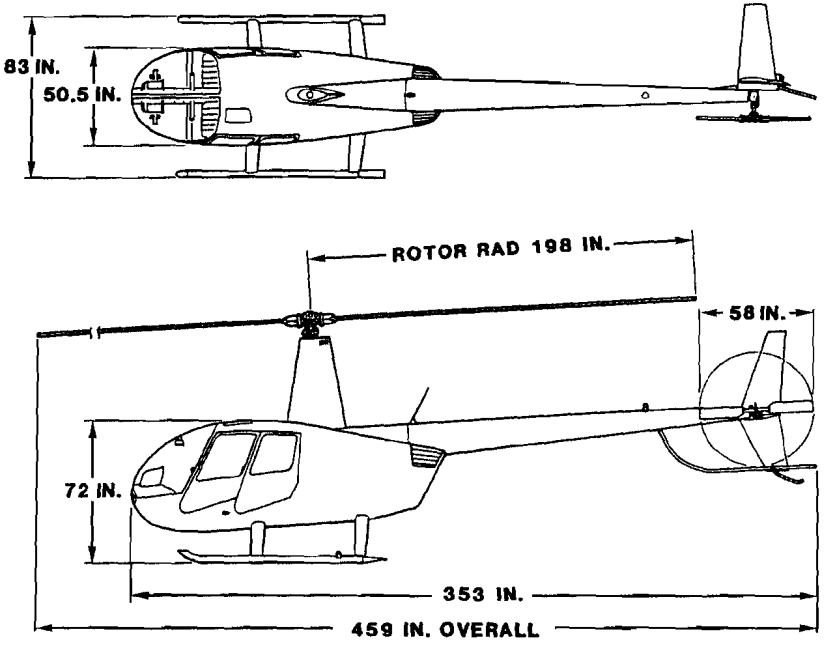


THREE VIEW OF R44 HELICOPTER

## DESCRIPTIVE DATA

MAIN ROTOR

| | |
|---|---|
| Articulation | Free to teeter and cone, rigid inplane |
| Number of Blades | 2 |
| Diameter | 33 feet |
| Blade Chord | 10.0 inches inboard, 10.6 inches outboard |
| Blade Twist | -6 Degrees |
| Tip Speed @ 102% RPM | 705 FPS |

TAIL ROTOR

| | |
|---|---|
| Articulation | Free to teeter, rigid inplane |
| Number of Blades | 2 |
| Diameter | 4 feet 10 inches |
| Blade Chord | 5.1 inches (constant) |
| Blade Twist | 0 |
| Precone Angle | 1 Degree |
| Tip Speed @ 102% RPM | 614 FPS |

DRIVE SYSTEM

| | |
|---|---|
| Engine to Upper Sheave: | Four double Vee-belts with 0.778:1 speed reducing ratio |
| Upper Sheave to Drive Line: | Sprag type overrunning clutch |
| Drive Line to Main Rotor: | Spiral-bevel gears with 11:57 speed reducing ratio |
| Drive Line to Tail Rotor: | Spiral-bevel gears with 31:27 speed increasing ratio |

**DESCRIPTIVE DATA (cont'd)**

POWERPLANT

Model: Lycoming IO-540-AE1A5

Type: Six cylinder, horizontally opposed, direct drive, air cooled, fuel injected, normally aspirated

Displacement: 541.5 cubic inches

Maximum continuous rating: 205 BHP at 2718 RPM (102% on tachometer)

5 Minute takeoff rating: 245 BHP at 2718 RPM

Cooling system: Direct drive squirrel-cage blower

FUEL

Approved fuel grades and capacity: See Section 2.

OIL

Approved oil grades and capacity: See Section 8.

## PERFORMANCE DEFINITIONS

| | |
|---|---|
| KIAS | Knots Indicated Airspeed is speed shown on the Airspeed Indicator. |
| KCAS | Knots Calibrated Airspeed is speed shown on the Airspeed Indicator corrected for instrument and position error. (See page 5-2 for position error correction.) |
| KTAS | Knots True Airspeed is airspeed relative to undisturbed air. It is KCAS corrected for pressure altitude and temperature. |
| $V_{ne}$ | Never-Exceed Airspeed. |
| $V_y$ | Speed for best rate of climb. |
| $V_h$ | Stabilized level-flight speed at maximum continuous power. |
| MSL Altitude | Altitude above sea level, in feet, indicated by the altimeter (corrected for position and instrument error) when the barometric subscale is set to the atmospheric pressure existing at sea level. |
| Pressure Altitude | Altitude, in feet, indicated by the altimeter (corrected for position and instrument error) when the barometric subscale is set to 29.92 inches of mercury (1013.2 mb). |
| Density Altitude | Altitude, in feet, in ISA conditions at which the air would have the same density (it is pressure altitude corrected for OAT). |
| ISA | International Standard Atmosphere exists when pressure is 29.92 inches of mercury at sea level, temperature is 15°C at sea level, and temperature decreases 1.98°C per 1000 feet of altitude. |
| BHP | Brake Horsepower is actual power output of the engine. |
| MAP | Manifold Pressure is the absolute pressure, in inches of mercury, in the engine intake manifold. |
| RPM | Revolutions Per Minute or speed of engine or main rotor. (Shown by Tachometer as percentage of 2665 engine RPM or 400 main rotor RPM). |
| MCP | Maximum Continuous Power. |
| TOP | Takeoff Power (usually for a maximum of 5 minutes). |
| Critical Altitude | Altitude at which full throttle produces maximum allowable power (MCP or TOP). |
| TOGW | Takeoff Gross Weight. |

## PERFORMANCE DEFINITIONS (cont'd)

| | |
|---|---|
| OAT | Outside Air Temperature |
| CHT | Cylinder Head Temperature |
| GPH | Gallons Per Hour |
| AGL | Above Ground Level |
| IGE | In Ground Effect |
| OGE | Out of Ground Effect |
| ALT | Alternator |

## WEIGHT AND BALANCE DEFINITIONS

| | |
|---|---|
| Reference Datum | An imaginary vertical plane from which all horizontal distances are measured for balance purposes. |
| Station | A fore-and-aft location along the helicopter fuselage usually given in terms of distance in inches from the reference datum. |
| Arm | Horizontal distance from the reference datum to the center of gravity (CG) of an item. |
| Moment | The weight of an item multiplied by its arm. (Moment divided by a constant is used to simplify balance calculations by reducing the number of digits). |
| Center of Gravity (CG) | Point at which a helicopter would balance if suspended. Its distance from the reference datum is found by dividing total moment by total weight of the helicopter. |
| CG Arm | Arm from the reference datum obtained by adding individual moments and dividing the sum by the total weight. |
| CG Limits | Extreme center of gravity locations within which the helicopter must be operated at a given weight. |
| Usable Fuel | Fuel available for flight planning. |
| Unusable Fuel | Fuel remaining after a runout test has been completed in accordance with government regulations. |
| Standard Empty Weight | Weight of a standard helicopter including unusable fuel, full operating fluids, and full oil. |
| Basic Empty Weight | Standard empty weight plus weight of installed optional equipment. |
| Payload | Weight of occupants, cargo, and baggage. |
| Useful Load | Difference between maximum takeoff weight and basic empty weight. |

## CONVERSION TABLES

### METRIC TO ENGLISH

| Multiply | By | To Obtain |
|---|---|---|
| centimeters (cm) | .3937 | inches (in) |
| kilograms (kg) | 2.2046 | pounds (lb) |
| kilometers (km) | .5400 | nautical miles (nm) |
| kilometers (km) | .6214 | statute miles (mi) |
| liters (l) | .2642 | gallons, U.S. (gal) |
| liters (l) | 1.0567 | quarts (qt) |
| meters (m) | 3.2808 | feet (ft) |

### ENGLISH TO METRIC

| Multiply | By | To Obtain |
|---|---|---|
| feet (ft) | .3048 | meters (m) |
| gallons, U.S. (gal) | 3.7854 | liters (l) |
| inches (in) | 2.5400 | centimeters (cm) |
| inches (in) | 25.4000 | millimeters (mm) |
| nautical miles (nm) | 1.8520 | kilometers (km) |
| pounds (lb) | .4536 | kilograms (kg) |
| quarts (qt) | .9464 | liters (l) |
| statute miles (mi) | 1.6093 | kilometers (km) |

# SECTION 2

# LIMITATIONS

## CONTENTS

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# SECTION 2

# LIMITATIONS

## GENERAL

Information contained in Section 2 is approved by the Federal Aviation Administration. This section includes operating limitations, instrument markings, and basic placards required for safe operation of the helicopter, its engine, and other standard systems. This helicopter is approved under FAA Type Certificate No. H11NM as Model R44 II.

## COLOR CODE FOR INSTRUMENT MARKINGS

| | |
|---|---|
| Red | Indicates operating limits. Pointer should not enter red during normal operation. |
| Red Cross-hatch | Indicates power-off Vne. |
| Yellow | Precautionary or special operating procedure range. |
| Green | Normal operating range. |

## AIRSPEED LIMITS

NEVER-EXCEED AIRSPEED (Vne)

Up to 3000 feet density altitude:

| | |
|---|---|
| 2200 lb TOGW & below | 130 KIAS |
| Over 2200 lb TOGW | 120 KIAS |
| Autorotation | 100 KIAS |

Above 3000 feet density altitude, see placard on page 2-9.

ADDITIONAL AIRSPEED LIMITS

Do not exceed 100 KIAS when operating at power above MCP.

Do not exceed 100 KIAS with any door(s) removed.

## ROTOR SPEED LIMITS

| | TACHOMETER READING | ACTUAL RPM |
|---|---|---|
| Power On | | |
| Maximum | 102% | 408 |
| Minimum | 101% | 404 |
| Power Off | | |
| Maximum | 108% | 432 |
| Minimum | 90% | 360 |

## POWERPLANT LIMITATIONS

ENGINE

One Lycoming Model IO-540-AE1A5

OPERATING LIMITATIONS

| | |
|---|---|
| Engine Maximum Speed | 2718 RPM (102% |
| Cylinder Head Max Temperature | 500°F (260°C) |
| Oil Maximum Temperature | 245°F (118°C) |
| Oil Pressure | |
| Minimum during idle | 25 psi |
| Minimum during flight | 55 psi |
| Maximum during flight | 95 psi |
| Maximum during start & warm up | 115 psi |
| Oil Quantity, minimum for takeoff | 7 qt |

Manifold Pressure: See placard on page 2-9 for MAP schedule.

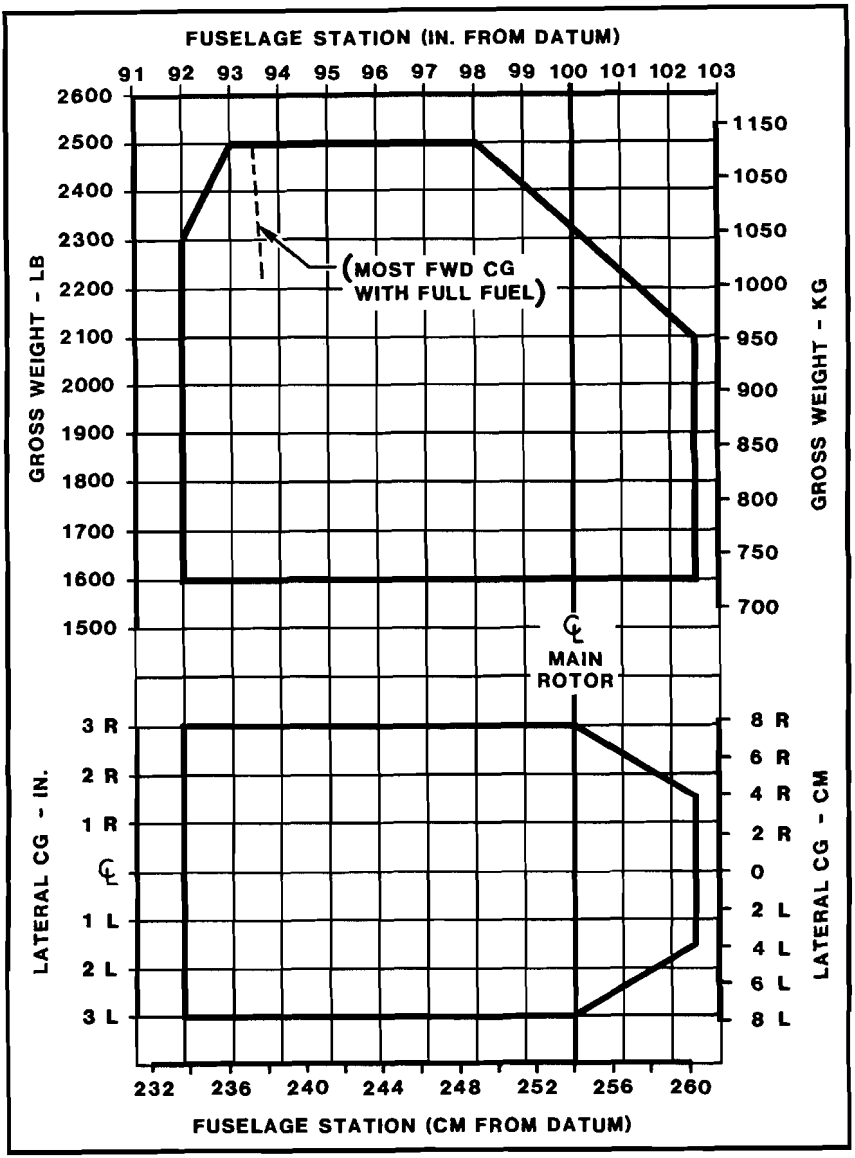
## WEIGHT LIMITS

| | |
|---|---|
| Maximum gross weight | 2500 lbs (1134 kg) |
| Minimum gross weight | 1600 lbs (726 kg) |
| Maximum per seat including baggage compartment | 300 lbs (136 kg) |
| Maximum in any baggage compartment | 50 lbs (23 kg) |

Minimum solo pilot plus forward baggage weight with all doors installed is 150 lbs (68 kg) unless a weight and balance computation shows CG is within limits. Ballast may be required.

## CENTER OF GRAVITY (CG) LIMITS

See figure on page 2-4. Datum line is 100 inches forward of main rotor shaft centerline.




CENTER OF GRAVITY LIMITS

## FLIGHT AND MANEUVER LIMITATIONS

Aerobatic flight prohibited.

Low-G cyclic pushovers prohibited.

***CAUTION***

A pushover (forward cyclic maneuver) performed from level flight or following a pull-up causes a low-G (near weightless) condition which can result in catastrophic loss of lateral control. To eliminate a low-G condition, immediately apply gentle aft cyclic. Should a right roll commence during a low-G condition, apply gentle aft cyclic to reload rotor before applying lateral cyclic to stop the roll.

Flight prohibited with governor selected off, with exceptions for in-flight system malfunction or emergency procedures training.

Flight in known icing conditions prohibited.

Maximum operating density altitude 14,000 feet.

Maximum operating altitude 9000 feet AGL to allow landing within 5 minutes in case of fire.

Alternator, RPM governor, low rotor RPM warning system, OAT gage, and hydraulic control system must be operational for flight.

Solo flight from right seat only.

Forward left seat belt must be buckled.

Minimum crew is one pilot.

Doors-off operation up to 100 KIAS approved with any or all doors removed.

***CAUTION***

No loose items allowed in cabin during doors-off flight.

## FLIGHT AND MANEUVER LIMITATIONS (cont'd)

***CAUTION***

Avoid abrupt control inputs. They produce high fatigue stresses and could lead to a premature and catastrophic failure of a critical component.

## KINDS OF OPERATION LIMITATIONS

VFR day is approved.

VFR operation at night is permitted only when landing, navigation, instrument, and anti-collision lights are operational. Orientation during night flight must be maintained by visual reference to ground objects illuminated solely by lights on the ground or adequate celestial illumination.

Note: There may be additional requirements in countries outside the U.S.

## FUEL LIMITATIONS

Approved Fuel Grades:

100LL grade aviation fuel

100/130 grade aviation fuel

Fuel Capacity:

| | |
|---|---|
| Main tank total capacity: | 31.6 US gallons (120 liters) |
| Main tank usable capacity: | 30.6 US gallons (116 liters) |
| Aux tank total capacity: | 18.5 US gallons (70 liters) |
| Aux tank usable capacity: | 18.3 US gallons (69 liters) |

## INSTRUMENT MARKINGS

### AIRSPEED INDICATOR

| | |
|---|---|
| Green arc | 0 to 130 KIAS |
| Red line | 130 KIAS |
| Red cross-hatch | 100 KIAS |

### ROTOR TACHOMETER

| | |
|---|---|
| Upper red line | 108% |
| Green arc | 90 to 108% |
| Lower red line | 90% |

### ENGINE TACHOMETER

| | |
|---|---|
| Upper red line | 102% |
| Green arc | 101 to 102% |
| Lower red line | 101% |

### OIL PRESSURE

| | |
|---|---|
| Lower red line | 25 psi |
| Lower yellow arc | 25 to 55 psi |
| Green arc | 55 to 95 psi |
| Upper yellow arc | 95 to 115 psi |
| Upper red line | 115 psi |

### OIL TEMPERATURE

| | |
|---|---|
| Green arc | 75 to 245°F (24 to 118°C) |
| Red line | 245°F (118°C) |

### CYLINDER HEAD TEMPERATURE

| | |
|---|---|
| Green arc | 200 to 500°F (93 to 260°C) |
| Red line | 500°F (260°C) |

### MANIFOLD PRESSURE

| | |
|---|---|
| Green arc | 15.0 to 23.3 in. Hg |
| Yellow arc | 19.1 to 26.1 in. Hg |
| Red line | 26.1 in. Hg |

Yellow arc denotes variable MAP limits. See placard on page 2-9.

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## PLACARDS

In clear view and readable by pilot in flight:

**LIMIT MANIFOLD PRESSURE - IN. HG**

| MAXIMUM CONTINUOUS POWER | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PRESS ALT-FT | OAT - °C | | | | | | | |
| | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 |
| SL | 21.5 | 21.8 | 22.1 | 22.4 | 22.6 | 22.9 | 23.1 | 23.3 |
| 2000 | 20.9 | 21.2 | 21.5 | 21.8 | 22.1 | 22.3 | 22.5 | 22.8 |
| 4000 | 20.4 | 20.7 | 21.0 | 21.3 | 21.5 | 21.8 | 22.0 | 22.2 |
| 6000 | 19.9 | 20.2 | 20.5 | 20.8 | 21.0 | 21.3 | 21.5 | 21.7 |
| 8000 | 19.5 | 19.8 | 20.1 | 20.3 | 20.6 | 20.8 | 21.0 | 21.3 |
| 10000 | 19.1 | 19.4 | 19.6 | 19.9 | FULL THROTTLE | | | |
| 12000 | FULL THROTTLE | | | | | | | |
| FOR MAX TAKEOFF POWER (5 MIN), ADD 2.8 IN. | | | | | | | | |

**NEVER EXCEED SPEED - KIAS**

| 2200 LB TOGW & BELOW | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PRESS ALT-FT | OAT - °C | | | | | | | |
| | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 |
| SL | 130 | | | | | | 127 | 123 |
| 2000 | | | | | 126 | 122 | 118 | 114 |
| 4000 | | | 126 | 122 | 117 | 113 | 108 | 103 |
| 6000 | 126 | 122 | 117 | 112 | 107 | 101 | 96 | 91 |
| 8000 | 117 | 112 | 106 | 101 | 95 | 90 | 85 | |
| 10000 | 107 | 101 | 95 | 89 | NO FLIGHT | | | |
| 12000 | 95 | 89 | NO FLIGHT | | | | | |
| 14000 | | | | | | | | |
| OVER 2200 LB TOGW, SUBTRACT 10 KIAS<br>FOR AUTOROTATION, SUBTRACT 30 KIAS | | | | | | | | |

**PLACARDS (cont'd)**

Near main fuel tank filler cap:

FUEL
100 OCT MIN GRADE AVIATION GASOLINE
USABLE CAP. 30.6 U.S. GAL

Near aux fuel tank filler cap:

AUX FUEL
100 OCT MIN GRADE AVIATION GASOLINE
USABLE CAP. 18.3 U.S. GAL
TO INSURE FULL FUEL:
FILL LEFT TANK FIRST AND TOP
OFF AFTER FILLING AUX TANK

Near fuel shut-off valve:

FUEL

On fuel shut-off valve:

ON OFF

Near main tank fuel gage:

30.6 U.S. GAL

Near aux tank fuel gage:

AUX: 18.3 U.S. GAL

**PLACARDS (cont'd)**

In clear view of all occupants:

NO SMOKING

On underside of each main rotor blade tip:

NEVER PULL DOWN
PUSH UP OPPOSITE BLADE

In clear view of pilot:

MINIMUM SOLO PILOT WEIGHT 150 LBS
(SEE PILOT'S HANDBOOK)

In clear view of pilot:

THIS ROTORCRAFT APPROVED FOR
DAY AND NIGHT VFR OPERATIONS

On removable cyclic grip:

SOLO FROM RIGHT SEAT ONLY

**PLACARDS (cont'd)**

In clear view of pilot:

LOW-G PUSHOVERS PROHIBITED

Inside each baggage compartment:

**CAUTION**

DO NOT EXCEED ANY OF THE FOLLOWING:
- COMPARTMENT CAPACITY: 50 LB MAX
- COMBINED SEAT PLUS COMPARTMENT: 300 LB MAX
- ROTORCRAFT GROSS WEIGHT LIMIT

SEE ROTORCRAFT FLIGHT MANUAL FOR ADDITIONAL LOADING INSTRUCTIONS.

On transponder when altitude encoder is installed:

ALTITUDE ENCODER INSTALLED

# SECTION 3

# EMERGENCY PROCEDURES

## CONTENTS

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# SECTION 3

# EMERGENCY PROCEDURES

## GENERAL

Information contained in Section 3 is approved by the Federal Aviation Administration.

## 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 - Land at the nearest airport or other facility where emergency maintenance may be performed.

## POWER FAILURE - GENERAL

1. A power failure may be caused by either an engine or drive system failure and will usually be indicated by the low RPM horn.
2. An engine failure may be indicated by a change in noise level, nose left yaw, OIL pressure light, or decreasing engine RPM.
3. 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.
4. Allow airspeed to reduce to power-off $V_{ne}$ or below.

***CAUTION***

Aft cyclic is required when collective is lowered at high speed and forward CG.

***CAUTION***

Avoid using aft cyclic during touchdown or during ground slide to prevent possible blade strike to tailcone.

## POWER FAILURE ABOVE 500 FEET AGL

1. Lower collective immediately to maintain RPM and enter normal autorotation.
2. Establish a steady glide at approximately 70 KIAS (See "Maximum Glide Distance Configuration", page 3-3).
3. Adjust collective to keep RPM in green arc 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 off unnecessary switches and shut off fuel.
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.

***NOTE***

If power failure occurs at night, do not turn on landing lights above 1000 feet AGL to preserve battery power.

## POWER FAILURE BETWEEN 8 FEET AND 500 FEET AGL

1. Takeoff operation should be conducted per Height-Velocity Diagram in Section 5.
2. If power failure occurs, lower collective immediately to maintain rotor RPM.
3. Adjust collective to keep RPM in green arc or apply full down collective if light weight prevents attaining above 97%.
4. Maintain airspeed until ground is approached, then begin cyclic flare to reduce rate of descent and forward speed.
5. At about 8 feet AGL, apply forward cyclic to level ship and raise collective just before touchdown to cushion landing. Touch down with skids level 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. Air restarts not recommended below 2000 feet AGL.

1. Mixture - Off.
2. Throttle - Closed.
3. Starter - Engage.
4. Mixture - Move slowly rich while cranking.

## DITCHING - POWER OFF

1. Follow same procedures as for power failure over land until contacting water.
2. Apply lateral cyclic when aircraft contacts water to stop blades from rotating.
3. Release seat belt and quickly clear aircraft when blades stop rotating.

## DITCHING - POWER ON

1. Descend to hover above water.
2. Unlatch doors.
3. Passengers exit aircraft.
4. Fly to safe distance from passengers to avoid possible injury by blades.
5. Switch off battery and alternator.
6. Roll throttle off into detent spring.
7. Keep aircraft level and apply full collective as aircraft contacts water.
8. Apply lateral cyclic to stop blades from rotating.
9. Release seat belt and quickly clear aircraft when blades stop rotating.

## LOSS OF TAIL ROTOR THRUST DURING FORWARD FLIGHT

1. Failure is usually indicated by nose right yaw which cannot be corrected by applying left pedal.
2. Immediately enter autorotation.
3. Maintain at least 70 KIAS if practical.
4. Select landing site, roll throttle off into detent spring, and perform autorotation landing.

***NOTE***

When a suitable landing site is not available, the vertical fin may permit limited controlled flight at low power settings and airspeeds above 70 KIAS; however, prior to reducing airspeed, re-enter full autorotation.

## LOSS OF TAIL ROTOR THRUST DURING HOVER

1. Failure is usually indicated by right yaw which cannot be stopped by applying left pedal.
2. Immediately roll throttle off into detent spring and allow aircraft to settle.
3. Raise collective just before touchdown to cushion landing.

## ENGINE FIRE DURING START ON GROUND

1. Cranking - Continue and attempt to start which would suck flames and excess fuel into engine.
2. If engine starts, run at 60-70% RPM for a short time, shut down, and inspect for damage.
3. If engine fails to start, shut off fuel and master battery switch.
4. Extinguish fire with fire extinguisher, wool blanket, or dirt.
5. Inspect for damage.

## FIRE IN FLIGHT

1. Enter autorotation.
2. Master battery switch - Off (if time permits).
3. Cabin heat - Off (if time permits).
4. Cabin vent - On (if time permits).
5. If engine is running, perform normal landing and immediately shut off fuel valve.
6. If engine stops running, shut off fuel valve and execute autorotation landing as described on pages 3-1 and 3-2.

## ELECTRICAL FIRE IN FLIGHT

1. Master battery switch - Off.
2. Alt switch - Off.
3. Land immediately.
4. Extinguish fire and inspect for damage.

***CAUTION***

Low RPM warning system and governor are inoperative with master battery and alternator switches both off.

## 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 even if the master battery and alternator switches are both off.

## HYDRAULIC SYSTEM FAILURE

Hydraulic system failure is indicated by heavy or stiff cyclic and collective controls. Control will be normal except for the increase in stick forces.

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

***NOTE***

If a light causes excessive glare at night, bulb may be unscrewed or circuit breaker pulled to eliminate glare during landing.

OIL — Indicates loss of engine power or oil pressure. Check engine tach for power loss. Check oil pressure gage and, if pressure loss is confirmed, land immediately. Continued operation without oil pressure will cause serious engine damage and engine failure may occur.

ENG FIRE — Indicates possible fire in engine compartment. See procedures on page 3-6.

MR TEMP — Indicates excessive temperature of main rotor gearbox. See note below.

MR CHIP — Indicates metallic particles in main rotor gearbox. See note below.

TR CHIP — Indicates metallic particles in tail rotor gearbox. See note below.

***NOTE***

If light is accompanied by any indication of a problem such as noise, vibration, or temperature rise, land immediately. If there is no other indication of a problem, land as soon as practical.

Break-in fuzz will occasionally activate chip lights. If no metal chips or slivers are found on detector plug, clean and reinstall (tail rotor gearbox must be refilled with new oil). Hover for at least 30 minutes. If chip light comes on again, replace gearbox before further flight.

**WARNING/CAUTION LIGHTS (cont'd)**

LOW FUEL Indicates approximately three gallons of usable fuel remaining. Engine will run out of fuel after ten minutes at cruise power.

***CAUTION***

Do not use low fuel warning light as a working indication of fuel quantity.

AUX FUEL PUMP Indicates low auxiliary fuel pump pressure. If no other indication of a problem, land as soon as practical. If light is accompanied by erratic engine operation, land immediately.

FUEL FILTER Indicates fuel strainer contamination. If no other indication of a problem, land as soon as practical. If light is accompanied by aux fuel pump warning light or erratic engine operation, land immediately.

CLUTCH Indicates clutch actuator circuit is on, either engaging or disengaging clutch. When switch is in ENGAGE position, light stays on until belts are properly tensioned. Never take off before light goes out.

***NOTE***

Clutch light may come on momentarily during run-up or during flight to retension belts as they warm-up and stretch slightly. This is normal. If, however, the light flickers or comes on in flight and does not go out within 7 or 8 seconds, pull CLUTCH circuit breaker, reduce power, and land immediately. Be prepared to enter autorotation. Inspect drive system for a possible malfunction.

## WARNING/CAUTION LIGHTS (cont'd)

ALT — Indicates low voltage and possible alternator failure. Turn off nonessential electrical equipment and switch ALT off and back on after one second to reset overvoltage relay. If light stays on, land as soon as practical. Continued flight without functioning alternator can result in loss of electronic tachometer, 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 to idle cut-off and turn master 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. Open nose and door vents and shut off heater. If hovering, transition to forward flight. If symptoms of CO poisoning (headache, drowsiness, dizziness) accompany light, land immediately.

## 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.

# SECTION 4

# NORMAL PROCEDURES

## CONTENTS

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# SECTION 4

# NORMAL PROCEDURES

## GENERAL

Information contained in Section 4 is approved by the Federal Aviation Administration.

## AIRSPEEDS FOR SAFE OPERATION

| | |
|---|---|
| Takeoff & Climbs | 60 KIAS |
| Maximum Rate of Climb ($V_Y$) | 55 KIAS |
| Maximum Range | 100 KIAS* |
| Landing Approach | 60 KIAS |
| Autorotation | 70 KIAS* |

*Certain conditions may require lower airspeeds. See placard on page 2-9.

## DAILY OR PREFLIGHT CHECKS

Remove any temporary covers and, in cold weather, remove even small accumulations of frost, ice, or snow. Check maintenance records to be sure aircraft is airworthy. An 8-foot step ladder is recommended for daily preflight inspection of main rotor; however, main rotor hub may be reached by first opening right rear seat and stepping on seat support and then stepping on deck below the aux fuel tank.

Check general condition of aircraft and verify no leaks, discoloration due to heat, dents, chafing, galling, nicks, corrosion, or cracks. Also verify no fretting at seams where parts are joined together. Fretting of aluminum parts produces a fine black powder while fretting of steel parts produces a reddish brown or black residue. Verify Telatemps show no unexplained temperature increases during prior flight.

1. Upper Forward Cowl Doors - Right Side
   - Master switch . . . . . On
   - Oil pressure, alt, gov, aux fuel pump lights . . . . . On
   - Warning light test switches . . . . . Push to test
   - Fuel quantity . . . . . Check gages
   - Master switch . . . . . Off
   - Aux fuel tank quantity . . . . . Check
   - Fuel filler cap . . . . . Tight
   - Aux fuel tank . . . . . No leaks
   - Fuel Lines . . . . . No leaks
   - Aux fuel drain . . . . . Sample
   - Gascolator drain . . . . . Sample
   - Gearbox oil . . . . . Full, no leaks
   - Hydraulic system . . . . . Fluid full, no leaks
   - Rotor brake . . . . . Actuation normal
   - Flex coupling . . . . . No cracks, nuts tight
   - Yoke flanges . . . . . No cracks
   - Gearbox, hydraulic pump Telatemps . . . . . Normal
   - Control rod ends . . . . . Free without looseness
   - Steel tube frame . . . . . No cracks
   - All fasteners . . . . . Tight
   - Tail rotor control . . . . . No interference

**DAILY OR PREFLIGHT CHECKS (cont'd)**

2. Main Rotor

***CAUTION***

Do not pull rotor blades down as damage may occur. To lower one blade, push opposite blade up.

Blades . . . . . Clean and no damage/cracks
Pitch change boots . . . . . No leaks
Main hinge bolts . . . . . Cotter pins installed
All rod ends . . . . . Free without looseness
Pitch link jam nuts . . . . . Tight
Pitch link safety wire . . . . . Secure
All fasteners . . . . . Tight
Swashplate scissors . . . . . No excessive looseness
Upper forward cowl doors . . . . . Latched

3. Lower Cowl Door - Right Side

Air box and duct . . . . . Secure
Engine sheet metal . . . . . No cracks
Fuel lines . . . . . No leaks
Oil lines . . . . . No leaks or chafing
Exhaust system . . . . . No cracks
Throttle linkage . . . . . Operable
Cowl door . . . . . Latched

4. Aft Cowl Door - Right Side

Oil cooler door . . . . . Check
V-belt condition . . . . . Check
V-belt slack . . . . . Check
Sprag clutch . . . . . No leaks
Upper bearing . . . . . No leaks
Telatemp - upper bearing . . . . . Normal
Flex coupling . . . . . No cracks, nuts tight
Yoke flanges . . . . . No cracks
Steel tube frame . . . . . No cracks
Tail rotor control . . . . . No interference
Tailcone attachment bolts . . . . . Check
Cowl door . . . . . Latched

## DAILY OR PREFLIGHT CHECKS (cont'd)

5. Engine Rear
   - Cooling fan nut . . . . . Pin in line with marks
   - Cooling fan . . . . . No cracks
   - Fan scroll . . . . . No cracks
   - Tailpipe hanger . . . . . No cracks

6. Empennage
   - Tail surfaces . . . . . No cracks
   - Fasteners . . . . . Tight
   - Position light . . . . . Check
   - Tail rotor guard . . . . . No cracks

7. Tail Rotor
   - Gearbox Telatemp . . . . . Normal
   - Gearbox . . . . . Oil visible, no leaks
   - Blades . . . . . Clean and no damage/cracks
   - Rod ends . . . . . Free without looseness
   - Pitch link jam nuts . . . . . Tight
   - Teeter bearings . . . . . Check condition
   - Teeter bearing bolt . . . . . Does not rotate
   - Control bellcrank . . . . . Free without looseness

8. Tailcone
   - Rivets . . . . . Tight
   - Skins . . . . . No cracks or dents
   - Strobe light condition . . . . . Check
   - Antenna . . . . . Check

9. Cowl Door - Left Side
   - Engine oil . . . . . 7-9 qts
   - Oil filter . . . . . Secure, no leaks
   - Battery and relay (if located here) . . . . . Secure
   - Steel tube frame . . . . . No cracks
   - Engine sheet metal . . . . . No cracks
   - Exhaust system . . . . . No cracks
   - Cowl door . . . . . Latched

10. Fuel tank (Main)
    - Quantity . . . . . Check
    - Filler cap . . . . . Tight
    - Leakage . . . . . None
    - Drain . . . . . Sample

**DAILY OR PREFLIGHT CHECKS (cont'd)**

11. Fuselage Left Side
    - Baggage compartments . . . . . Check
    - Removable controls . . . . . Secure if installed
    - Collective control . . . . . Clear
    - Seat belts . . . . . Check condition and fastened
    - Doors . . . . . Unlocked and latched
    - Door hinge safety pins . . . . . Installed
    - Landing gear . . . . . Check
    - Ground handling wheel . . . . . Removed
    - Position light . . . . . Check
    - Static port . . . . . Clear

12. Nose Section
    - Pitot tube . . . . . Clear
    - Windshield condition and cleanliness . . . . . Check
    - Fresh air vent . . . . . Clear
    - Landing lights . . . . . Check

13. Fuselage Right Side
    - Baggage compartments . . . . . Check
    - Seat belts . . . . . Check condition and fastened
    - Aft door . . . . . Unlocked and latched
    - Door hinge safety pins . . . . . Installed
    - Landing gear . . . . . Check
    - Ground handling wheel . . . . . Removed
    - Position light . . . . . Check
    - Static port . . . . . Clear

14. Cabin Interior
    - Loose articles . . . . . Removed or stowed
    - Instruments, switches, and controls. . Check condition
    - Clock . . . . . Functioning
    - Adjustable pedals . . . . . Pins secure

***CAUTION***

Remove left seat controls if person in that seat is not a rated helicopter pilot.

## DAILY OR PREFLIGHT CHECKS (cont'd)

***CAUTION***

Fill baggage compartments under unoccupied seats to capacity before using baggage compartments under occupied seats. Avoid placing objects in compartment which could injure occupant if seat collapses during a hard landing.

***CAUTION***

Ensure all doors are unlocked before flight to allow rescue or exit in an emergency.

***CAUTION***

Shorter pilots may require cushion to obtain full travel of all controls. When using cushion, verify aft cyclic travel is not restricted.

***CAUTION***

Be sure rotor blades are approximately level to avoid possible tailcone strike.

## BEFORE STARTING ENGINE

Seat belts . . . . . Fastened
Fuel shut-off valve . . . . . On
Cyclic/collective friction . . . . . Off
Cyclic, collective, pedals . . . . . Full travel free
Throttle . . . . . Full travel free
Collective . . . . . Full down, friction on
Cyclic neutral . . . . . Friction on
Pedals . . . . . Neutral
Landing light . . . . . Off
HYD and governor switches . . . . . On
Circuit breakers . . . . . In
Clutch . . . . . Disengaged
Altimeter . . . . . Set
Rotor brake . . . . . Disengaged

## ENGINE STARTING TIPS

During prime, aux fuel pump warning light may remain illuminated momentarily. Continue prime 3 to 5 seconds after light extinguishes. If engine does not fire after 5 to 7 seconds of cranking, repeat priming sequence and re-attempt start. If engine fails to start after three attempts, allow starter to cool ten minutes before next attempt.

If engine fires momentarily but dies before or while moving mixture to rich, pull mixture off, engage starter, and push mixture slowly rich while cranking.

## STARTING ENGINE AND RUN-UP

Throttle . . . . . Closed
Master switch . . . . . On
Area . . . . . Clear
Strobe light . . . . . On
Mixture . . . . . Rich
Ignition switch . . . . . Prime, then Both
Mixture . . . . . Pull off
Starter . . . . . Engage until engine fires
Mixture . . . . . Move full rich
Mixture guard . . . . . Installed
Starter-On light . . . . . Out
Set engine RPM . . . . . 50 to 60%
Clutch switch . . . . . Engaged
Blades turning . . . . . Less than 5 seconds
Alternator switch . . . . . On
Oil pressure in 30 sec . . . . . 25 psi minimum
Avionics, headsets . . . . . On
Wait for clutch light . . . . . Out
Warm-up RPM . . . . . 60 to 70%
Engine gages . . . . . Green
Mag drop at 75% RPM . . . . . 7% max in 2 sec
Sprag clutch check from 75% RPM . . . . . Needles split
Doors . . . . . Closed and latched
Limit MAP chart . . . . . Check
Cyclic/collective friction . . . . . Off
Hydraulic system . . . . . Check
Governor On, increase throttle . . . . . RPM 101-102%
Warning lights . . . . . Out
Lift collective slightly, reduce RPM . . Horn/Light at 97%

## STARTING ENGINE AND RUN-UP (cont'd)

***CAUTION***

On slippery surfaces, be prepared to counter nose right rotation with left pedal as governor increases RPM.

***NOTE***

For hydraulic system check, use small cyclic inputs. With hydraulics off, there should be approximately one half inch of freeplay before encountering control stiffness and feedback. With hydraulics on, controls should be free with no feedback or uncommanded motion.

***NOTE***

During run-up and shutdown, pilot should uncover right ear, open right door, and listen for unusual bearing noise. Failing bearings will produce an audible whine or growl well before final failure.

***NOTE***

Idle mixture and speed may require adjustment as conditions vary from sea level standard. Refer to R44 Maintenance Manual for idle adjustment procedure.

## TAKEOFF PROCEDURE

1. Verify governor and hydraulics on, RPM stabilized at 101-102%.
2. Clear area. Slowly raise collective until aircraft is light on skids. Reposition cyclic as required for equilibrium, then gently lift aircraft into hover.
3. Check gages in green, lower nose, and accelerate to climb speed following profile shown by height-velocity diagram in Section 5. Avoid exceeding two inches MAP above IGE hover power to prevent excessive nose-down attitude. If RPM drops below 101%, lower collective.

## CRUISE

1. Verify RPM in green arc.
2. Set manifold pressure with collective for desired power.
3. Verify gages in green, warning lights out.

***CAUTION***

Inflight leaning with engine mixture control is not allowed. Mixture must be full rich during flight.

***NOTE***

Slight yaw oscillation during cruise can be stopped by applying a small amount of pedal.

## DOORS-OFF OPERATION

Maximum airspeed with door(s) off is 100 KIAS. Warn passengers to secure loose objects and to keep head and arms inside cabin to avoid high velocity airstream. Avoid removing left side doors to protect tail rotor from loose objects.

***CAUTION***

Do not stow lightweight objects in rear baggage compartments during doors-off flight unless rear seats are occupied. Doors-off flight may cause rear seat bottoms to lift and items could be blown out.

## PRACTICE AUTOROTATION - POWER RECOVERY

1. Lower collective to down stop and adjust throttle as required for small tachometer needle separation.

***CAUTION***

To avoid inadvertent engine stoppage, do not roll throttle to full idle. Roll throttle off smoothly only enough for a small visible needle split.

***NOTE***

Governor is inactive below 80% engine RPM regardless of governor switch position.

***NOTE***

When entering autorotation from above 6000 feet, reduce throttle slightly before lowering collective to prevent engine overspeed.

2. Raise collective as required to keep rotor RPM from going above green arc and adjust throttle for small needle separation.
3. Keep RPM in green arc and airspeed 60 to 70 KIAS.
4. At about 40 feet AGL, begin cyclic flare to reduce rate of descent and forward speed.
5. At about 8 feet AGL, apply forward cyclic to level aircraft and raise collective to control descent. Add throttle if required to keep RPM in green arc.

## PRACTICE AUTOROTATION - WITH GROUND CONTACT

If practice autorotations with ground contact are required for demonstration purposes, perform in same manner as power recovery autorotations except:

> Prior to cyclic flare, roll throttle off into detent spring and hold against hard stop until autorotation is complete. (This prevents throttle correlator from adding power when collective is raised.)

Always contact ground with skids level and nose straight ahead.

***CAUTION***

During simulated engine failures, rapid decrease in rotor RPM will occur, requiring immediate lowering of collective to avoid dangerously low rotor RPM. Catastrophic rotor stall could occur if rotor RPM ever drops below 80% plus 1% per 1000 feet of altitude.

***NOTE***

When practice autorotations are made with ground contact, rapid wear of landing gear skid shoes occurs. Inspect periodically and replace when minimum shoe thickness is .06 inches (1.5 mm).

## HYDRAULICS-OFF TRAINING

Hydraulic system failure may be simulated using cyclic-mounted hydraulic switch.

***CAUTION***

To avoid overcontrolling, relax force on cyclic and collective before switching hydraulics from off to on.

## APPROACH AND LANDING

1. Make final approach into wind at lowest practical rate of descent with initial airspeed of 60 knots.
2. Reduce airspeed and altitude smoothly to hover. (Be sure rate of descent is less than 300 FPM before airspeed is reduced below 30 KIAS.)
3. From hover, lower collective gradually until ground contact.
4. After initial ground contact, lower collective to full down position.

***CAUTION***

When landing on a slope, return cyclic control to neutral before final reduction of rotor RPM.

***CAUTION***

Never leave helicopter flight controls unattended while engine is running.

## SHUTDOWN PROCEDURE

Collective down, RPM 60-70% . . . . . Friction on
Cyclic and pedals neutral . . . . . Friction on
CHT drop . . . . . Throttle closed
Clutch switch . . . . . Disengage
Wait 30 seconds . . . . . Mixture off
Wait 30 seconds . . . . . Apply rotor brake
Clutch light off . . . . Ignition and master switches off |

***CAUTION***

Do not slow rotor by raising collective during shutdown. Blades may flap and strike tailcone.

***NOTE***

HYD switch should be left on for start-up and shutdown to reduce battery drain and possibility of unintentional hydraulics-off liftoff. Switch off only for pre-takeoff controls check or hydraulics-off training.

***NOTE***

Rotor brake should be left engaged after shutdown to disable starter buttons and reduce possibility of unintentional starter engagement.

## NOISE ABATEMENT

To improve the quality of our environment and to dissuade overly restrictive ordinances against helicopters, it is imperative that every pilot minimize noise irritation to the public. Following are several techniques which should be employed when possible.

1. Avoid flying over outdoor assemblies of people. When this cannot be avoided, fly as high as practicable, preferably over 2000 feet AGL.
2. Avoid blade slap. Blade slap generally occurs at airspeeds below 100 KIAS. It can usually be avoided by maintaining 100 KIAS until rate of descent is over 1000 FPM, then using a fairly steep approach until airspeed is below 65 KIAS. With the right door vent open, the pilot can easily determine those flight conditions which produce blade slap and develop piloting techniques to eliminate or reduce it.
3. When departing from or approaching a landing site, avoid prolonged flight over noise sensitive areas. Always fly above 500 feet AGL and preferably above 1000 feet AGL.
4. Repetitive noise is far more irritating than a single occurrence. If you must fly over the same area more than once, vary your flight path to not overfly the same buildings each time.
5. When overflying populated areas, look ahead and select the least noise sensitive route.

***NOTE***

Above procedures do not apply where they would conflict with Air Traffic Control clearances or instructions or when, in the pilot's judgment, they would result in an unsafe flight path.

# SECTION 5

# PERFORMANCE

## CONTENTS

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# SECTION 5

# PERFORMANCE

## GENERAL

Information contained in Section 5 is approved by the Federal Aviation Administration.

Hover controllability has been substantiated in 17 knot wind from any direction up to 9800 feet density altitude. Refer to IGE hover performance data for allowable gross weight.

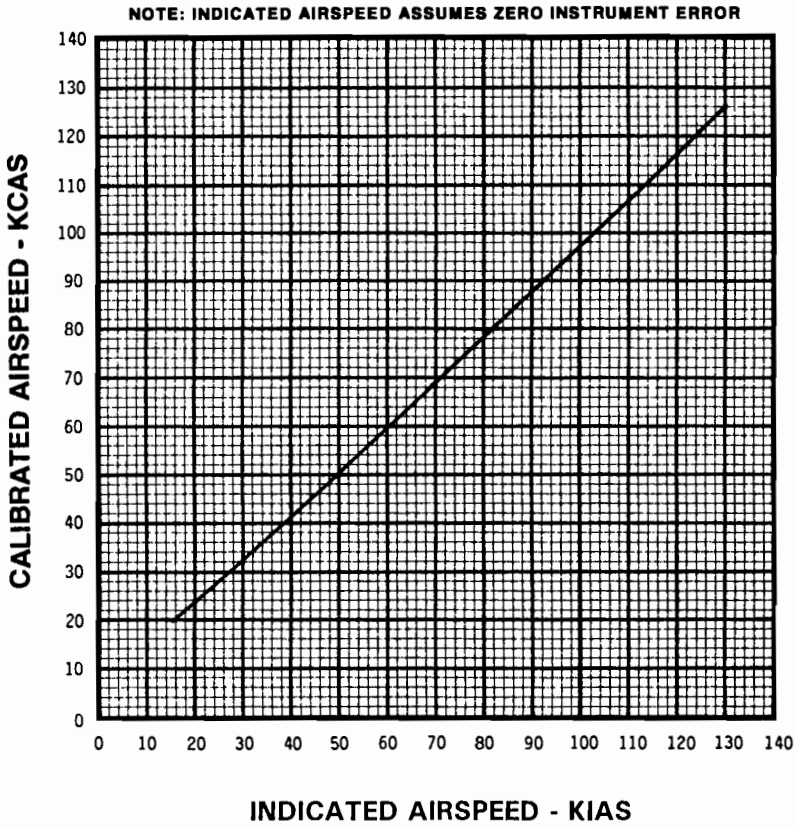
Indicated airspeed (KIAS) shown on graphs assumes zero instrument error.

***CAUTION***

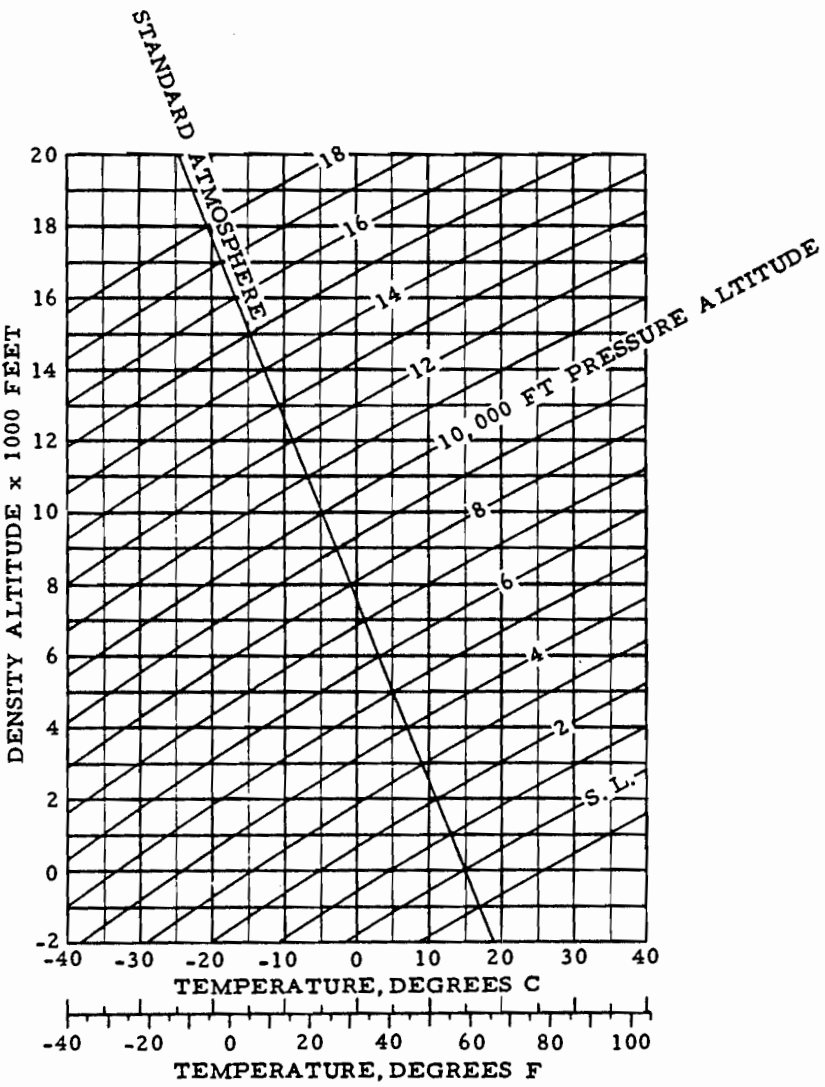
Performance data presented in this section was obtained under ideal conditions. Performance under other conditions may be substantially less.

## DEMONSTRATED OPERATING TEMPERATURE

Satisfactory engine cooling has been demonstrated to an outside air temperature of 38°C (100°F) at sea level or 23°C (41°F) above ISA at altitude.

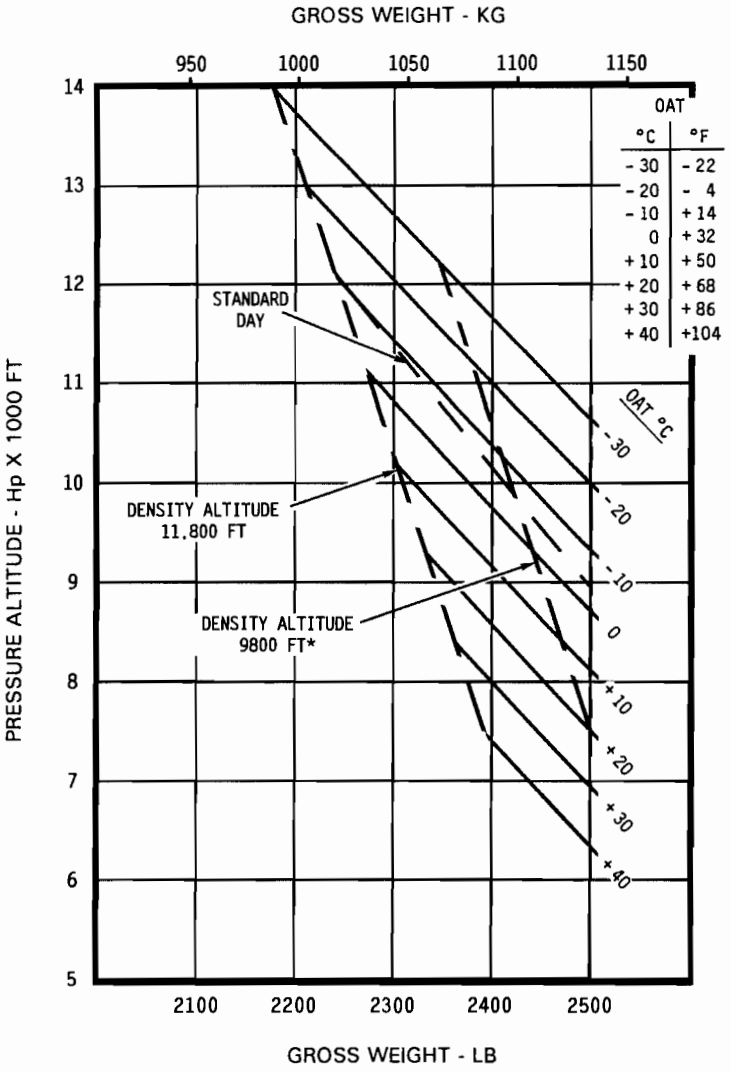



AIRSPEED CALIBRATION CURVE




**DENSITY ALTITUDE CHART**

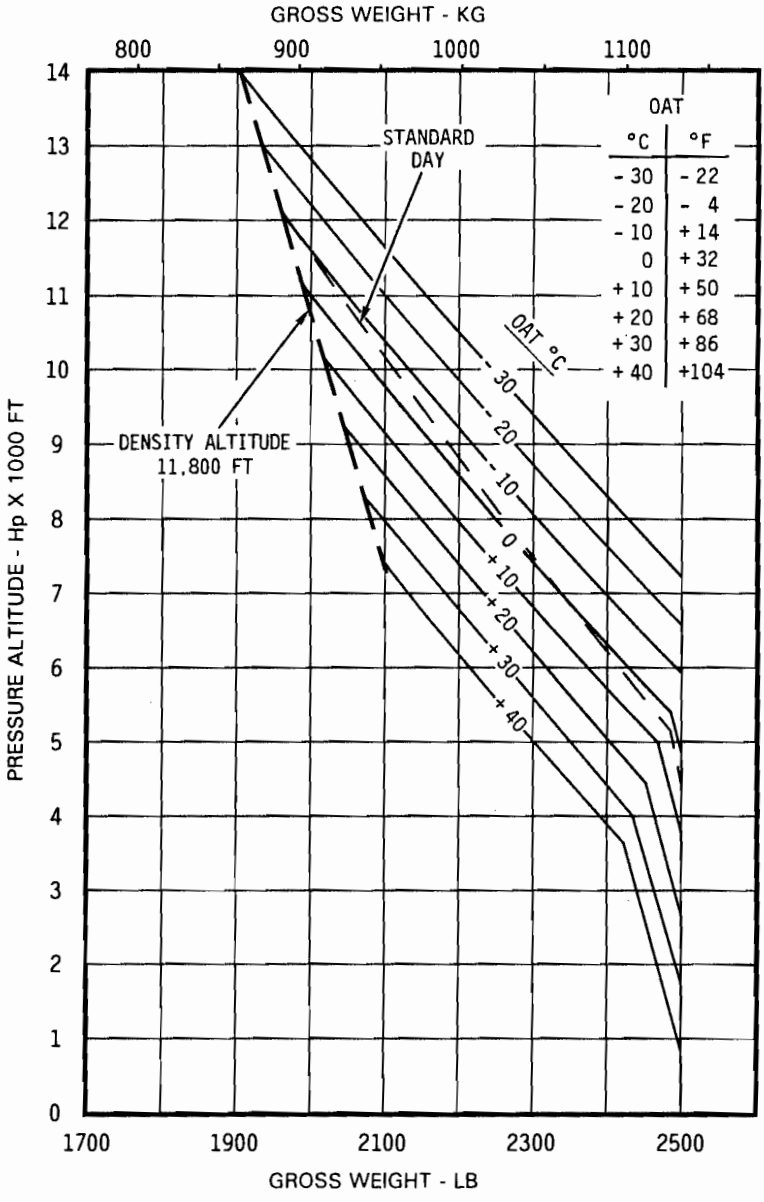
IN GROUND EFFECT AT 2 FOOT SKID HEIGHT
FULL THROTTLE
ZERO WIND




## IGE HOVER CEILING VS. GROSS WEIGHT

*Hover controllability with 17 knot wind substantiated up to 9800 feet density altitude.

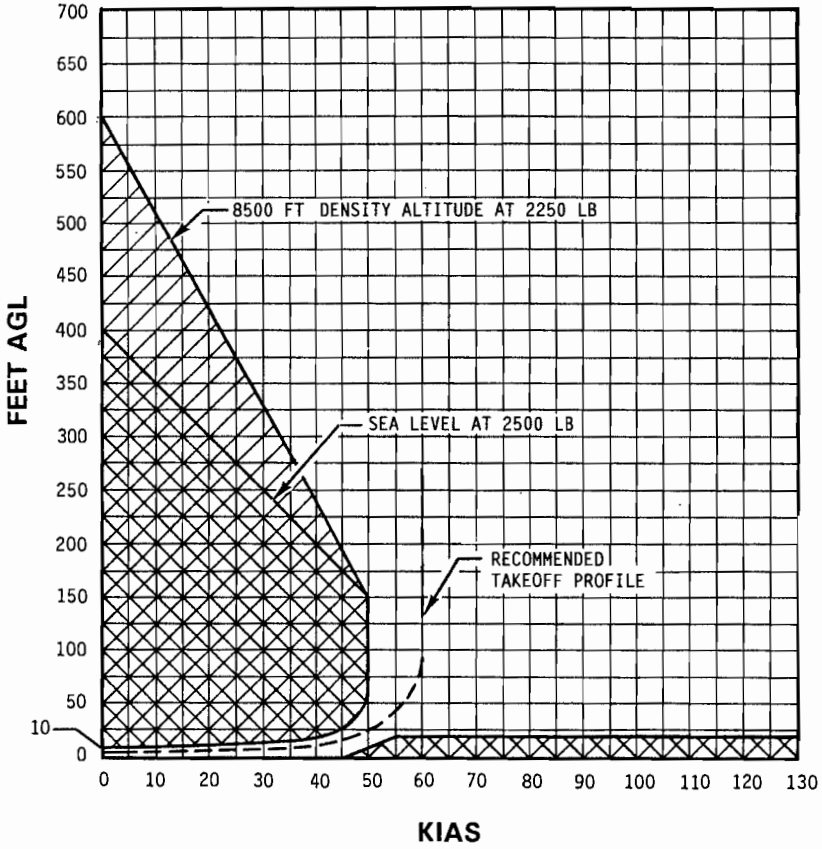
OUT OF GROUND EFFECT
TAKEOFF POWER OR FULL THROTTLE
ZERO WIND




**OGE HOVER CEILING VS. GROSS WEIGHT**

DEMONSTRATED CONDITIONS:
SMOOTH HARD SURFACE
WIND CALM

AVOID OPERATION IN SHADED AREAS




**HEIGHT - VELOCITY DIAGRAM**

## NOISE CHARACTERISTICS

The following noise level complies with FAR Part 36, Appendix J noise requirements and was obtained from FAA approved data from actual noise tests.

| | |
|---|---|
| Model: | R44 II |
| Engine: | Lycoming IO-540-AE1A5 |
| GW: | 2500 lb |
| Vh: | 109 KTAS |

The Sound Exposure Level (SEL) for a level flyover at 492 feet AGL is 81.0 dB(A) for a clean helicopter configuration with doors on.

***NOTE***

No determination has been made by the Federal Aviation Administration that the noise level is or should be acceptable or unacceptable for operation at, into, or out of any airport.

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# SECTION 6

# WEIGHT AND BALANCE

## CONTENTS

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# SECTION 6

# WEIGHT AND BALANCE

## GENERAL

The helicopter must be flown only within the weight and balance limits specified in Section 2. Loadings outside these limits can result in insufficient control travel for safe control. Refer to LOADING INSTRUCTIONS to ensure loading within safe limits.

***CAUTION***

Fuel is located aft of helicopter CG, causing CG to move forward during flight. Always determine safe loading with empty fuel as well as with takeoff fuel. Amount of fuel which can be off-loaded to allow for a greater payload is limited by forward CG location with empty fuel.

## WEIGHT AND BALANCE RECORD

An equipment list giving helicopter configuration, empty weight, and center of gravity is provided with each helicopter. This data applies to the helicopter as delivered from the factory. Any changes in helicopter configuration should be documented using the form on page 6-2.

***CAUTION***

Following any modification which moves empty CG aft, calculate weight and balance with 150 lb pilot and full fuel. If calculation shows CG aft of aft limit, fixed ballast must be installed in nose to comply with minimum solo pilot weight limitation in Section 2.

## WEIGHT AND BALANCE RECORD

(Continuous History of Changes in Structure or Equipment Affecting Weight and Balance)

| HELICOPTER MODEL R44 | SERIAL NUMBER | PAGE NUMBER |
|---|---|---|

| DATE | ITEM NO. | | DESCRIPTION OF ARTICLE OR MODIFICATION | WEIGHT CHANGE | | | | | | RUNNING BASIC EMPTY WEIGHT | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ADDED (+) | | | REMOVED (-) | | | | |
| | In | Out | | Wt. (lb.) | Arm (In.) | Moment /100 | Wt. (lb.) | Arm (In.) | Moment /100 | Wt. (lb.) | Moment /100 |
| | | | HELICOPTER AS WEIGHED | | | | | | | | |
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The following table may be used when determining loaded helicopter weight and CG position.

| Item | Weight (lb) | Longitudinal CG, inches | Lat CG, inches (+ = right side) |
|---|---|---|---|
| Pilot (right forward seat) | | 49.5* | +12.2 |
| Left forward passenger | | 49.5* | -10.4 |
| Baggage under forward seats | | 44.0 | ±11.5 |
| Aft passengers and baggage under aft seats | | 79.5 | ±12.2 |
| Main fuel | | 106.0 | -13.5 |
| Aux fuel | | 102.0 | +13.0 |
| Forward doors | 7.5 each | 49.4 | ±24.0 |
| Aft doors | 7.0 each | 75.4 | ±23.0 |
| Removable cyclic | 0.6 | 35.8 | - 8.0 |
| Removable collective | 0.8 | 47.0 | -21.0 |
| Removable pedals (both pedals) | 0.8 | 16.8 | - 9.5 |

*If backrest cushion is used, subtract thickness of compressed cushion.

## LOADING INSTRUCTIONS (cont'd)

The following sample calculation demonstrates how to determine loaded helicopter weight and longitudinal center of gravity. These may be compared with the CG limits given in Section 2 to determine safe loading. Alternately, total moments may be compared with the allowable moment chart on page 6-6. Both takeoff and empty fuel conditions must be within limits.

It is usually not necessary to determine lateral CG position as most optional equipment is located near centerline. If an unusual installation or loading occurs, lateral CG should be checked against the CG limits given in Section 2. The lateral CG datum is the aircraft centerline with items to the right positive and items to the left negative.

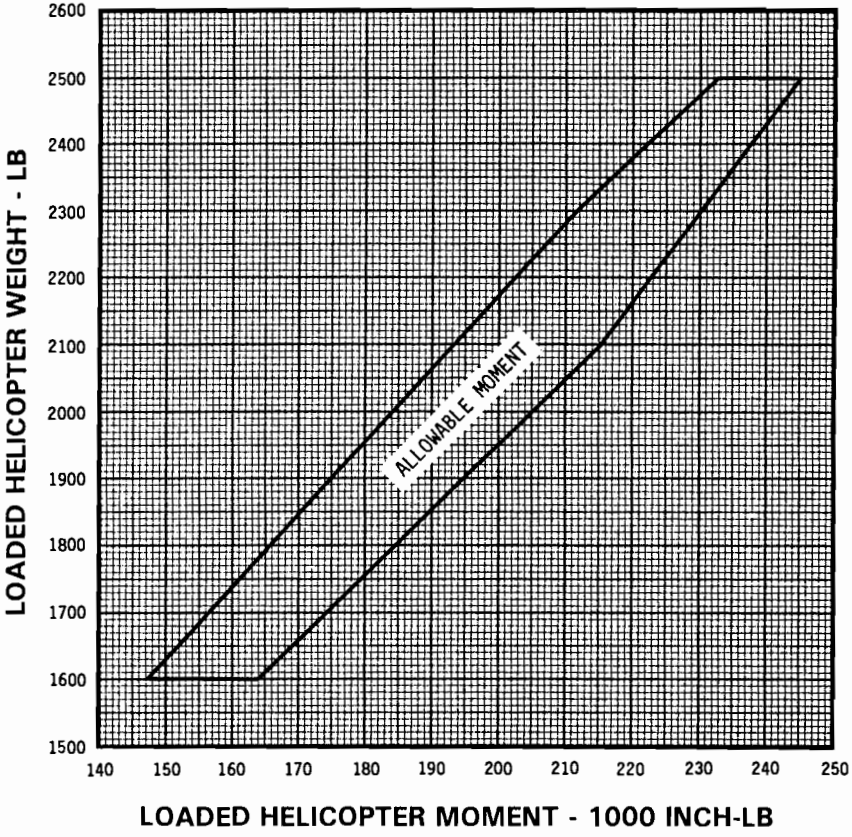
## LOADING INSTRUCTIONS (cont'd)

### SAMPLE LOADING CALCULATION

| Item | Arm (Inches from Datum) | Sample Helicopter | | Your Helicopter | |
|---|---|---|---|---|---|
| | | Weight (lb) | Moment (in-lb) | Weight (lb) | Moment (in-lb) |
| **Basic empty weight as equipped (Includes unusable fuel and full oil)** | | 1510 | 160,815 | | |
| Pilot door removed | 49.4 | -7.5 | -371 | | |
| Pilot and forward passenger | 49.5 | 340 | 16,830 | | |
| Forward baggage | 44.0 | 20 | 880 | | |
| Aft passengers and baggage | 79.5 | 336 | 26,712 | | |
| **Total weight and balance with zero usable fuel** | **93.2** | **2198.5** | **204,866** | | |
| Usable main tank fuel at 6 lbs/gal. | 106.0 | 184 | 19,504 | | |
| Usable aux tank fuel at 6 lbs/gal. | 102.0 | 110 | 11,220 | | |
| **Total weight and balance with take-off fuel** | **94.5** | **2492.5** | **235,590** | | |

Note: CG location (arm) aft of datum for loaded helicopter is determined by dividing total moment by total weight.

## LOADING INSTRUCTIONS (cont'd)




**R44 II**

**ALLOWABLE LOADED MOMENT VS. GROSS WEIGHT ENVELOPE**

# SECTION 7

# SYSTEMS DESCRIPTION

## CONTENTS

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# SECTION 7

# SYSTEMS DESCRIPTION

## AIRFRAME

The R44 is a four-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, engine cooling shrouds, and various other ducts and fairings. The doors are also constructed of fiberglass and thermoplastics.

Four right-side cowl doors provide access to the main rotor gearbox, drive system, and engine. A left-side engine cowl door provides access to the engine oil filler and dip stick. For additional access to controls and other components, there are removable panels between the seat cushions and seat backs, on each side of the engine compartment, and under the cabin.

The instrument console hinges up and aft to access nose-mounted batteries. Small removable plug buttons are located on the tailcone for internal inspection.

One stainless steel firewall is located forward of and another above the engine.

All four cabin doors may be removed and installed by maintenance personnel or pilots. To remove a door, disconnect door strut by lifting up at inboard end of strut while door is fully open, remove cotter rings in upper and lower hinge pins, and then lift door off. To install doors, use reverse procedure.

## ROTOR SYSTEMS

The main rotor has two all-metal blades connected to the hub by individual coning hinges. The hub is mounted to the shaft with a teeter hinge located above the coning hinges. The main rotor blades have thick stainless steel leading edges which resist corrosion due to weather and erosion due to sand and dust. Blade skins are also stainless steel to resist corrosion. Pitch change bearings for each blade are enclosed in a housing at the blade root. The housing is filled with oil and hermetically sealed with a neoprene boot. The coning and teetering hinges use self-lubricated Teflon bearings.

Droop stops for the main rotor blades provide a teeter hinge friction restraint which normally prevents the rotor from teetering while stopping or starting.

The tail rotor has two all-metal blades and a teetering hub with a fixed coning angle. The pitch change bearings have self-lubricated Teflon liners. The teeter hinge bearings are elastomeric. The tail rotor blades are constructed with wrap-around aluminum skins, honeycomb spars, and forged aluminum root fittings.

## 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 box are connected to the top of the engine shroud. 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 IO-540 six-cylinder, horizontally-opposed, overhead-valve, air-cooled, fuel-injected engine with a wet sump oil system powers the helicopter. The engine is equipped with a starter, alternator, shielded ignition, two magnetos, muffler, two oil coolers, oil filter, and induction air filter. See Sections 1 and 2 for powerplant specifications and limitations.

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

Induction air enters through an opening on the right side of the aircraft and passes through a radial-flow air filter within the air box. Air then passes along a flexible duct, through the fuel control, and into the engine. A spring-loaded door in the air box automatically opens to bypass the filter with sheltered engine compartment air should contamination occur. Some power loss can be expected in this condition.

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 or have self-lubricated Teflon liners.

Flight controls are conventional. The cyclic stick appears to be different but the grip moves the same as in other helicopters due to the free hinge at the center pivot. The cyclic grip is free to move vertically allowing the pilot to rest his forearm on his knee if he chooses.

The collective stick is also conventional with a twist grip throttle control. When the collective is raised, the throttle is opened by an interconnecting linkage. An electronic governor makes minor throttle adjustments required to maintain RPM.

***CAUTION***

Above 6000 feet, throttle correlation and governor are less effective. Therefore, power changes should be slow and smooth.

***CAUTION***

At high power settings above 6000 feet, the throttle is frequently wide open and RPM must be controlled with collective.

Pilot-side tail rotor pedals are adjustable. To adjust, extract 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 pins. Verify pins secure before flight.

## REMOVABLE FLIGHT CONTROLS

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

1. To remove cyclic, extract quick release pin by depressing button and pulling, then pull outward on left grip while supporting stick. Rotate cyclic arm clockwise to stop, depress stop pin under cyclic pivot, and continue clockwise rotation one turn to wind up balance spring. To install removable cyclic, use reverse procedure.

***CAUTION***

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

***CAUTION***

After removing cyclic control, place protective plastic cap on exposed cyclic tube to prevent possible injury.

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

***CAUTION***

When collective control 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.

## 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 only active 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 rotor gearbox to maintain hydraulic pressure in the event of an engine failure. 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 rotor 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 through the right side upper cowl doors. 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. The switch should be left on during helicopter shutdown and start up except during the hydraulic system check.

***NOTE***

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

## CONTROL FRICTION ADJUSTMENT

Cyclic and collective controls are equipped with adjustable friction devices. A toggle type 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. Cyclic friction is normally applied only on the ground.

The pedals actuate push-pull controls connected directly to the tail rotor pitch control and do not incorporate any friction devices.

***CAUTION***

Control friction must be used with caution if applied during flight to avoid inadvertent locking of a control.

## ENGINE CONTROLS

A twist grip throttle control is located on each collective stick. They are interconnected and actuate the fuel control butterfly valve through a system of bellcranks and push-pull tubes.

The linkage is designed to open throttle as the collective stick is raised. A detent spring, located in the vertical throttle push-pull tube, 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 stick is raised.

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

## ENGINE CONTROLS (cont'd)

Other engine controls include a mixture control on the console face, push-to-start buttons on pilot's cyclic and collective, an engine governor switch on pilot's collective, and a key-type ignition switch. The cyclic start button allows the pilot to maintain cyclic control during an air restart. The momentary (most clockwise) ignition switch position operates the auxiliary fuel pump for engine priming.

***CAUTION***

Starter buttons are active when master switch is on, even if ignition switch is off. Rotor brake should be left engaged after shutdown to disable starter button and reduce possibility of unintentional starter engagement.

***CAUTION***

In-flight leaning with engine mixture control is not allowed. Mixture must be full rich during flight.

## 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. A caution light illuminates whenever the actuator is operating, either engaging, disengaging, or retensioning the belts. The light stays on until the belts are tensioned or completely disengaged.

A fuse located on the test switch panel prevents an actuator motor overload from tripping the circuit breaker and turning off the caution light prematurely.

***CAUTION***

Never take off while clutch caution light is on.

## FUEL SYSTEM

The fuel system includes main and auxiliary tanks, a shutoff valve between the front seats, a strainer (gascolator), an auxiliary (electric) pump, and an engine-driven pump. Fuel tank air vents are located inside the mast fairing, and fuel tank expansion spaces are interconnected for redundancy in the event one vent becomes clogged. A fuel return line allows pump supply in excess of engine demand to return to the fuel tanks.

The engine will operate normally with either or both fuel pumps functioning. The auxiliary pump primes the engine for starting and runs in flight to provide fuel pump redundancy.

The ignition switch prime (momentary) position operates the auxiliary fuel pump for priming prior to engine start. After start, the pump runs continuously as long as the engine has oil pressure and the clutch switch is in the engage position.

A pressure switch on the gascolator illuminates the fuel filter warning light if the strainer becomes contaminated. Continued operation with an illuminated filter warning light may result in fuel starvation. A pressure switch downstream of the auxiliary fuel pump illuminates the aux fuel pump warning light if auxiliary pump output pressure is low. Proper mechanical fuel pump function is indicated by normal engine operation after engine start prior to clutch engagement and before shutdown while clutch is disengaging.

## FUEL SYSTEM (cont'd)

A drain is located at the forward left side of the main tank and is opened by pushing the plunger. A drain is also provided on the gascolator located on the lower right side of the vertical firewall. It is opened by pushing up on the plastic tube which extends below the belly. The auxiliary tank drain is located inside the cowl door below the tank. It is opened by extending the plastic tube clear of the aircraft and pushing up on the drain. All three drains should be opened daily prior to flight to check for water, sediment, and fuel type/grade.

The fuel gages are electrically operated by float-type transmitters in the tanks. When the gages read E the tanks are empty except for a small quantity of unusable fuel. The low fuel warning light is actuated by a separate electric sender located on the bottom of the main tank.

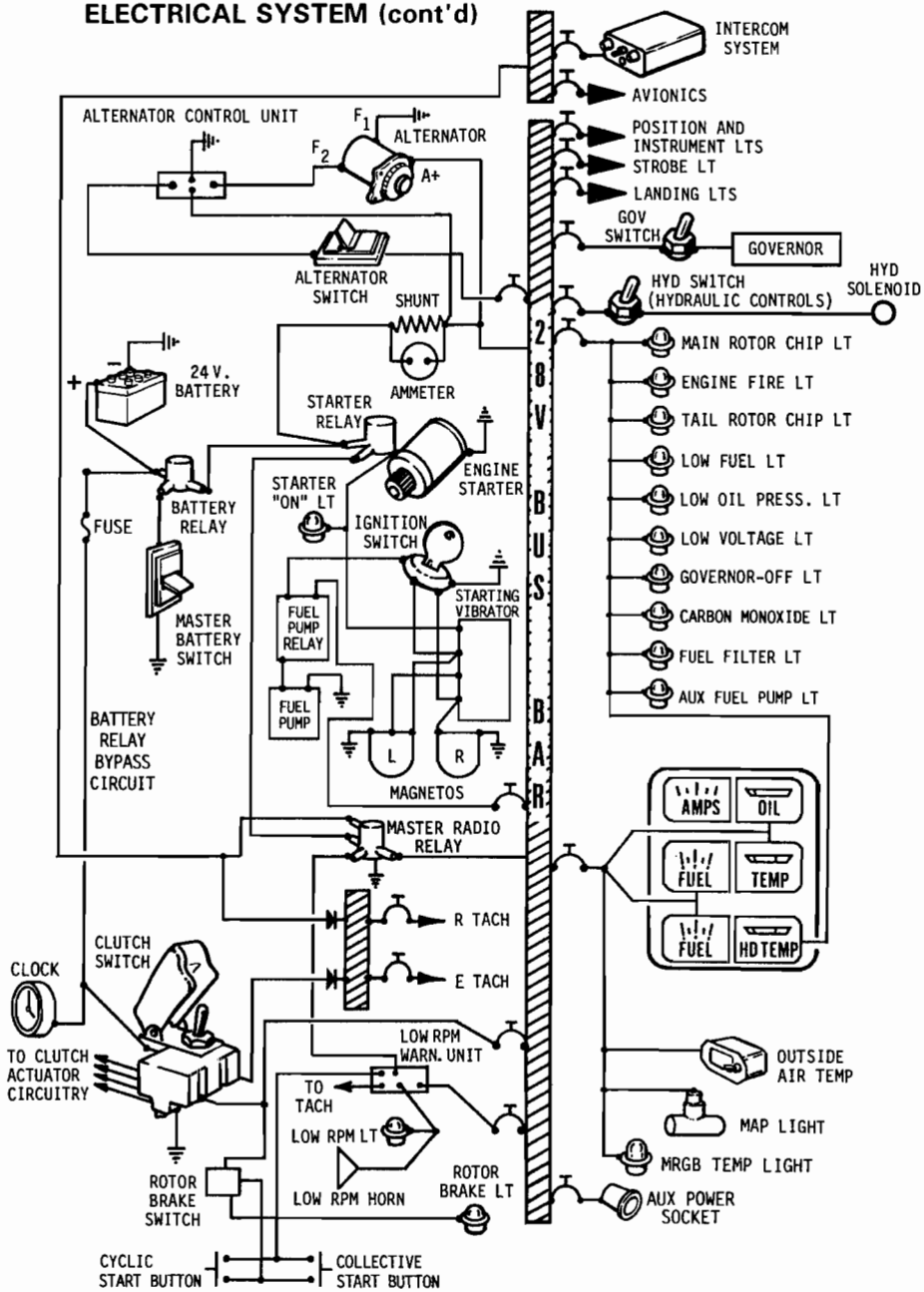
The auxiliary tank is interconnected with the main tank and is located somewhat higher so it will empty while fuel still remains in the main tank. One valve controls flow from both tanks.

## ELECTRICAL SYSTEM

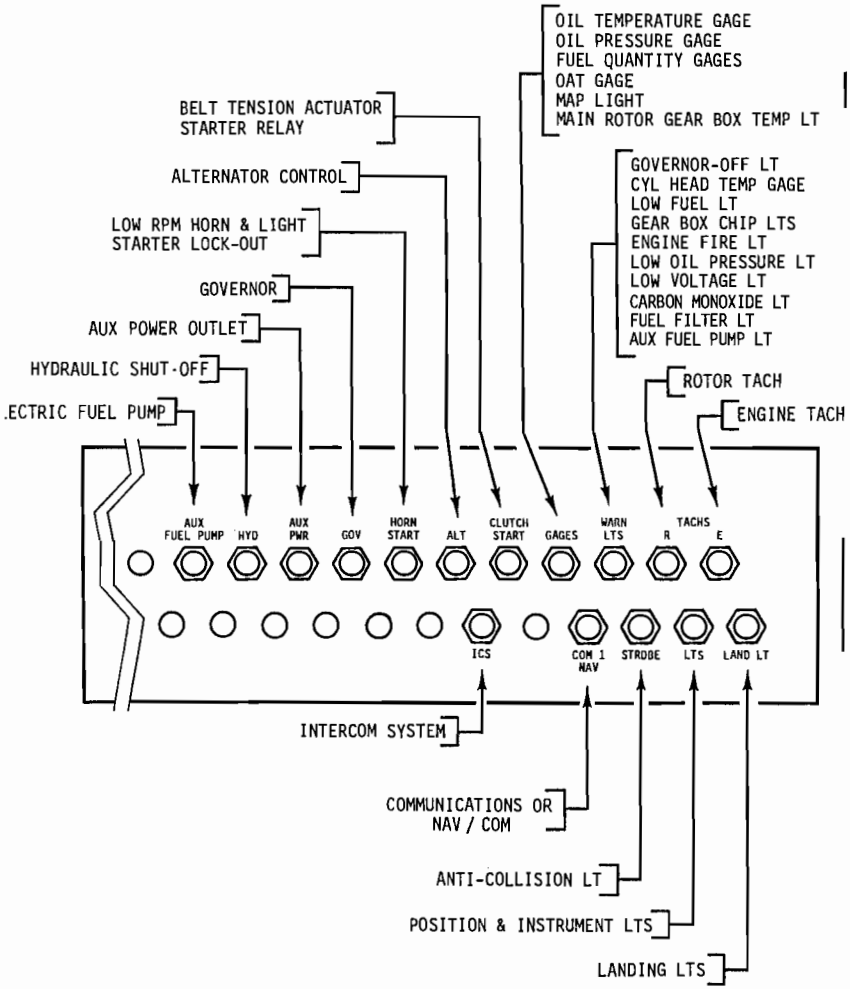
A 28-volt electrical system which includes an alternator, voltage controller, battery relay, and 24-volt battery is standard. The voltage controller is located forward of the firewall behind the right rear seat back. The battery is located in the engine compartment, under the left front seat, or beneath the instrument console.

Various switches are located on the console and circuit breakers are on the ledge just forward of the left seat. Breakers are marked to indicate function and amperage and are of the push-to-reset type. If a circuit breaker trips, wait a few seconds for it to cool before resetting.

## ELECTRICAL SYSTEM (cont'd)



## ELECTRICAL SYSTEM (cont'd)




CIRCUIT BREAKER PANEL - TYPICAL

## ELECTRICAL SYSTEM (cont'd)

The MASTER BATTERY switch controls the battery relay which disconnects the battery from the electrical system. A small power wire protected by a fuse near the battery bypasses the battery relay. The bypass wire allows the tachometers and the clock to continue to receive battery power with the MASTER BATTERY switch off.

The alternator control unit protects the electrical system from overvoltage conditions. The ammeter indicates current to the battery ("—" indicates discharge). If ALT light comes on or ammeter indicates discharge during flight, turn off all nonessential electrical equipment and switch ALT off and back on after one second to reset. If ALT light stays on or ammeter still indicates discharge, terminate flight as soon as practical.

***CAUTION***

Continued flight with malfunctioning charging system can result in loss of power to electronic tachometers, producing a hazardous flight condition.

## LIGHTING SYSTEM

A red anti-collision strobe light is installed on the tailboom. Night lights include navigation lights on each side of the cabin and on the tail. Twin landing lights are installed in the nose at different vertical angles to increase the pilot's field of vision. Post and internal lights illuminate the instruments. An overhead map light provides additional lighting. The map light switch is located at the base of the light. A dimmer control for panel lights is located above the NAV LTS switch. Panel lights function only when the NAV LTS switch is on.

The strobe, navigation, and landing lights each have separate circuit breakers. Panel lights are on the same breaker as navigation lights, but the map light is on the gages breaker.

## LIGHTING SYSTEM (cont'd)

The landing light switch is located on the cyclic center post.

***CAUTION***

Landing light switch location should be carefully memorized so it can be turned on without delay in an emergency.

***NOTE***

Landing lights operate only when CLUTCH switch is in engage position.

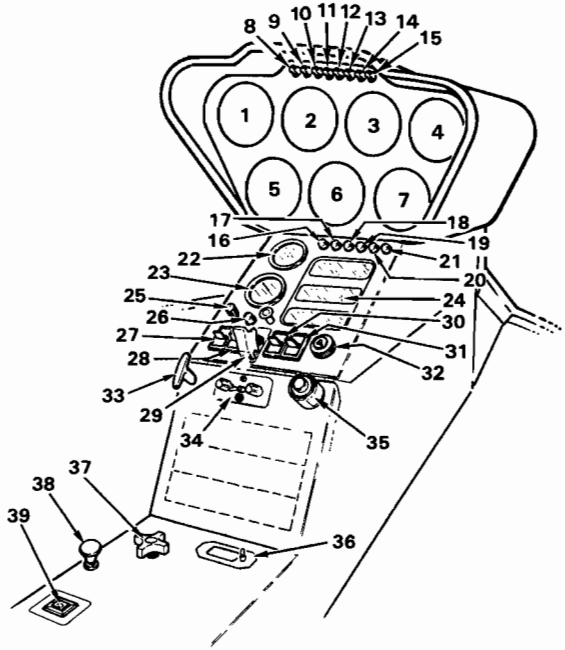
An optional white strobe light may be mounted on the tailboom in addition to the red strobe. When the white strobe is installed, it is controlled by the strobe light switch and the red strobe is powered whenever the master battery switch is on. The single strobe circuit breaker provides circuit protection for both lights.

***CAUTION***

Turn white strobe off any time glare is objectionable.

## INSTRUMENT PANEL

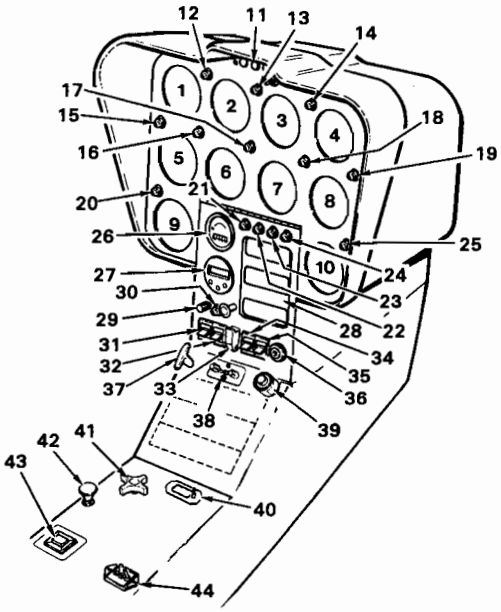
Standard flight instruments include a rate-of-climb indicator, airspeed indicator, engine and rotor dual tachometer, sensitive altimeter, manifold pressure gage, and magnetic compass. Engine gages include an ammeter, oil pressure, oil temperature, cylinder head temperature, fuel quantity for main and aux tanks, and a collective-activated hourmeter. Also provided are a clock and digital outside air temperature gage. Space is also provided for optional instruments and avionics.




1. VERTICAL SPEED INDICATOR
2. OPTIONAL INSTRUMENT
3. AIR SPEED INDICATOR
4. ENGINE AND ROTOR TACH
5. ALTIMETER
6. OPTIONAL INSTRUMENT
7. MANIFOLD PRESSURE
8. CLUTCH LIGHT
9. M.R. GEARBOX TEMP LIGHT
10. M.R. GEARBOX CHIP LIGHT
11. CARBON MONOXIDE LIGHT
12. STARTER-ON LIGHT
13. T.R. GEARBOX CHIP LIGHT
14. LOW FUEL LIGHT
15. LOW RPM LIGHT
16. FUEL FILTER LIGHT
17. AUX FUEL PUMP LIGHT
18. ALT LOW VOLTAGE LIGHT
19. ENGINE FIRE LIGHT
20. OIL PRESSURE LIGHT
21. GOVERNOR-OFF LIGHT
22. HOURMETER
23. CLOCK
24. ENGINE INSTRUMENTS
25. PANEL LIGHTS DIMMER
26. ROTOR BRAKE LIGHT
27. NAVIGATION LIGHTS SWITCH
28. STROBE LIGHT SWITCH
29. CLUTCH ACTUATOR SWITCH
30. ALTERNATOR SWITCH
31. MASTER BATTERY SWITCH
32. IGNITION AND PRIMER SWITCH
33. CABIN AIR
34. INTERCOM
35. MIXTURE CONTROL WITH GUARD
36. OUTSIDE AIR TEMP
37. CYCLIC FRICTION
38. CABIN HEAT
39. ELT SWITCH

## INSTRUMENT PANEL - TYPICAL

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




1. ENGINE AND ROTOR TACH
2. AIR SPEED INDICATOR
3. ARTIFICIAL HORIZON
4. ALTIMETER
5. MANIFOLD PRESSURE
6. TURN COORDINATOR
7. HSI
8. VERTICAL SPEED INDICATOR
9. OPTIONAL INSTRUMENT
10. OPTIONAL INSTRUMENT
11. MARKER BEACON
12. M.R. GEARBOX TEMP LIGHT
13. T.R. GEARBOX CHIP LIGHT
14. M.R. GEARBOX CHIP LIGHT
15. STARTER-ON LIGHT
16. LOW RPM LIGHT
17. LOW FUEL LIGHT
18. CARBON MONOXIDE LIGHT
19. CLUTCH LIGHT
20. AUX FUEL PUMP LIGHT
21. ALT LOW VOLTAGE LIGHT
22. ENGINE FIRE LIGHT
23. OIL PRESSURE LIGHT
24. GOVERNOR-OFF LIGHT
25. FUEL FILTER LIGHT
26. HOURMETER
27. CLOCK
28. ENGINE INSTRUMENTS
29. PANEL LIGHTS DIMMER
30. ROTOR BRAKE LIGHT
31. NAVIGATION LIGHTS SWITCH
32. STROBE LIGHT SWITCH
33. CLUTCH ACTUATOR SWITCH
34. ALTERNATOR SWITCH
35. MASTER BATTERY SWITCH
36. IGNITION AND PRIMER SWITCH
37. CABIN AIR
38. INTERCOM
39. MIXTURE CONTROL WITH GUARD
40. OUTSIDE AIR TEMP
41. CYCLIC FRICTION
42. CABIN HEAT
43. ELT SWITCH
44. HSI SLAVE CONTROL

## OPTIONAL INSTRUMENT PANEL

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

## INTERCOM SYSTEM

A four-place intercom system which allows radio and auxiliary audio input to be mixed with voice-activated intercom audio is standard. The ICS VOLUME knob controls intercom volume, but does not affect radio or auxiliary audio volume. The VOX SQUELCH knob is used to set threshold volume at which the intercom is activated. When the knob is turned fully counterclockwise to LIVE, the intercom is constantly on. When the knob is turned fully clockwise, keying is required to activate the intercom.

The cyclic grips are equipped with trigger-style intercom/transmit switches. The first trigger switch detent activates the intercom and the second detent transmits. Additional intercom buttons are located inboard of the rear seats and on the left forward floor. An amber light on the intercom panel illuminates when the intercom is active and a green light illuminates during transmission.

A toggle switch allows selection of PILOT ISO mode in which the pilot is connected only to the radio while the co-pilot and rear passengers remain in the intercom mode.

An AUX AUDIO IN jack (for plugging in personal radios, etc.) is located on the aft seat console. This line is muted when the intercom is active, when transmitting, and during reception of radio signals.

## PITOT-STATIC SYSTEM

The pitot-static system supplies air pressure to operate the airspeed indicator and altimeter. 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 only be required if the airspeed indicator or altimeter appears erratic.

Pitot and static sources should be inspected frequently for bugs or other obstructions.

## TACHOMETERS

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 magnets on the main gearbox drive yoke. Each tachometer circuit has a separate circuit breaker and is completely independent from the other. With MASTER BATTERY and ALT switches off, the tachometer bus continues to receive power through a bypass circuit as long as the CLUTCH switch is in the engage position.

***CAUTION***

Installation of electrical devices can affect accuracy and reliability of electronic tachometers, low RPM warning system, and governor. Therefore, no electrical equipment may be installed unless specifically approved by the factory.

## WARNING LIGHTS

Warning lights include clutch, main gearbox over-temperature, main and tail gearbox chip, engine fire, starter on, low fuel, fuel filter, auxiliary fuel pump, low RPM, alternator, low oil pressure, rotor brake, and carbon monoxide. The clutch light indicates that the actuator is tightening the vee belts. The low RPM light and horn indicate rotor RPM at 97% or below. The engine fire light is actuated by a temperature switch located at the forward end of the horizontal firewall. The low oil pressure and low fuel lights are actuated by sensors in those systems and are independent of gage indicators. The alternator and auxiliary fuel pump lights warn of possible failures of those accessories, and the fuel filter light warns of possible filter contamination. The governor-off light indicates governor is switched off.

The main and tail gearbox chip detectors are magnetic devices located in the drain plug of each gearbox. When metallic particles are drawn to the magnets they close an electrical circuit, illuminating the warning light. Metal particles may be caused by a failing bearing or gear, thus giving warning of impending gearbox failure. The main gearbox over-temp light is actuated by a temperature switch located near the input pinion bearing.

The carbon monoxide light is actuated by a sensor above the pilot's heater outlet and indicates elevated cabin carbon monoxide levels.

## HEATING AND VENTILATION

Fresh air vents are located in each door and in the nose. Door vents are opened and closed using the center pivot of the double-arm linkage. 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 vent knob on console face. Air from the nose inlet is directed along inside surface of windshield for defogging as well as for ventilation.

The cabin heater consists of a muffler heat shroud, a control valve at the firewall, outlet grilles forward of tail rotor pedals and at rear seats, and interconnecting ducts between components. The heat control is located to the left of the cyclic stick. The control actuates the valve which directs heat either into the cabin or out an overboard discharge on the cabin underside.

***CAUTION***

In case of engine fire, heat control should be in closed position to seal cabin area from engine compartment.

## SEATS, BELTS, AND BAGGAGE

A baggage compartment is located under each seat. Seat cushions hinge forward for access. Each seat is equipped with a combined seat 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.

Four-point harnesses are optional for the front seats. Later four-point harnesses are equipped with webbing stops located above the inertia reels. The stops limit retraction of the harnesses and should be adjusted such that the harnesses are comfortable without excessive slack.

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

## LANDING GEAR

A spring and yield 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 center crosstube yields (takes permanent set) to absorb the impact. Slight crosstube yielding is acceptable. However, yielding which allows the tail skid to be within 30 inches of the ground when the ship is sitting empty on level pavement requires crosstube replacement.

Hardened steel 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. Replace shoes whenever the thinnest point is less than 1/16 of an inch (.06 in.).

## ROTOR BRAKE

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

1. After pulling idle cutoff, wait at least 30 seconds.
2. Pull brake handle forward and down using moderate force (10 lb).
3. After rotor stops, release handle or, to use as parking brake, hook bead chain in slot in bracket.

Brake must be released before starting engine. When brake is engaged, starter buttons are disabled.

***CAUTION***

Applying rotor brake without waiting at least 30 seconds after engine stops or using a force which stops rotor in less than 20 seconds may permanently damage brake shoes.

## CARBON MONOXIDE DETECTOR

The carbon monoxide (CO) detector indicates elevated cabin CO levels. CO is an odorless, toxic gas present in engine exhaust which causes headaches, drowsiness, and possible unconsciousness. CO levels may become elevated due to an exhaust leak or possibly due to exhaust recirculation during prolonged hovering.

The CO detector system consists of a sensor above the pilot's heater outlet and a warning light. A system check (light flashes twice) is performed each time power is switched on. A sensor malfunction is indicated by a continuing flash every four seconds.

If the warning light illuminates, open nose and door vents and shut off heater as required to ventilate the cabin. If hovering, land or transition to forward flight. If symptoms of CO poisoning (headache, drowsiness, dizziness) accompany warning light, land immediately. Inspect exhaust system before next flight.

Many chemicals can damage the CO sensor. Avoid use of solvents, detergents, or aerosol sprays near the sensor. Tape off openings in top and bottom of sensor housing when cleaning cabin interior.

## 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 aft, upper cowl door. 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 secured in the AUTO position at installation and should always be in this position for flight. The remote switch/annunciator is a three position rocker switch with internal indicator light. This switch should also be in the AUTO (middle) position for flight. With both switches set to AUTO, the ELT will begin transmitting on international distress frequencies 121.5 and 243.0 MHz when subjected to a high "G" load. When the unit is transmitting, the red indicator in the rocker switch illuminates.

Moving the rocker switch to ON activates the transmitter for test or emergency situations. Use the ON position if an emergency landing is imminent and time permits.

If ELT is inadvertently activated, use the RESET position of the rocker 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 instructions supplied with the unit.

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# SECTION 8

# HANDLING AND MAINTENANCE

## CONTENTS

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# SECTION 8

# HANDLING AND MAINTENANCE

## GENERAL

This section outlines procedures recommended for handling, servicing, and maintaining the R44 helicopter. Every owner should stay in close contact with a Robinson Service Center to obtain the latest service and maintenance information. Owners should also be registered with the factory to receive service bulletins, changes to this handbook, and other helpful information as it becomes available.

Federal Aviation Regulations place responsibility for maintenance of a helicopter on the owner and operator. He must insure that all maintenance is performed by qualified mechanics and in accordance with the R44 Maintenance Manual (Instructions for Continued Airworthiness), Service Bulletins/Service Letters, and FAA Airworthiness Directives.

All limits, procedures, safety practices, time limits, servicing, and maintenance requirements contained in this handbook are considered mandatory.

Authorized Robinson Service Centers will have recommended modification, service, and operating procedures issued by the FAA and by Robinson Helicopter Company. This information will be useful in obtaining maximum utility and safety with the helicopter.

## REQUIRED DOCUMENTS

The Airworthiness Certificate (FAA Form 8100-2) must be displayed in the aircraft at all times. The following additional documents must be carried in the aircraft:

1. Registration Certificate (FAA Form 8050-3)
2. Pilot's Operating Handbook

## REQUIRED DOCUMENTS (cont'd)

The following documents should not be carried in the aircraft, but must be available for use by any mechanic or pilot servicing the aircraft:

1. Aircraft Logbook
2. Engine Logbook

***NOTE***

Required documents may vary in countries other than the United States.

## REQUIRED INSPECTIONS

Federal Aviation Regulations require that all civil aircraft of U.S. registry undergo a complete (annual) inspection every twelve months. This annual inspection must be signed off by a mechanic with Inspection Authorization (IA). This inspection is required whether the helicopter is used commercially or privately.

In addition to the annual inspection, the R44 Maintenance Manual requires a complete inspection after every 100 hours of operation. The helicopter also incorporates a number of fatigue life-limited components which must be retired at specified time intervals. A list of these components is contained in the Airworthiness Limitations section of the R44 Maintenance Manual and Instructions for Continued Airworthiness.

The R44 helicopter includes many unique features. Even with a maintenance manual, an Airframe and Powerplant (A & P) mechanic is not qualified to perform the above inspections of the R44 helicopter without additional training. Therefore, these inspections must only be performed by properly rated personnel who have successfully completed a factory-approved maintenance course of instruction on the R44 helicopter.

## REQUIRED INSPECTIONS (cont'd)

The factory occasionally publishes Service Bulletins and the Federal Aviation Administration (FAA) occasionally publishes Airworthiness Directives (ADs) that apply to specific groups of aircraft. They are mandatory changes or inspections which must be complied with within the time limit specified. Owners should periodically check with Robinson Service Centers to be sure that the latest Service Bulletins and ADs issued have been complied with.

## PREVENTIVE MAINTENANCE BY THE PILOT

Part 43 of the Federal Aviation Regulations (FAR) allows a certified pilot who owns or operates an aircraft to obtain a maintenance manual and perform certain limited maintenance functions. These functions are defined in the above regulations, and, as they apply to the R44 helicopter, generally include the following:

1. Replace defective safety wire or cotter pins.
2. Replace bulbs, reflectors, and lenses of position and landing lights.
3. Replace, clean, or gap spark plugs.
4. Replace engine air filter.
5. Clean or refinish exterior of aircraft.
6. Replace wear shoes on landing gear skids.
7. Service or replace battery.
8. Change engine oil and filter.
9. Inspect chip detectors and add oil to tail rotor gearbox.
10. Remove or replace any cowling or inspection panels.
11. Remove and replace gascolator bowl.
12. Replenish hydraulic fluid in reservoir.

Although the above work is allowed by law, it should only be performed by pilots confident that they are qualified to reliably complete the work. All work must be done in accordance with the maintenance manual.

## PREVENTIVE MAINTENANCE BY THE PILOT (cont'd)

After completing the work, when required, the pilot must enter the following in the appropriate logbook:

1. Date work accomplished.
2. Description of work.
3. Total hours on aircraft.
4. Pilot certificate number.
5. Signature of pilot.

## ALTERATIONS TO AIRCRAFT

The compactness and many unique design features of the R44 helicopter make any modification inadvisable. Dynamic characteristics and susceptibility to fatigue of the rotor, drive, and control systems make any modification to these systems extremely hazardous.

Also hazardous is installation of any electronic equipment or avionics not factory-approved and supplied. The compactness of the console and tunnel containing the controls and wire bundles makes installation of any additional wires likely to interfere with free control movement. Even more importantly, the electronic tachometers and governor are affected by other electronic devices. Their reliability and accuracy is essential for safe operation of the helicopter, and installation of an electrical device not tested and approved by the factory could easily result in a hazardous condition.

Because of these potential hazards, Robinson Helicopter Company does not approve any modification or alteration other than those which are factory-supplied and installed by factory-trained personnel.

## GROUND HANDLING

For leveling, hoisting, or jacking, see appropriate sections of the maintenance manual.

The helicopter is normally maneuvered on the ground using ground handling wheels.

To attach wheels:

1. Hold handle and wheel with protruding spindle in its lowest position.
2. Insert spindle into support mounted on skid. Make sure spindle is all the way in.
3. Pull handle over center to raise helicopter and lock wheel in position.

***CAUTION***

When lowering helicopter, handle has a tendency to snap over.

Ground handling generally requires two people: one to hold the tail down and steer by holding the tail rotor gearbox and a second to push on the fuselage. The steel tube frame inside the aft cowl door may be used as a hand hold for pushing. Keep feet clear of skid tubes. Alternately, a Robinson electric tow cart may be used per the instructions provided.

***CAUTION***

Do not move helicopter by gripping tail rotor guard, outboard part of horizontal stabilizer, tail rotor, or tail rotor controls.

## PARKING

1. Place cyclic control in neutral and apply friction.
2. Put collective full down and apply friction.
3. Align rotor blades approximately fore and aft. In windy conditions, align blades slightly offset from fore and aft to prevent aft blade from flapping into tailcone. Apply rotor brake.
4. During storm conditions, helicopter should be hangared or moved to a safe area.

## ENGINE OIL

Recommended maximum oil quantity is nine quarts and minimum quantity for takeoff is seven quarts as indicated by the oil dipstick.

The oil and filter should be changed at least every 50 hours or four months, whichever occurs first. Check alternator drive belt condition and tension and fan shaft bearing condition at each oil change.

To change oil:

1. Ground run or fly helicopter to obtain normal operating temperature.
2. Remove engine side cowls and open quick drain on bottom of sump to drain oil into suitable container.
3. Cut safety wire from oil suction screen cap located on aircraft right side of sump between cylinder #4 exhaust riser and cylinder #6 intake pipe.
4. Remove, inspect, clean, and reinstall oil suction screen. Re-safety cap.
5. Cut safety wire from oil filter and break filter loose using wrench.
6. Place suitable container below and inboard of magneto to catch oil retained in filter and remove filter slowly to allow oil to drain into container. Do not allow oil to drain on magneto housing.

ENGINE OIL (cont'd)

7. Remove filter and cut open to inspect.
8. Install new filter per instructions printed on filter, and safety wire. Use only Champion CH48108, CH48108-1, or Robinson B123-1 filter.
9. Close quick drain and fill sump with 9 quarts of appropriate grade oil as recommended below.
10. Start helicopter. Verify oil pressure within 30 seconds. Ground run for a few minutes, shut down, and verify no leaks.
11. Check oil level on dipstick.
12. Install cowlings.
13. Make appropriate maintenance record entries.

The following grades of oil are recommended:

| Average Ambient Air Temperature | Mineral Grades MIL-L-6082 or SAEJ1966 (Use first 50 hours) | Ashless Dispersant Grades MIL-L-22851 or SAEJ1899 (Use after first 50 hours) |
|---|---|---|
| All Temperatures | — | SAE15W50 or SAE20W50 |
| Above 80°F | SAE60 | SAE60 |
| Above 60°F | SAE50 | SAE40 or SAE50 |
| 30°F to 90°F | SAE40 | SAE40 |
| 0°F to 70°F | SAE30 | SAE30, SAE40,or SAE20W40 |
| 0°F to 90°F | SAE20W50 | SAE20W50 or SAE15W50 |
| Below 10°F | SAE20 | SAE30 or SAE20W30 |

## TAIL ROTOR GEARBOX OIL

If oil is not visible in the sight gage with helicopter sitting level, oil must be added.

To add oil:

1. Cut safety wire and remove filler/vent cap located on top of gearbox.
2. Use only oil obtained from Robinson Helicopter and identified with part number A257-2.
3. Fill very slowly until oil is visible in sight gage. DO NOT overfill. (Less than a tablespoon of oil is usually required.)
4. Reinstall filler/vent cap. Be sure gasket is in place.
5. Safety wire as before. Be sure safety wire applies tension in direction which would tighten cap.

## HYDRAULIC FLUID

If hydraulic fluid is not visible in reservoir sight gage with helicopter sitting level, remove filler/vent cap and add Robinson part number A257-15 fluid as required to obtain normal sight glass reading.

***NOTE***

Sight glass reading will be higher with system hot. Do not overfill cold system.

## FUEL

Approved fuel grades and fuel capacity are given in Section 2, Limitations.

A small quantity of fuel should be drained from the gascolator and from each tank using the quick drains prior to the first flight each day. Drain enough fuel to remove any water or dirt and check for approved fuel color. If fuel contamination is suspected, continue to drain fuel from gascolator and tank drains until all contamination is eliminated.

***CAUTION***

Fuel injection components are particularly susceptible to damage from dirt or foreign material contamination. Service with fuel from reliable sources and use caution to keep fuel system clean.

***NOTE***

Idle mixture and speed may require adjustment as conditions vary from sea level standard. Refer to R44 Maintenance Manual for idle adjustment procedure.

## BATTERY

The battery is located in the engine compartment, under the left front seat, or beneath the instrument console. The battery is sealed and does not require fluid level checks.

***CAUTION***

Keep open flames or electric sparks away from battery. Do not smoke near battery. Protect eyes, face, and other exposed areas when working near a battery.

A discharged battery is NOT AIRWORTHY because it will not have the reserve capacity to operate the electrical system should the charging system fail in flight.

Often, a 10 or 15 minute charge will improve battery condition enough to start the engine. If battery is located in the engine compartment, open left engine cowl access door and connect positive charger cable to positive (battery side) battery relay terminal. Then, connect negative charger cable to battery ground strap or engine. If battery is located beneath the instrument console, remove console hold down screws (one each side), lift console, remove battery box cover, and connect charger cables directly to battery posts (connect positive cable first). Use extreme caution not to short to console sheet metal. Later console installations are equipped with charging posts on the right side of the console. Charger cables may be connected directly to these posts without accessing the battery. If battery is located beneath the left front seat, open under-seat compartment, remove battery protective panel at forward end of compartment, and connect charger cables as described for engine compartment battery.

After charging, disconnect cables (disconnect negative cable first), secure access panels or console as required, and attempt a normal start. If battery still has insufficient charge to start engine, service or replace before further flight.

## CLEANING HELICOPTER

### CLEANING EXTERIOR SURFACES

The helicopter should be washed with mild soap and water. Harsh abrasives, alkaline soaps, or detergents could scratch painted or plastic surfaces or could cause corrosion of metal. Cover areas where cleaning solution could cause damage. Use the following procedure:

1. Rinse away loose dirt with water.
2. Apply cleaning solution with a soft cloth, sponge, or soft bristle brush.
3. To remove stubborn oil and grease, use a cloth dampened with aliphatic naphtha.
4. Rinse all surfaces thoroughly.
5. Any good automotive wax may be used to preserve painted surfaces. Soft cleaning cloths or a chamois should be used to prevent scratches when cleaning or polishing.

***CAUTION***

Never use high-pressure spray to clean helicopter. Never blow compressed air into main or tail rotor blade tip drain holes.

### CLEANING WINDSHIELD AND WINDOWS

1. Remove dirt, mud and other loose particles from exterior surfaces with clean water.
2. Wash with mild soap and warm water or with aircraft plastic cleaner. Use a soft cloth or sponge in a straight back and forth motion. Do not rub harshly.
3. Remove oil and grease with a cloth moistened with isopropyl alcohol (rubbing alcohol) or aliphatic naphtha.

**CLEANING HELICOPTER (cont'd)**

CLEANING WINDSHIELD AND WINDOWS (cont'd)

***CAUTION***

Do not use gasoline, other alcohols, benzene, carbon tetrachloride, thinner, acetone or window (glass) cleaning sprays.

4. After cleaning plastic surfaces, apply a thin coat of hard polishing wax. Rub lightly with a soft cloth. Do not use a circular motion.
5. Scratches can be removed by rubbing with jeweler's rouge followed by hand polishing with commercial plastic polish. Use a figure eight motion when polishing.

CLEANING UPHOLSTERY AND SEATS

1. Vacuum and brush, then wipe with damp cloth. Dry immediately.
2. Soiled upholstery, except leather, may be cleaned with a good upholstery cleaner suitable for the material. Follow manufacturer's instructions. Avoid soaking or harsh rubbing.

***CAUTION***

Avoid use of solvents, detergents, or aerosol sprays near CO sensor. Tape off openings in top and bottom of sensor housing when cleaning cabin interior.

3. Leather should be cleaned with saddle soap or a mild hard soap and water.

CLEANING CARPETS

Remove loose dirt with a whisk broom or vacuum. For soiled spots and stains, use nonflammable dry cleaning liquid.

# SECTION 9

# SUPPLEMENTS

## GENERAL

This section contains information in the form of supplements which are necessary for safe and efficient operation when one or more of the following options is installed.

Information contained in the supplements applies only when the related equipment is installed.

## CONTENTS

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## FAA APPROVED
## R44 II PILOT'S OPERATING HANDBOOK

## FIXED FLOATS SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when fixed-float landing gear is installed.

Information contained herein supplements or supersedes the basic manual only in those areas listed in this supplement. For limitations, procedures, and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook.

APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: October 3, 2002

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REVISIONS
APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: November 5, 2004

## SECTION 1: GENERAL

### INTRODUCTION

This supplement contains the changes and additional data applicable when fixed-float landing gear is installed.

The fixed-float landing gear installation includes inflated floats, additional airframe sealing and corrosion protection, additional forward position lights in the mast fairing, and longer landing gear struts. An additional stabilizer is installed at the base of the lower vertical stabilizer for controllability. Standard landing gear may be installed in place of the float landing gear per Maintenance Manual instructions.

Float landing gear is intended for safety during flights over water. Intentional water landings for other than training purposes are not recommended.

Note: The float landing gear is approved for amphibious operation but is not certified for ditching. Some countries may prohibit certain over-water operations.

## SECTION 2: LIMITATIONS

### AIRSPEED LIMITATIONS

NEVER EXCEED AIRSPEED ($V_{ne}$) WITH FLOATS

Up to 3000 feet density altitude:

| | |
|---|---|
| 2200 lb TOGW & below | 120 KIAS |
| Over 2200 lb TOGW | 110 KIAS |
| Autorotation | 100 KIAS |

Above 3000 feet density altitude: See placard on page 9-5.3.

### FLIGHT AND MANEUVER LIMITATIONS

Water landings for any reason other than an actual emergency are prohibited at weights above 2400 lb.

## SECTION 2: LIMITATIONS (cont'd)

### PLACARDS

In clear view and readable by the pilot in flight:

**NEVER EXCEED SPEED - KIAS**
**WITH FLOATS**

| 2200 LB TOGW & BELOW | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PRESS | OAT - °C | | | | | | | |
| ALT-FT | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 |
| SL | 120 | | | | | | 117 | 113 |
| 2000 | | | | | | | | |
| 4000 | | | | | 116 | 112 | 108 | 104 |
| 6000 | | | 116 | 112 | 107 | 103 | 98 | 93 |
| 8000 | 116 | 112 | 107 | 102 | 97 | 91 | 86 | 81 |
| 10000 | 107 | 102 | 96 | 91 | 85 | 80 | 75 | |
| 12000 | 97 | 91 | 85 | 79 | NO FLIGHT | | | |
| 14000 | 85 | 79 | | | | | | |
| OVER 2200 LB TOGW, SUBTRACT 10 KIAS<br>FOR AUTOROTATION, SUBTRACT 20 KIAS | | | | | | | | |

**NEVER EXCEED SPEED - KIAS**
**WITHOUT FLOATS**

| 2200 LB TOGW & BELOW | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PRESS | OAT - °C | | | | | | | |
| ALT-FT | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 |
| SL | 130 | | | | | | 127 | 123 |
| 2000 | | | | | | | | |
| 4000 | | | | | 126 | 122 | 118 | 114 |
| 6000 | | | 126 | 122 | 117 | 113 | 108 | 103 |
| 8000 | 126 | 122 | 117 | 112 | 107 | 101 | 96 | 91 |
| 10000 | 117 | 112 | 106 | 101 | 95 | 90 | 85 | |
| 12000 | 107 | 101 | 95 | 89 | NO FLIGHT | | | |
| 14000 | 95 | 89 | | | | | | |
| OVER 2200 LB TOGW, SUBTRACT 10 KIAS<br>FOR AUTOROTATION, SUBTRACT 30 KIAS | | | | | | | | |

Located on floats:

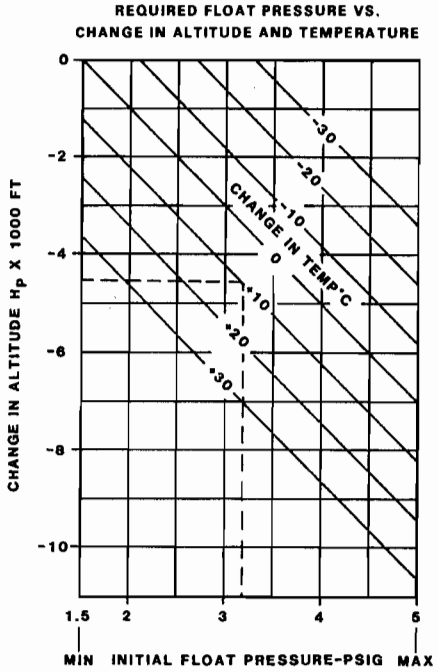
SEE PILOT'S HANDBOOK FOR
PROPER INFLATION PRESSURE

## SECTION 2: LIMITATIONS (cont'd)

### FLOAT PRESSURE LIMITS

Minimum Float Pressure: 1.5 psig (psi gage)
Maximum Float Pressure: 5 psig

A decrease in altitude or temperature reduces float pressure. If decrease in altitude or temperature is anticipated, inflate floats per chart below to ensure 1.5 psig minimum at landing. Pressure relief valves will limit pressure for an increase in altitude or temperature.




***CAUTION***

Failure to maintain adequate pressure can result in loss of buoyancy or in-flight instability.

| EXAMPLE: | Pressure Altitude | Temp |
|---|---|---|
| Conditions at destination: | 1000 ft | 15°C |
| Initial conditions: | 5500 ft | 5°C |
| Subtract to obtain change in altitude and temp: | -4500 ft | +10°C |

Using graph, locate -4500 ft line, read across to +10°C line, then down for minimum initial float pressure required, approximately 3.2 psig.

## SECTION 3: EMERGENCY PROCEDURES

### GENERAL

Without floats, emergency procedures in the basic manual apply. With floats, the following procedures are applicable.

### POWER FAILURE ABOVE 500 FEET AGL

Autorotation to Land: Same as in basic manual.

Autorotation to Water:

1. Lower collective immediately to maintain RPM.
2. Establish steady glide at approximately 70 KIAS.
3. If altitude permits, maneuver into wind.
4. At about 40 feet AGL, begin cyclic flare.
5. At about 8 feet AGL, apply forward cyclic and raise collective just before touchdown. Touch down in slight nose high attitude with nose straight ahead.
6. Maintain cyclic in touchdown position and do not lower collective full down until forward motion has stopped.

***CAUTION***

Lowering collective or applying forward cyclic while helicopter is moving forward on water can cause floats to submerge and helicopter to nose over.

## SECTION 3: EMERGENCY PROCEDURES (cont'd)

### POWER FAILURE BETWEEN 8 FEET AND 500 FEET AGL

Autorotation to Land: Same as in basic manual.

Autorotation to Water:

1. Lower collective immediately to maintain RPM.
2. If altitude permits, maneuver into wind.
3. Maintain airspeed until water is approached, then begin cyclic flare.
4. At about 8 feet AGL, apply forward cyclic and raise collective just before touchdown. Touch down in slight nose high attitude with nose straight ahead.
5. Maintain cyclic in touchdown position and do not lower collective full down until forward motion has stopped.

***CAUTION***

Lowering collective or applying forward cyclic while helicopter is moving forward on water can cause floats to submerge and helicopter to nose over.

### MAXIMUM GLIDE DISTANCE CONFIGURATION

Same as without floats, except airspeed approximately 80 KIAS.

### DITCHING

Not applicable with floats.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

15. Inflatable Floats

Float Pressure . . . . . Check (See Section 2)
Float Condition . . . . . Check

***CAUTION***

Helicopters equipped with inflated floats have an adverse roll characteristic. When sideslipping nose left or right, helicopter will tend to roll in opposite direction and could cause loss of control. To avoid adverse roll, keep helicopter trimmed with zero sideslip. Exercise extreme caution when performing simulated power failures.

***CAUTION***

Avoid night flight over water beyond autorotation distance to land. Height above water may be difficult to judge during a water landing.

## SECTION 4: NORMAL PROCEDURES (cont'd)

### OPERATION ON WATER

***CAUTION***

Except for actual emergencies, maximum weight for water operation is 2400 lb.

Since the helicopter sits very low on water, it is likely that water will leak into the cabin. Intentional water landings should be limited to training. For training, seal the removable belly panels and landing gear cross tube cover using aluminum foil tape or duct tape. Avoid salt water if possible.

Maximum recommended water taxi speed is 5 knots. Some application of collective is required.

***CAUTION***

To avoid contacting rotor teeter stops, do not apply full cyclic control during water taxi.

***CAUTION***

If starting or stopping rotor on water, ensure area is clear as helicopter can rotate one or more complete turns while tail rotor RPM is low.

***NOTE***

Safe operation on water has been demonstrated in waves up to 12 inches (trough to crest).

## SECTION 4: NORMAL PROCEDURES (cont'd)

### PRACTICE AUTOROTATION - WITH GROUND CONTACT

Same as in basic manual. Autorotations should only be performed to a smooth, hard surface to avoid damage to floats.

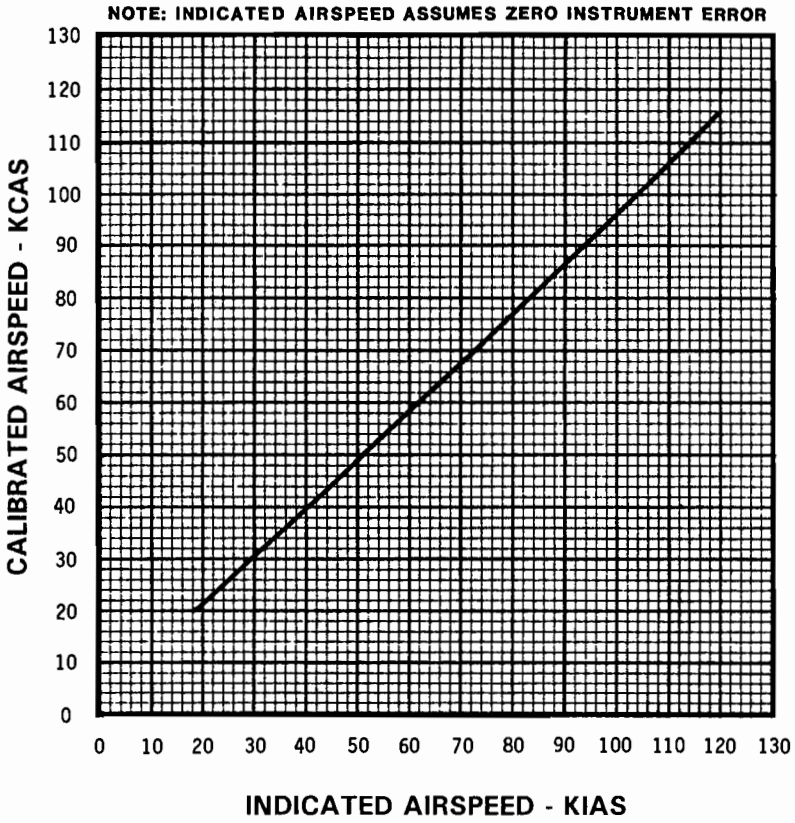
### PRACTICE AUTOROTATION - WITH WATER CONTACT

Same as practice autorotation with ground contact in basic manual except touch down in slight nose high attitude with nose straight ahead. Maintain cyclic in touchdown position and do not lower collective full down until forward motion has stopped.

***CAUTION***

Lowering collective or applying forward cyclic while helicopter is moving forward on water can cause floats to submerge and helicopter to nose over.

## SECTION 5: PERFORMANCE




AIRSPEED CALIBRATION CURVE

R44 WITH FIXED FLOAT LANDING GEAR

## SECTION 6: WEIGHT AND BALANCE

***CAUTION***

When changing between float and non-float configurations, weight and balance must be revised and autorotation RPM readjusted per R44 Maintenance Manual.

### WEIGHT AND BALANCE RECORD

Basic empty weight and CG in float and non-float configurations is included in the Weight and Balance Data provided with the helicopter. Modifications are to be recorded in Section 6 of the basic manual.

## SECTION 7: SYSTEMS DESCRIPTION

No change.

## SECTION 8: HANDLING, SERVICING AND MAINTENANCE

### GROUND HANDLING

With floats installed, special ground handling wheels are required. Refer to R44 Maintenance Manual for wheel installation and removal procedures.

### FLOAT TUBES

To promote long float tube life:

1. Do not inflate floats to higher pressure than required by limitations section. Do not arbitrarily inflate floats to relief valve pressure.
2. Reduce pressure in floats if solar heating is causing excessive pressure buildup.
3. Do not allow floats to sit uninflated. Maintain some pressure to keep shape when not in use.

***CAUTION***

When inflating chambers individually (without a manifold), increase pressure in each chamber in increments no greater than 0.5 psig.

## SECTION 10: SAFETY TIPS

Flight characteristics and handling qualities with inflated floats are more critical than with conventional landing gear. Helicopters with floats installed have an adverse roll characteristic. When sideslipping nose right or left, the helicopter will tend to roll in the opposite direction out of the turn. This could be extremely dangerous if a pilot failed to apply right pedal or put in the wrong pedal during a simulated power failure. Also, aerodynamic lift produced by floats makes both RPM and pitch control more difficult during autorotation entries. Helicopters with floats installed are also more gust sensitive and difficult to fly in turbulence.

For these reasons, it is strongly recommended that floats be removed and standard gear installed for primary flight instruction. With floats installed, pilots must keep the helicopter trimmed with zero sideslip and exercise extreme caution when performing simulated power failures.

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# FAA APPROVED
# R44 II PILOT'S OPERATING HANDBOOK

## HEATED PITOT SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when the heated pitot is installed.

Information contained herein supplements or supersedes the basic manual only in those areas listed in this supplement. For limitations, procedures, and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook.

APPROVED BY: _____

Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: October 3, 2002

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## SECTION 1: GENERAL

### INTRODUCTION

This supplement contains the changes and additional data applicable when the heated pitot is installed.

**SECTIONS 2 and 3** No change.

## SECTION 4: NORMAL PROCEDURES

### USE OF PITOT HEAT

When conditions conducive to pitot ice exist, switch pitot heat on until landing or until no longer in potential icing conditions.

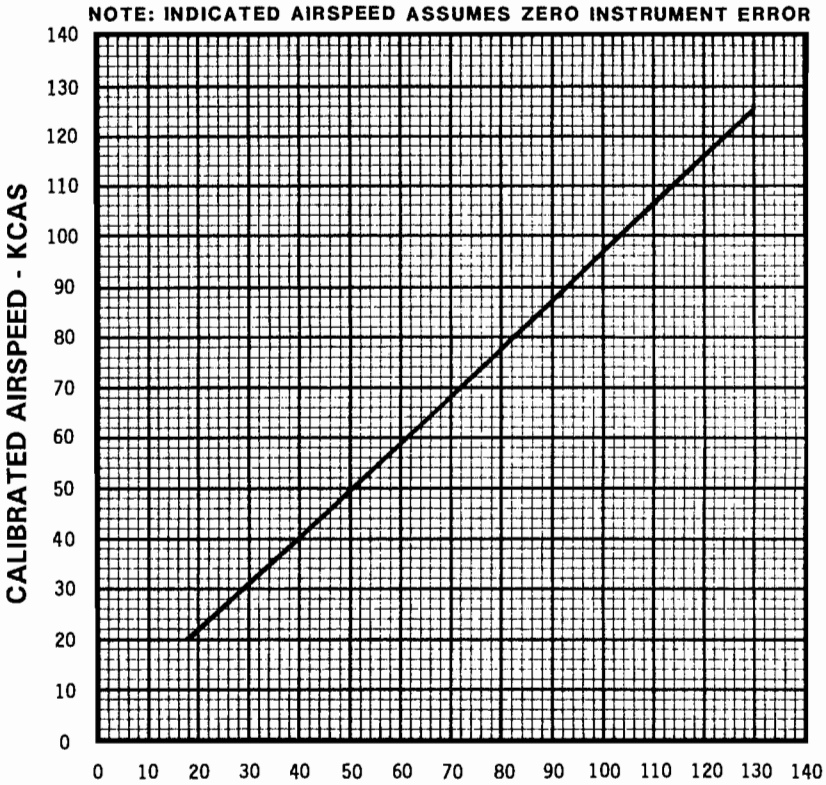
***NOTE***

The R44 is not certified for flight into known or suspected icing conditions.

***NOTE***

Continued use of pitot heat following an engine or alternator failure will significantly increase battery drain.

SECTION 5: PERFORMANCE




AIRSPEED CALIBRATION CURVE

HEATED PITOT INSTALLATION
VALID WITH PITOT HEAT ON OR OFF

## SECTION 6: WEIGHT AND BALANCE

No change.

## SECTION 7: SYSTEMS DESCRIPTION

### HEATED PITOT INSTALLATION

The heated pitot tube is installed in the mast fairing, replacing the standard pitot tube. Pitot heat is controlled by a toggle switch located to the right of the cyclic. Power is supplied to the heated pitot through its own 10-amp circuit breaker.

## SECTION 8: HANDLING AND MAINTENANCE

***CAUTION***

Pitot tube becomes extremely hot with pitot heat switched on. Touching pitot tube after it has been on for more than 30 seconds can result in severe burns.

## FAA APPROVED
## R44 II PILOT'S OPERATING HANDBOOK

## POLICE VERSION SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when police equipment is installed.

Information contained herein supplements or supersedes the basic manual only in those areas listed in this supplement. For limitations, procedures, and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook.

APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: October 3, 2002

### LOG OF REVISIONS

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| 9-7.3 | 3 Oct 02 | 9-7.7 | 3 Oct 02 |
| 9-7.4 | 3 Oct 02 | 9-7.8 | 3 Oct 02 |

REVISIONS
APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: April 16, 2004

## SECTION 1: GENERAL

### INTRODUCTION

This supplement contains the changes and additional data applicable to the Police Version.

The Police Version is equipped with a nose-mounted gyro-stabilized infrared camera with flat-screen LCD monitor. Available police options include a belly-mounted searchlight, FM transceivers, a video tape recorder, a PA/siren, Lojack equipment, and a microwave transmitter. A modified left-side cyclic control allows flight from the left seat with the LCD monitor installed. Extended landing gear provides additional ground clearance for the searchlight. The battery is relocated to the tailcone to balance the weight of the infrared camera.

## SECTION 2: LIMITATIONS

### FLIGHT AND MANEUVER LIMITATIONS

Pilot in command must occupy right seat.

### PLACARDS

Located on cover replacing right rear seat:

| DO NOT OCCUPY |
|---|

Located in right rear baggage compartment:

| NO STOWAGE |
|---|

## SECTION 3: EMERGENCY PROCEDURES

### POWER FAILURE ABOVE 500 FEET AGL

If time permits, retract omni antenna.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

Add to item 4, Aft Cowl Door - Right Side:
Battery Relay . . . . . Secure

Add to item 8, Tailcone:
Battery . . . . . Secure

Delete from item 9, Cowl Door - Left Side:
Battery and Relay . . . . . Secure

Add to item 11, Fuselage Left Side:
Siren . . . . . Secure

Add to item 12, Nose Section:
Camera and Fairing . . . . . Secure

Add to item 13, Fuselage Right Side:
Searchlight . . . . . Secure
Omni Antenna . . . . . Secure

***NOTE***

Stow searchlight horizontally when not in use to minimize chance of damage during a hard landing.

### APPROACH AND LANDING

Retract omni antenna.

## SECTION 5: PERFORMANCE No change.

## SECTION 6: WEIGHT AND BALANCE

***CAUTION***

Removal of nose-mounted camera causes a large shift in CG of empty helicopter. Calculate weight and balance prior to flight with camera removed to assure aft CG limit is not exceeded.

## SECTION 7: SYSTEMS DESCRIPTION

The following optional equipment may be installed:

### AIRFRAME

The R44 is a three-place helicopter when police equipment is installed.

Forward cabin doors with bubble windows to enhance downward visibility replace the standard doors.

### FLIGHT CONTROLS

The cyclic control has been modified to prevent interference with the LCD monitor. The left-side removable grip has been replaced with a grip on the center post.

### ELECTRICAL SYSTEM

An increased-capacity alternator replaces the standard alternator to accommodate police equipment power requirements. The battery has been relocated to a battery box beneath the tailcone to balance the weight of the nose-mounted camera.

An additional circuit breaker panel on the ledge just forward of the pilot's seat contains all circuit breakers for police equipment. The outboard section of the aft row of circuit breakers is a 14-volt bus which is powered by a 28- to 14-volt converter. The police equipment master switch on the left side of the panel controls power to all police equipment.

Wiring for police equipment is in a separate harness on the right-hand keel panel outside of the control tunnel.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### INTERCOM SYSTEM

The intercom system is controlled via the audio control panel in the avionics stack. The intercom and transmit switches for the left front seat have been relocated to the floor near the observer's right heel.

### SEATS, BELTS, AND BAGGAGE

The right rear seat has been replaced with a cover and cannot be occupied. Baggage is not permitted in the right rear baggage compartment due to electronic equipment and wiring in that compartment.

### EXTENDED LANDING GEAR

Extended landing gear struts provide additional ground clearance for the searchlight.

### INFRARED CAMERA SYSTEM

The infrared camera system consists of a gyro-stabilized, gimbal-mounted infrared/video camera in the chin and a power junction box in the right rear baggage compartment. A fairing between the camera ball and chin minimizes the aerodynamic effects of the camera. The camera is operated by the observer in the left front seat via a handheld controller.

A flat screen LCD monitor is located in front of the left front seat to display camera images. The monitor is equipped with a visor to minimize glare from the sun during daylight operation and shield the pilot from the monitor at night. The monitor mount is hinged to retract forward and down, out of the observer's way, when not in use.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### VIDEO TAPE RECORDER

The video tape recorder (VTR) is mounted on the monitor support structure and is used to record camera images. A toggle switch determines video signal routing. In the REC position, camera images can be recorded by the VTR. In the PLAY position, images being played back on the VTR can be viewed on the monitor.

### SEARCHLIGHT INSTALLATION

The searchlight is installed on a motorized gimbal under the belly. The searchlight power junction box is located in the right rear baggage compartment. The searchlight is steerable in azimuth and elevation and is operated from the left front seat via a remote controller. An optional slaving system allows the searchlight to be slaved to follow the camera. The searchlight should be stowed horizontally when not in use to minimize chance of damage during a hard landing.

***CAUTION***

The searchlight is very bright and can disorient other pilots or ground personnel at long distances.

***CAUTION***

The searchlight beam is very hot. Exposure to the beam at close range for more than a few seconds can result in burns.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### PA/SIREN SYSTEM

A 100-watt speaker is located on the aft left landing gear strut. The PA system control panel is located on the instrument panel and allows the pilot or observer to select PA, radio, yelp, or siren for broadcast through the speaker.

### FM TRANSCEIVERS

Four brands of FM transceiver are available on the Police Version: NAT, BK Radio, Motorola, and Technisonic.

NAT and Motorola FM transceivers are mounted in the right rear baggage compartment. A control head located beneath the monitor is used to control tuning and individual radio functions.

BK Radio and Technisonic dual-band FM transceivers are mounted beneath the fold down monitor and incorporate controls on their faceplates.

The FM transceivers are selectable from the audio control panel in the avionics stack.

### INTERIOR LIGHT

An additional observer-side interior light is operated via a momentary foot switch on the left-hand forward floor. Power is supplied to the interior light via the "GAGES" breaker in the left hand circuit breaker panel and is not disconnected by the police equipment master switch.

### LOJACK

The Lojack installation consists of a receiver in the right rear baggage compartment, a display and control unit on the right side of the instrument console, and four belly-mounted stub antennas. Lojack is used to track stolen vehicles equipped with Lojack transmitters.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### MICROWAVE SYSTEM

The microwave transmitting system consists of the microwave transmitter in the right rear baggage compartment, a retractable omnidirectional microwave antenna on the right skid tube, and an optional belly-mounted downlook antenna. If both antennas are installed, a switch forward of the right rear baggage compartment selects which antenna is active. The transmitter is operated via a controller in the rear-center console. The skid-mounted antenna is stowed parallel to the skid tube and rotated down to the vertical position for transmitting. It is actuated by an electric motor with the control switch located on the rear-center console. The antenna is designed to break away without damaging the helicopter if inadvertently left extended during landing. However, damage to the antenna or actuation mechanism may occur.

***CAUTION***

Do not kick or step on antenna. Ensure antenna is retracted before landing.

## SECTION 8: HANDLING AND MAINTENANCE

### BATTERY

The battery is located in a box beneath the tailcone. For battery charging, access to battery relay terminal A1 (labeled + 24V) and a grounded tab (labeled –) is provided inside the aft cowl door.

# FAA APPROVED
# R44 II PILOT'S OPERATING HANDBOOK

## E.N.G. VERSION SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when Electronic News Gathering (ENG) equipment is installed.

Information contained herein supplements or supersedes the basic manual only in those areas listed in this supplement. For limitations, procedures, and performance information not contained in this supplement, consult the basic R44 Pilot's Operating Handbook.

APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: October 3, 2002

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| 9-8.4 | 31 Jan 03 | 9-8.10 | 31 Jan 03 |
| 9-8.5 | 31 Jan 03 | 9-8.11 | 31 Jan 03 |
| 9-8.6 | 3 Oct 02 | 9-8.12 | 31 Jan 03 |

REVISIONS
APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: January 31, 2003

## SECTION 1: GENERAL

### INTRODUCTION

This supplement contains the changes and additional data applicable when Electronic News Gathering (ENG) equipment is installed.

The ENG version is equipped with a nose-mounted, gyro-stabilized video camera and two rear seat equipment panels which house various audio and video controls. The battery is relocated to the tailcone to balance the weight of the nose camera and the right rear seat is not installed to allow equipment installation in that area. ENG equipment options are described in section 7.

## SECTION 2: LIMITATIONS

### WEIGHT LIMITS

| | |
|---|---|
| Maximum in left front seat | 250 lb (113 kg) |

### PLACARDS

Located under left front seat and in right rear equipment compartment:

NO STOWAGE

Located on laptop camera controller and on video titler keyboard:

STOW DURING TAXI,
TAKEOFF, AND LANDING

## SECTION 3: EMERGENCY PROCEDURES

### POWER FAILURE ABOVE 500 FEET AGL

If time permits, stow laptop controller and video titler keyboard, and retract omni antenna.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

Add to item 4, Aft Cowl Door - Right Side:
Battery Relay . . . . . Secure

Add to item 8, Tailcone:
Battery . . . . . Secure

Delete from item 9, Cowl Door - Left Side:
Battery and Relay . . . . . Secure

Add to item 12, Nose Section:
Camera and Fairing . . . . . Secure

Add to item 13, Fuselage Right Side:
Omni Antenna . . . . . Secure

### TAKEOFF PROCEDURE

Stow laptop camera controller and video titler keyboard during taxi and takeoff.

### APPROACH AND LANDING

Stow laptop controller and video titler keyboard, and retract omni antenna.

## SECTION 5: PERFORMANCE No change.

## SECTION 6: WEIGHT AND BALANCE

***CAUTION***

Removal of nose-mounted camera causes a large shift in CG of empty helicopter. Calculate weight and balance prior to flight with camera removed to assure aft CG limit is not exceeded.

## SECTION 7: SYSTEMS DESCRIPTION

### AIRFRAME

The R44 is a three-place helicopter when ENG equipment is installed.

### ELECTRICAL SYSTEM

The battery has been relocated to a battery box beneath the tailcone to balance the weight of the nose-mounted camera.

An additional circuit breaker panel on the ledge just forward of the pilot's seat contains all circuit breakers for ENG equipment. The forward row of circuit breakers is a 28-volt bus and the aft row is a 14-volt bus. A 28- to 14-volt converter powers the 14-volt bus. The news equipment master switch on the left side of the panel controls power to all ENG equipment.

Various combinations of the following optional equipment may be installed.

SECTION 7: SYSTEMS DESCRIPTION (cont'd)

## NOSE-MOUNTED CAMERA SYSTEM

The nose-mounted camera system consists of a gyro-stabilized, gimbal-mounted video camera in the chin and a power junction box in the right rear equipment compartment. A fairing between the camera ball and chin minimizes the aerodynamic effects of the camera. The camera is operated from the left rear seat via a laptop controller.

When not in use, the laptop controller may be stowed and secured with the supplied bungee cord in the stowage tray which replaces the right rear seat.

***CAUTION***

The laptop controller is heavy and can cause injury if not secured during a hard landing. Always secure controller during taxi, takeoff, and landing operations.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### AUDIO AND INTERCOM SYSTEM

The audio system consists of four audio control panels and an audio junction box. The audio junction box is located beneath the left front seat. Power is supplied via a 5-amp circuit breaker in the left hand circuit breaker panel. Power to the audio system is not disconnected by the news equipment master switch.

The pilot's audio panel is located in the console. Push buttons are used to select a primary (transmit and monitor) audio component. Green LEDs indicate which audio component is currently selected as primary. Additional components may be monitored by selecting their toggle switches up. Sliders control volume level for each component being monitored.

Intercom control is at the far right of the audio panel. Toggle switch down isolates the pilot from the intercom system, toggle switch up selects normal keyed intercom mode, and button depressed is hot-mic mode.

The first detent of the pilot's trigger switch is the intercom key. The second detent transmits on Com 1. The thumb button transmits on the panel-selected audio component.

A toggle switch to the right of the OAT gage may be used to bypass the audio system and connect the pilot directly to Com 1. This mode is automatically engaged in the event of an audio system power failure. (The transmit indicator on Com 1's display can be used to verify transmission.)

The left front seat audio panel operates in the same manner as the pilot's audio panel but is not connected to the bypass toggle switch. The first detent of the co-pilot's trigger switch is the intercom key, and the second detent transmits on the panel-selected audio component. A handheld transmit switch has been added for use when the left cyclic grip is removed.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### AUDIO AND INTERCOM SYSTEM (cont'd)

The rear seat audio panel is connected to the rear seat headset jack. There is no voice-activated intercom mode for the rear seat. The rear seat intercom switch has been relocated to the outboard side of the seat box. In addition, the laptop camera controller contains intercom and transmit switches for the camera operator.

The microwave audio panel controls which signals are sent to the microwave transmitter. Selecting the toggle switch up for a component sends its signal to the transmitter. Push buttons are not functional on this panel.

### FORWARD MONITOR INSTALLATION

The forward monitor installation consists of two small color LCD monitors mounted side by side on top of the instrument panel. The right monitor displays nose camera, micro-camera, or video tape recorder images as selected by the video switcher. The left monitor displays TV broadcasts as selected by the TV tuner.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### AFT MONITOR INSTALLATION

The aft monitor installation consists of two color LCD monitors mounted to the cross tube between the front seatbacks. Position and angle of the monitors is adjustable via friction swivel mounts.

The small, right-hand monitor displays TV broadcasts as selected by the TV tuner. The large, left-hand monitor may be switched between three input signals. Input A displays nose camera, micro camera, or video tape recorder images as selected by the video switcher. Input B bypasses the video switcher and displays annotated nose-camera images directly. The YPrPb input bypasses the video switcher and displays nose-camera images in their component form.

### VIDEO SWITCHER

The video switcher is located in the center rear equipment panel and is used to select the video signal source (nose camera, video recorder playback, microwave receiver, or micro cameras). The signal is then routed to the monitors, microwave transmitter, and video tape recorder.

### TV TUNER

The TV tuner is mounted in the right rear equipment panel and is used to select television broadcasts to be displayed on the monitors.

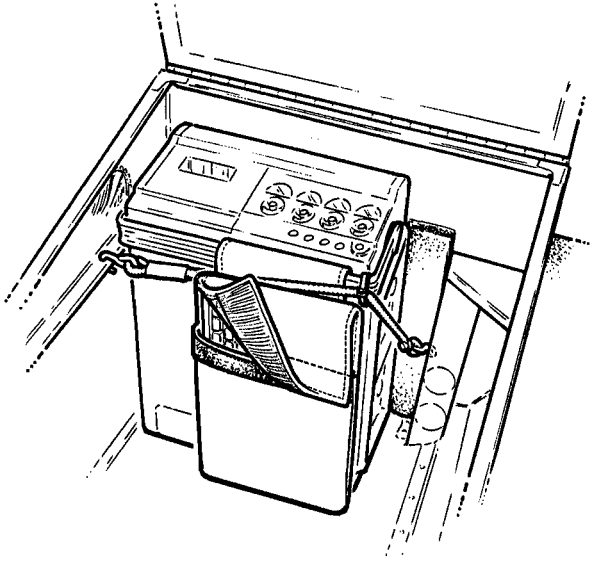
### MICRO CAMERA SYSTEM

The micro camera system consists of up to three small cameras which may be mounted at the tip of the horizontal stabilizer, on the windshield bow, and on the aft cabin wall; and their control units which are in the right rear equipment panel. The horizontal stabilizer camera is enclosed in a weather-proof case and may be accessed by unscrewing the front half of the case.

SECTION 7: SYSTEMS DESCRIPTION (cont'd)

## VIDEO TAPE RECORDER

The video tape recorder is located in the right rear equipment compartment and is controlled either by a remote control mounted on the center rear equipment panel or by the controls on its face. It is secured using the elastic cord as shown below.



## VIDEO TITLER

The video titler consists of the processor located in the right rear equipment compartment and a laptop keyboard. The keyboard is used to add captions to the nose-mounted camera video signal. In addition, the processor is connected to the helicopter's GPS receiver, allowing GPS coordinates to be displayed. Selecting "AUX" on the video switcher adds the titler signal to the nose-mounted camera signal.

When not in use, stow keyboard in the pouch as shown above.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### MICROWAVE SYSTEM

Two microwave transmitting systems are available on the ENG version.

The omnidirectional microwave transmitting system consists of the microwave transmitter in the right rear equipment compartment and a retractable omni-directional microwave antenna on the right skid tube. The transmitter is operated via a controller in the center rear equipment panel. The antenna is stowed parallel to the skid tube and rotated down to the vertical position for transmitting. It is actuated by an electric motor with the control switch located on the center rear panel. The antenna is designed to break away without damaging the helicopter if inadvertently left extended during landing. However, damage to the antenna or actuation mechanism may occur.

***CAUTION***

Do not kick or step on antenna. Ensure antenna is retracted before landing.

The directional microwave transmitting system uses the same transmitter and transmitter controller as the omni-directional system. The directional antenna is contained in a pod under the belly. The directional antenna pod contains a GPS tracking system which keeps the antenna aimed at a ground-based receive site. The antenna controller is located in the center rear equipment panel.

Either or both types of transmitting system may be installed. If both types are installed, a switch on the center rear equipment panel controls which antenna is active.

The transmitting system may be combined with an optional microwave receiver which is located in the right rear equipment panel. Controls are located on the receiver face.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### FM TRANSCEIVERS

FM transceiver #1 is mounted forward and below the left circuit breaker panel, and FM transceiver #2 is mounted in the center rear equipment panel. Either transceiver is selectable from any of the three main audio control panels.

### AM/FM RECEIVERS

AM/FM receiver #1 is mounted adjacent to FM transceiver #1, and AM/FM receiver #2 is mounted in the right rear equipment panel. Either receiver is selectable from any of the three main audio control panels.

### SCANNER

A multi-band scanner may be installed in place of AM/FM receiver #2 and is selectable from any of the three main audio control panels.

### INTERIOR LIGHT

An additional interior light installed to the right of the rear headset hangers illuminates the rear equipment panels and the camera operator's laptop controller. Power is supplied to the interior light via the "GAGES" circuit breaker in the left hand circuit breaker panel and is not disconnected by the news equipment master switch. The light is controlled by a switch on its face plate.

## SECTION 7: SYSTEMS DESCRIPTION (cont'd)

### TALENT LIGHT

The forward talent light is mounted on the left side of the instrument console and is used to illuminate the reporter during broadcasts in low-light conditions. Beam elevation is adjustable via a friction mount. The aft talent light is mounted at the top of the right door post and is used to illuminate the camera operator. Both lights are controlled by toggle switches on the center rear equipment panel.

***CAUTION***

Talent lights may cause glare for pilot at night. Switch lights off if glare is objectionable.

### SEATS, BELTS, AND BAGGAGE

Baggage is not permitted under the left front seat or in the right rear equipment compartment due to electronic equipment and wiring in these areas.

## SECTION 8: HANDLING AND MAINTENANCE

### BATTERY

The battery is located in a box beneath the tailcone. For battery charging, access to battery relay terminal A1 (labeled + 24V) and a grounded tab (labeled –) is provided inside the aft cowl door.

# FAA APPROVED
# R44 II PILOT'S OPERATING HANDBOOK

## GARMIN GPSMAP 225 SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when the Garmin GPSMAP 225 is installed.

Information contained herein supplements or supersedes the basic manual only in those areas listed in this supplement. For limitations, procedures, and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook.

APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: October 3, 2002

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## SECTION 1: GENERAL

Refer to Owner's Manual for use of the Garmin GPSMAP 225.

**SECTIONS 2 and 3** No change.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

***CAUTION***

Dimmer may not dim display sufficiently for night flight. To further reduce brightness, increase contrast setting using Auxiliary menu and System Setup submenu. (Refer to Owner's Manual.)

**SECTIONS 5 thru 8** No change.

## FAA APPROVED
## R44 II PILOT'S OPERATING HANDBOOK

## POP-OUT FLOATS SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when pop-out floats are installed.

Information contained herein supplements or supersedes the basic manual only in those areas listed in this supplement. For limitations, procedures, and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook.

APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: October 3, 2002

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| 9-10.5 | 3 Oct 02 | 9-10.10 | 3 Oct 02 |

REVISIONS
APPROVED BY: _____
Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: November 5, 2004

## SECTION 1: GENERAL

### INTRODUCTION

This supplement contains the changes and additional data applicable when pop-out floats are installed.

Pop-out floats are intended for safety during over water flights. In-flight inflations or intentional water landings for other than training purposes are not recommended.

Note: The pop-out floats are approved for amphibious operation but are not certified for ditching. Some countries may prohibit certain over-water operations.

## SECTION 2: LIMITATIONS

### AIRSPEED LIMITATIONS

Do not inflate floats above 80 KIAS.

Do not exceed 80 KIAS with floats inflated.

### FLIGHT AND MANEUVER LIMITATIONS

Inflation above 4000 ft AGL is prohibited.

Water landings for any reason other than an actual emergency are prohibited at weights above 2400 lb.

### PLACARDS

Located in clear view of the pilot:

| $V_{ne}$ WITH FLOATS INFLATED: 80 KIAS |
|---|

## SECTION 3: EMERGENCY PROCEDURES

### POWER FAILURE ABOVE 500 FEET AGL

Autorotation to Land: Same as in basic manual.

Autorotation to Water:

1. Lower collective immediately to maintain RPM.
2. Reduce airspeed to below 80 KIAS.
3. If altitude permits, maneuver into wind.
4. Inflate floats.

***CAUTION***

Do not inflate floats above 80 KIAS. Do not exceed 80 KIAS with floats inflated.

5. At about 40 feet AGL, begin cyclic flare.
6. At about 8 feet AGL, apply forward cyclic and raise collective just before touchdown. Touch down in slight nose high attitude with nose straight ahead.
7. Maintain cyclic in touchdown position and do not lower collective full down until forward motion has stopped.

***CAUTION***

Lowering collective or applying forward cyclic while helicopter is moving forward on water can cause floats to submerge and helicopter to nose over.

## SECTION 3: EMERGENCY PROCEDURES (cont'd)

### POWER FAILURE BETWEEN 8 FEET AND 500 FEET AGL

Autorotation to Land: Same as in basic manual.

Autorotation to Water:

1. Lower collective immediately to maintain rotor RPM.
2. Reduce airspeed to below 80 KIAS.
3. If altitude permits, maneuver into wind.
4. Inflate floats.

***CAUTION***

Do not inflate floats above 80 KIAS. Do not exceed 80 KIAS with floats inflated.

***NOTE***

Float inflation may take up to three seconds. Squeeze lever early enough to allow full inflation before water contact.

5. Maintain airspeed until water is approached, then begin cyclic flare.
6. At about 8 feet AGL, apply forward cyclic and raise collective just before touchdown. Touch down in slight nose high attitude with nose straight ahead.
7. Maintain cyclic in touchdown position and do not lower collective full down until forward motion has stopped.

***CAUTION***

Lowering collective or applying forward cyclic while helicopter is moving forward on water can cause floats to submerge and helicopter to nose over.

## SECTION 3: EMERGENCY PROCEDURES (cont'd)

### POWER FAILURE BELOW 8 FEET AGL

Over land: Same as in basic manual.

Over water:

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

### MAXIMUM GLIDE DISTANCE CONFIGURATION

Same as in basic manual, except airspeed 80 KIAS with floats inflated.

### DITCHING

Not applicable with floats.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

15. Pop-Out Floats

Float and Float Cover Condition . . . . . Check
Hose and Fitting Condition . . . . . Check
Pressure Cylinder . . . . . Check Pressure
Safety Pin at Pressure Cylinder. . . . Verify Removed
Inflation Lever Safety . . . . . "Ready" or "Locked" as required

***CAUTION***

Avoid night flight over water beyond autorotation distance to land. Height above water may be difficult to judge during a water landing.

## SECTION 4: NORMAL PROCEDURES (cont'd)

### FLOAT INFLATION

The red inflation lever located under the pilot's collective is equipped with a safety to prevent inadvertent float inflation. Prior to overwater flight, push spring-loaded knob to left with thumb while rotating U-shaped catch from "LOCKED" to "READY" position with forefinger. With safety in "READY" position, floats may be inflated by squeezing inflation lever.

***NOTE***

When OAT is below -10°C, there may be insufficient charge for full inflation.

***CAUTION***

The pressure cylinder is also equipped with a safety pin at the valve. This safety pin is for use during maintenance and cylinder transport only and must be removed at all other times.

***CAUTION***

Helicopters equipped with inflated floats have an adverse roll characteristic. When sideslipping nose left or right, helicopter will tend to roll in opposite direction and could cause loss of control. To avoid adverse roll, keep helicopter trimmed with zero sideslip. Exercise extreme caution when performing simulated power failures.

## SECTION 4: NORMAL PROCEDURES (cont'd)

### OPERATION ON WATER

***CAUTION***

Except for actual emergencies, maximum weight for water operation is 2400 lb.

Since the helicopter sits very low on water, it is likely that water will leak into the cabin. Intentional water landings should be limited to training. For training, seal the removable belly panels and landing gear cross tube cover using aluminum foil tape or duct tape. Avoid salt water if possible.

Maximum recommended water taxi speed is 5 knots. Some application of collective is required.

***CAUTION***

To avoid contacting rotor teeter stops, do not apply full cyclic control during water taxi.

***CAUTION***

If starting or stopping rotor on water, ensure area is clear as helicopter can rotate one or more complete turns while tail rotor RPM is low.

***NOTE***

Safe operation on water has been demonstrated in waves up to 12 inches (trough to crest).

## SECTION 4: NORMAL PROCEDURES (cont'd)

### PRACTICE AUTOROTATION - WITH GROUND CONTACT

Same as in basic manual. Autorotations should only be performed to a smooth, hard surface to avoid damage to floats. Touch-down autorotations with floats inflated are not recommended due to the possibility of damage to floats.

### PRACTICE AUTOROTATION - WITH WATER CONTACT

Autorotation to water with floats inflated is same as practice autorotation with ground contact in basic manual except touch down in slight nose high attitude with nose straight ahead. Maintain cyclic in touchdown position and do not lower collective full down until forward motion has stopped.

***CAUTION***

Lowering collective or applying forward cyclic while helicopter is moving forward on water can cause floats to submerge and helicopter to nose over.

### SHUTDOWN PROCEDURE

Add:

Inflation Lever Safety . . . . . "Locked"

## SECTION 5: PERFORMANCE

No change.

## SECTION 6: WEIGHT AND BALANCE

### WEIGHT AND BALANCE RECORD

Basic empty weight and CG with pop-out float landing gear and pressure cylinder installed are included in the Weight and Balance Data provided with the helicopter. If pressure cylinder is removed, update Weight and Balance Record. The longitudinal arm of the cylinder is 41.2 inches from datum and the lateral arm is -8.5 inches from datum. Updates are to be recorded in Section 6 of the basic manual.

## SECTION 7: SYSTEMS DESCRIPTION

The pop-out float system consists of inflatable floats stowed in protective covers along the skid tubes, a pressure cylinder located in the compartment under the left front seat, flexible hoses from the cylinder to the floats, an inflation lever located on the pilot's collective, and an additional stabilizer installed at the base of the lower vertical stabilizer.

The filament-wound composite pressure cylinder is charged with helium. Proper pressure is indicated on a placard on the cylinder and can be verified by a gage on the cylinder valve.

A safety on the inflation lever prevents inadvertent actuation. With the safety in the "READY" position, floats are inflated by squeezing firmly on the lever. (Approximately 20 lb force is required.) Float inflation time is approximately 2-3 seconds.

## SECTION 8: HANDLING, SERVICING AND MAINTENANCE

### GROUND HANDLING

With floats installed, special ground handling wheels are required. Refer to R44 Maintenance Manual for wheel installation and removal procedures.

A safety pin is provided for installation at the pressure cylinder valve. This pin should be installed during maintenance and cylinder transport to prevent inadvertent pressure release.

### FLOAT TUBES AND COVERS

Immediately replace any damaged float tube cover to minimize chance of float damage. Inspect float tube condition after each inflation. Refer to R44 Maintenance Manual for periodic inspection, float repacking, and cylinder recharge instructions.

# FAA APPROVED
# R44 II PILOT'S OPERATING HANDBOOK

## AIR CONDITIONING SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when cabin air conditioning is installed.

Information contained herein supplements or supersedes the basic manual only in those areas listed in this supplement. For limitations, procedures, and performance information not contained in this supplement, consult the basic Pilot's Operating Handbook.

APPROVED BY: Frank J Hoerman
acting Manager, Flight Test Branch, ANM-160L
Federal Aviation Administration, LAACO
Transport Airplane Directorate

DATE: MARCH 9, 2004

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## SECTION 1: GENERAL

### INTRODUCTION

This supplement contains the changes and additional data applicable when cabin air conditioning is installed.

## SECTION 2: LIMITATIONS No change.

## SECTION 3: EMERGENCY PROCEDURES No change.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

Add to item 9, Cowl door - Left Side:
Compressor belt tension . . . . . Check

### AIR CONDITIONING OPERATION

Air conditioning is controlled by the toggle switch at the forward end of the overhead duct. The switch allows selection of off, low, and high fan settings. The compressor is automatically engaged by switching the fan on. Each of the six outlets may be directed as desired.

***NOTE***

Evaporator condensate drains from a tube through the aircraft belly. Water drainage during ground operations is normal.

## SECTION 5: PERFORMANCE No change.

SECTION 6: WEIGHT AND BALANCE No change.

## SECTION 7: SYSTEMS DESCRIPTION

The cabin air conditioning system consists of a compressor accessible through the left engine cowl door, a condenser mounted on the left side of the engine cooling fan scroll, an evaporator and fan assembly mounted to the aft cabin wall, an overhead outlet duct, and interconnecting lines and hoses. The system uses R-134a refrigerant.

The compressor is belt-driven from an engine accessory drive and equipped with an electromagnetic clutch. When the system is off, the compressor clutch is disengaged, allowing the compressor pulley to freewheel.

The evaporator fan draws warm cabin air through the evaporator inlet grill and evaporator where it is cooled. Cooled air is drawn through the fan and blown into the overhead duct.

The system is controlled by a toggle switch on the overhead duct which allows selection of off, low, and high fan settings. The compressor is automatically engaged by switching the fan on. A temperature switch disengages the compressor when evaporator temperature drops below freezing. Safety switches disengage the compressor if refrigerant leakage occurs or if refrigerant pressure is excessive. A full throttle switch disengages the compressor when the engine is near full throttle to ensure that aircraft performance is not affected. The compressor clutch and fan circuits are protected by the A/C circuit breaker.

## SECTION 8: HANDLING AND MAINTENANCE

Standard automotive-style charge ports are located inside the left engine cowl door. Normal charge is 1.00 to 1.25 lb R-134a refrigerant. Refer to R44 Maintenance Manual for complete system service procedures.

***CAUTION***

System may be serviced only by qualified personnel following R44 Maintenance Manual procedures.

# SECTION 10

# SAFETY TIPS AND NOTICES

## CONTENTS

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# SECTION 10

# SAFETY TIPS

## GENERAL

This section provides miscellaneous suggestions to help the pilot operate the helicopter more safely.

## SAFETY TIPS

1. Never push the cyclic forward to descend or to terminate a pull-up (as you would in an airplane). This may produce a low-G (near weightless) condition which can result in a main rotor blade striking the cabin. Always use the collective to initiate a descent.
2. Never intentionally allow the fuel quantity to become so low in flight that the low fuel warning light comes on.
3. Never leave the helicopter unprotected where curious onlookers may inadvertently damage critical parts, such as the tail rotor blades.
4. Turn the strobe light on before engaging the drive system and leave it on until the rotors stop turning. The strobe light is located near the tail rotor and provides a warning to ground personnel. Leaving it on in flight is also advisable since the helicopter may be difficult for other aircraft to see.
5. Never carry an external load except when using an approved hook, nor attach anything to the outside of the helicopter. Also be sure no loose articles are in the cabin, particularly when flying with any of the doors removed. Even a small object or piece of cloth or paper could damage the tail rotor if it came loose in flight.
6. Avoid abrupt control inputs or accelerated maneuvers, particularly at high speed. These produce high fatigue loads in the dynamic components and could cause a premature and catastrophic failure of a critical component.

SAFETY TIPS (cont'd)

7. A change in the sound or vibration of the helicopter may indicate an impending failure of a critical component. Make a safe landing and thoroughly inspect aircraft before flight is resumed. A good practice would be to hover the helicopter close to the ground for a prolonged period and reinspect before resuming free flight.

8. Be sure ground personnel or onlookers don't walk into the tail rotor. The main blades can also be dangerous, particularly on a sloped surface where the bystander may be on higher ground than the helicopter.

9. Never allow rotor RPM to become dangerously low. Most hard landings will be survivable as long as the rotor keeps turning and is not allowed to stall.

10. Never make takeoffs or landings downwind, especially at high altitude. The resulting loss of translational lift can cause the aircraft to settle into ground obstacles.

11. A vertical descent or steep approach downwind can result in "settling with power." This happens when the rotor is settling in its own downwash and additional power won't stop the descent. Should this occur, reduce collective and lower the nose to increase airspeed. This can be very dangerous near the ground as the recovery results in a substantial loss of altitude.

12. The helicopter is stable on its landing gear as long as ground contact is made vertically or with the aircraft moving forward. Should ground contact be made with the helicopter moving rearward, tail damage and possibly a rollover could occur. Low time pilots and students should practice landings and hovering with the aircraft slowly moving forward.

SAFETY TIPS (cont'd)

13. When operating at higher altitudes (above 3000 or 4000 feet), the throttle is frequently wide open and the RPM must be controlled with the collective. The throttle/collective correlation is not effective under these conditions and the governor response rate is fairly slow, so extreme care must be taken to roll throttle off as the collective is lowered to prevent an overspeed.

14. Do not use collective pitch to slow the rotor during shut-down. Collective pitch produces lift on the blades which can disengage the teeter hinge friction and allow the blades to strike the tailcone. Also, do not slow or stop the rotors by grabbing the tail rotor. Stopping or turning the tail rotor by hand can damage the tail rotor drive.

15. Never land in tall dry grass. The exhaust is low to the ground and very hot; a grass fire may be ignited.

16. Always check an area for wires or other obstructions before practicing autorotations.

17. With hydraulic controls, use special caution to avoid abrupt control inputs or accelerated maneuvers. Since no feedback is felt in the flight controls, the pilot may be unaware of the high fatigue loads generated during such maneuvers. Frequent or prolonged high-load maneuvers could cause premature, catastrophic failure of a critical component.

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# SAFETY NOTICES

The following safety notices have been issued by Robinson Helicopter Company as a result of various accidents and incidents. Studying the mistakes made by other pilots will help you avoid making the same errors.

| SAFETY NOTICE | TITLE |
|---|---|
| SN-1 | Inadvertent Actuation of Mixture Control in Flight |
| SN-9 | Many Accidents Involve Dynamic Rollover |
| SN-10 | Fatal Accidents Caused by Low RPM Rotor Stall |
| SN-11 | Low-G Pushovers - Extremely Dangerous |
| SN-13 | Do Not Attach Items to the Skids |
| SN-15 | Fuel Exhaustion Can Be Fatal |
| SN-16 | Power Lines Are Deadly |
| SN-17 | Never Exit Helicopter with Engine Running<br>Hold Controls When Boarding Passengers<br>Never Land in Tall Dry Grass |
| SN-18 | Loss of Visibility Can Be Fatal<br>Overconfidence Prevails in Accidents |
| SN-19 | Flying Low Over Water is Very Hazardous |
| SN-20 | Beware of Demonstration or Initial Training Flights |
| SN-22 | Always Reduce Rate-of-Descent Before Reducing Airspeed |
| SN-23 | Walking into Tail Rotor Can Be Fatal |
| SN-24 | Low RPM Rotor Stall Can Be Fatal |
| SN-25 | Carburetor Ice |
| SN-26 | Night Flight Plus Bad Weather Can Be Deadly |
| SN-27 | Surprise Throttle Chops Can Be Deadly |
| SN-28 | Listen for Impending Bearing Failure<br>Clutch Light Warning |
| SN-29 | Airplane Pilots High Risk When Flying Helicopters |
| SN-30 | Loose Objects Can Be Fatal |
| SN-31 | Governor Can Mask Carb Ice |
| SN-32 | High Winds or Turbulence |
| SN-33 | Vee-Belts Turning Rotor During Engine Start-Up |
| SN-34 | Photo Flights - Very High Risk |
| SN-35 | Flying Near Broadcast Towers |
| SN-36 | Overspeeds During Liftoff |
| SN-37 | Exceeding Approved Limitations Can Be Fatal |
| SN-38 | Practice Autorotations Cause Many Training Accidents |
| SN-39 | Unusual Vibration Can Indicate a Main Rotor Blade Crack |
| SN-40 | Postcrash Fires |

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# Safety Notice SN-1

Issued: Jan 81 Rev: Feb 89; Jun 94

INADVERTENT ACTUATION OF MIXTURE CONTROL IN FLIGHT

Cases have been reported where a pilot inadvertently pulled the mixture control instead of the carb heat or other control, resulting in sudden and complete engine stoppage. The knobs are shaped differently and the mixture control has a guard which must be removed and a push-button lock which must be depressed before actuating. These differences should be stressed when checking out new pilots. Also, in the R22, it is a good practice to always reach around the left side of the cyclic control when actuating the lateral trim. This will lessen the chance of pulling the mixture control by mistake. Always use the small plastic guard which is placed on the mixture control prior to starting the engine and is not removed until the end of the flight when the idle cut-off is pulled. Replace the guard on the mixture control so it will be in place for the next flight.

If the mixture control is inadvertently pulled, lower the collective and enter autorotation. If there is sufficient altitude, push the mixture control in and restart the engine using the left hand. DO NOT disengage the clutch.

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Safety Notices SN-2 thru SN-8 have been superseded or deleted.

# Safety Notice SN-9

Issued: Jul 82 Rev: Jun 94

MANY ACCIDENTS INVOLVE DYNAMIC ROLLOVER

A dynamic rollover can occur whenever the landing gear contacts a fixed object, forcing the aircraft to pivot about the object instead of about its own center of gravity. The fixed object can be any obstacle or surface which prevents the skid from moving sideways. Once started, dynamic rollover cannot be stopped by application of opposite cyclic alone. For example, assume the right skid contacts an object and becomes the pivot point while the helicopter starts rolling to the right. Even with full left cyclic applied, the main rotor thrust vector will still pass on the left side of the pivot point and produce a rolling moment to the right instead of to the left. The thrust vector and its moment will follow the aircraft as it continues rolling to the right. Quickly applying down collective is the most effective way to stop a dynamic rollover.

To avoid a dynamic rollover:

1) Always practice hovering autorotations into the wind and never when the wind is gusty or over 10 knots.

2) Never hover close to fences, sprinklers, bushes, runway lights or other obstacles a skid could catch on.

3) Always use a two-step liftoff. Pull in just enough collective to be light on the skids and feel for equilibrium, then gently lift the helicopter into the air.

4) Do not practice hovering maneuvers close to the ground. Keep the skids at least five feet above the ground when practicing sideward or rearward flight.

# Safety Notice SN-10

Issued: Oct 82 Rev: Feb 89; Jun 94

FATAL ACCIDENTS CAUSED BY LOW RPM ROTOR STALL

A primary cause of fatal accidents in light helicopters is failure to maintain rotor RPM. To avoid this, every pilot must have his reflexes conditioned so he will instantly add throttle and lower collective to maintain RPM in any emergency.

The R22 and R44 have demonstrated excellent crashworthiness as long as the pilot flies the aircraft all the way to the ground and executes a flare at the bottom to reduce his airspeed and rate of descent. Even when going down into rough terrain, trees, wires or water, he must force himself to lower the collective to maintain RPM until just before impact. The ship may roll over and be severely damaged, but the occupants have an excellent chance of walking away from it without injury.

Power available from the engine is directly proportional to RPM. If the RPM drops 10%, there is 10% less power. With less power, the helicopter will start to settle, and if the collective is raised to stop it from settling, the RPM will be pulled down even lower, causing the ship to settle even faster. If the pilot not only fails to lower collective, but instead pulls up on the collective to keep the ship from going down, the rotor will stall almost immediately. When it stalls, the blades will either "blow back" and cut off the tailcone or it will just stop flying, allowing the helicopter to fall at an extreme rate. In either case, the resulting crash is likely to be fatal.

No matter what causes the low rotor RPM, the pilot must first roll on throttle and lower the collective simultaneously to recover RPM **before** investigating the problem. It must be a conditioned reflex. In forward flight, applying aft cyclic to bleed off airspeed will also help recover lost RPM.

# Safety Notice SN-11

Issued: Oct 82 Rev: Nov 00

LOW-G PUSHOVERS - EXTREMELY DANGEROUS

Pushing the cyclic forward following a pull-up or rapid climb, or even from level flight, produces a low-G (weightless) flight condition. If the helicopter is still pitching forward when the pilot applies aft cyclic to reload the rotor, the rotor disc may tilt aft relative to the fuselage before it is reloaded. The main rotor torque reaction will then combine with tail rotor thrust to produce a powerful right rolling moment on the fuselage. With no lift from the rotor, there is no lateral control to stop the rapid right roll and mast bumping can occur. Severe in-flight mast bumping usually results in main rotor shaft separation and/or rotor blade contact with the fuselage.

The rotor must be reloaded before lateral cyclic can stop the right roll. To reload the rotor, apply an immediate gentle aft cyclic, but avoid any large aft cyclic inputs. (The low-G which occurs during a rapid autorotation entry is not a problem because lowering collective reduces both rotor lift and rotor torque at the same time.)

Never attempt to demonstrate or experiment with low-G maneuvers, regardless of your skill or experience level. Even highly experienced test pilots have been killed investigating the low-G flight condition. Always use great care to avoid any maneuver which could result in a low-G condition. Low-G mast bumping accidents are almost always fatal.

NEVER PERFORM A LOW-G PUSHOVER!!

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Safety Notice SN-12 has been superseded by SN-24

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# Safety Notice SN-13

Issued: Jan 83 Rev: Jun 94

DO NOT ATTACH ITEMS TO THE SKIDS

The landing gear strut elbows have cracked on several helicopters when the pilot attempted to carry an external load strapped to the landing gear skids. The landing gear is optimized to take high "up" loads. Consequently, it has very low strength in the opposite or "down" direction. Also, even a small weight attached to the landing gear may change the natural frequency enough to cause high loads due to inflight vibration. Do not attempt to carry any external load or object attached to the landing gear.

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Safety Notice SN-14 has been superseded by SN-17, SN-27 and SN-28

# Safety Notice SN-15

Issued: Aug 83 Rev: Jun 94

FUEL EXHAUSTION CAN BE FATAL

Many pilots underestimate the seriousness of fuel exhaustion. Running out of fuel is the same as a sudden total engine or drive system failure. When that occurs, the pilot must immediately enter autorotation and prepare for a forced landing. Refer to Section 3 of the Pilot's Operating Handbook under Power Failure. If autorotation is not entered immediately, the RPM will rapidly decay, the rotor will stall, and the results will likely be fatal. Serious or fatal accidents have occurred as a result of fuel exhaustion.

To insure this does not happen to you, observe the following precautions:

1) Never rely solely on the fuel gage or the low fuel warning light. These electromechanical devices have questionable reliability in any airplane or helicopter. Always record the hourmeter reading each time the fuel tanks are filled.

2) During your preflight:

   a) Check the fuel level in the tanks visually.
   b) Be sure the fuel caps are tight.
   c) Drain a small quantity of fuel from each tank and the gascolator to check for water or other contamination.

3) Before takeoff:

   a) Insure that the fuel valve is full on.
   b) Be sure guard is placed on mixture control.
   c) Plan your next fuel stop so you will have at least 20 minutes of fuel remaining.

4) In flight:

   a) Continually check both hourmeter and fuel gages. If either indicates low fuel, LAND.
   b) Always land to refuel before the main tank fuel gage reads less than 1/4 full.
   c) NEVER allow the fuel quantity to become so low in flight that the low fuel warning light comes on.

# Safety Notice SN-16

Issued: Apr 84 Rev: Jun 94

POWER LINES ARE DEADLY

Flying into wires, cables, and other objects is by far the number one cause of fatal accidents in helicopters. Pilots must constantly be on the alert for this very real hazard.

* Watch for the towers; you will not see the wires in time.
* Fly directly over the towers when crossing power lines.
* Allow for the smaller, usually invisible, grounding wire(s) which are well above the larger more visible wires.
* Constantly scan the higher terrain on either side of your flight path for towers.
* Always maintain at least 500 feet AGL except during take-off and landing. By always flying above 500 feet AGL, you can virtually eliminate the primary cause of fatal accidents.

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# Safety Notice SN-17

Issued: Nov 84 Rev: Feb 89; Jun 94

NEVER EXIT HELICOPTER WITH ENGINE RUNNING

Several accidents have occurred when pilots momentarily left their helicopters unattended with the engine running and rotors turning. The collective can creep up, increasing both pitch and throttle, allowing the helicopter to lift off or roll out of control.

HOLD CONTROLS WHEN BOARDING PASSENGERS

It is important to firmly grip both cyclic and throttle while loading or unloading passengers with the engine running in case they inadvertently bump the controls or slide across the throttle, rolling it open.

NEVER LAND IN TALL DRY GRASS

The engine exhaust is very hot and can easily ignite tall grass or brush. One R22 was completely destroyed by fire after a normal landing in tall grass.

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# Safety Notice SN-18

Issued: Jan 85 Rev: Feb 89; Jun 94

LOSS OF VISIBILITY CAN BE FATAL

Flying a helicopter in obscured visibility due to fog, snow, low ceiling, or even a dark night can be fatal. Helicopters have less inherent stability and much faster roll and pitch rates than airplanes. Loss of the pilot's outside visual references, even for a moment, can result in disorientation, wrong control inputs, and an uncontrolled crash. This type of situation is likely to occur when a pilot attempts to fly through a partially obscured area and realizes too late that he is losing visibility. He loses control of the helicopter when he attempts a turn to regain visibility but is unable to complete the turn without visual references.

You must take corrective action before visibility is lost! Remember, unlike the airplane, the unique capability of the helicopter allows you to land and use alternate transportation during bad weather, provided you have the good judgement and necessary willpower to make the correct decision.

OVERCONFIDENCE PREVAILS IN ACCIDENTS

A personal trait most often found in pilots having serious accidents is overconfidence. High-time fixed-wing pilots transitioning into helicopters and private owners are particularly susceptible. Airplane pilots feel confident and relaxed in the air, but have not yet developed the control feel, coordination, and sensitivity demanded by a helicopter. Private owners are their own boss and can fly without discipline, enforced rules, or periodic flight checks and critique by a chief pilot. A private owner must depend on self-discipline, which is sometimes forgotten.

When flown properly and conservatively, helicopters are potentially the safest aircraft built. But helicopters are also probably the least forgiving. They must always be flown defensively. The pilot should allow himself a greater safety margin than he thinks will be necessary, just in case.

# Safety Notice SN-19

Issued: Jul 85 Rev: Jun 94

FLYING LOW OVER WATER IS VERY HAZARDOUS

Many helicopter accidents have occurred while maneuvering low over water. Many pilots do not realize their loss of depth perception when flying over water. Flying over calm glassy water is particularly dangerous, but even choppy water, with its constantly varying surface, interferes with normal depth perception and may cause a pilot to misjudge his height above the water.

MAINTAIN 500 FEET AGL WHENEVER POSSIBLE AND AVOID MANEUVERS OVER WATER BELOW 200 FEET AGL.

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# Safety Notice SN-20

Issued: Sep 85 Rev: Jun 94

BEWARE OF DEMONSTRATION OR INITIAL TRAINING FLIGHTS

A disproportionate number of fatal and non-fatal accidents occur during demonstration or initial training flights. The accidents occur because individuals other than the pilot are allowed to manipulate the controls without being properly prepared or indoctrinated.

If a student begins to lose control of the aircraft, an experienced flight instructor can easily regain control provided the student does not make any large or abrupt control movements. If, however, the student becomes momentarily confused and makes a sudden large control input in the wrong direction, even the most experienced instructor may not be able to recover control. Instructors are usually prepared to handle the situation where the student loses control and does nothing, but they are seldom prepared for the student who loses control and does the wrong thing.

Before allowing someone to touch the controls of the aircraft, they must be thoroughly indoctrinated concerning the extreme sensitivity of the controls in a light helicopter. They must be firmly instructed to never make a large or sudden movement with the controls. And, the pilot-in-command must be prepared to instantly grip the controls should the student start to make a wrong move.

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Safety Notice SN-21 has been deleted.

# Safety Notice SN-22

Issued: Jul 86 Rev: Jun 94

ALWAYS REDUCE RATE-OF-DESCENT BEFORE REDUCING AIRSPEED

Many helicopter accidents have been caused by the pilot reducing his airspeed to near zero during an approach before reducing his rate-of-descent. As the pilot then raises the collective and flares to stop his rate-of-descent, he flares into his own downwash, greatly increasing the power and collective pitch required. The aircraft begins to enter the vortex ring state (settling-with-power) and a hard landing occurs, often followed by a rollover. This can occur during a steep approach either power-on or power-off.

This can be avoided by always reducing your rate-of-descent before reducing your airspeed. A good rule to follow is never allow your airspeed to be less than 30 knots until your rate-of-descent is less than 300 feet per minute.

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# Safety Notice SN-23

Issued: Jul 86 Rev: Jun 94

WALKING INTO TAIL ROTOR CAN BE FATAL

Non-pilot passengers have been killed by inadvertently walking into a rotating tail rotor. Every possible precaution must be taken by the pilot to prevent this tragic type of accident. The following rules should always be observed:

1) Never allow anyone to approach the helicopter unless they are escorted or have been properly instructed. If necessary, shut down and stop rotors before boarding passengers.

2) Always have strobe light flashing when rotors are turning.

3) Instruct passengers to establish and maintain eye contact with pilot when approaching helicopter. (This will force them to approach only from the nose or side, never the tail).

4) Instruct passengers to leave the helicopter in full view of the pilot and walk only around the nose, never the tail.

5) Be especially careful when landing off airports as unseen children or adults might approach the helicopter from the rear.

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# Safety Notice SN-24

Issued: Sep 86 Rev: Jun 94

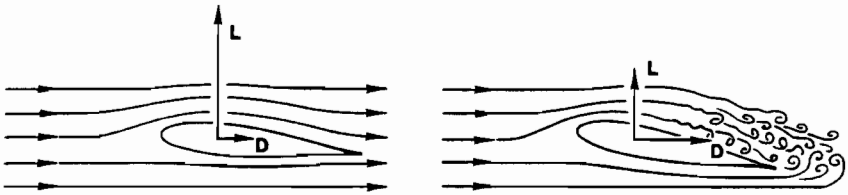
LOW RPM ROTOR STALL CAN BE FATAL

Rotor stall due to low RPM causes a very high percentage of helicopter accidents, both fatal and non-fatal. Frequently misunderstood, rotor stall is not to be confused with retreating tip stall which occurs only at high forward speeds when stall occurs over a small portion of the retreating blade tip. Retreating tip stall causes vibration and control problems, but the rotor is still very capable of providing sufficient lift to support the weight of the helicopter.

Rotor stall, on the other hand, can occur at any airspeed and when it does, the rotor stops producing the lift required to support the helicopter and the aircraft literally falls out of the sky. Fortunately, rotor stall accidents most often occur close to the ground during takeoff or landing and the helicopter falls only four or five feet. The helicopter is wrecked but the occupants survive. However, rotor stall also occurs at higher altitudes and when it happens at heights above 40 or 50 feet AGL it is most likely to be fatal.

Rotor stall is very similar to the stall of an airplane wing at low airspeeds. As the airspeed of an airplane gets lower, the nose-up angle, or angle-of-attack, of the wing must be higher for the wing to produce the lift required to support the weight of the airplane. At a critical angle (about 15 degrees), the airflow over the wing will separate and stall, causing a sudden loss of lift and a very large increase in drag. The airplane pilot recovers by lowering the nose of the airplane to reduce the wing angle-of-attack below stall and adds power to recover the lost airspeed.

The same thing happens during rotor stall with a helicopter except it occurs due to low rotor RPM instead of low airspeed. As the RPM of the rotor gets lower, the angle-of-attack of the rotor blades must be higher to generate the lift required to support the weight of the helicopter. Even if the collective is not raised by the pilot to provide the higher blade angle, the helicopter will start to descend until the




Wing or rotor blade unstalled and stalled.

Safety Notice SN-24 (continued)

upward movement of air to the rotor provides the necessary increase in blade angle-of-attack. As with the airplane wing, the blade airfoil will stall at a critical angle, resulting in a sudden loss of lift and a large increase in drag. The increased drag on the blades acts like a huge rotor brake causing the rotor RPM to rapidly decrease, further increasing the rotor stall. As the helicopter begins to fall, the upward rushing air continues to increase the angle-of-attack on the slowly rotating blades, making recovery virtually impossible, even with full down collective.

When the rotor stalls, it does not do so symmetrically because any forward airspeed of the helicopter will produce a higher airflow on the advancing blade than on the retreating blade. This causes the retreating blade to stall first, allowing it to dive as it goes aft while the advancing blade is still climbing as it goes forward. The resulting low aft blade and high forward blade become a rapid aft tilting of the rotor disc sometimes referred to as "rotor blow-back". Also, as the helicopter begins to fall, the upward flow of air under the tail surfaces tends to pitch the aircraft nose-down. These two effects, combined with aft cyclic by the pilot attempting to keep the nose from dropping, will frequently allow the rotor blades to blow back and chop off the tailboom as the stalled helicopter falls. Due to the magnitude of the forces involved and the flexibility of rotor blades, rotor teeter stops will not prevent the boom chop. The resulting boom chop, however, is academic, as the aircraft and its occupants are already doomed by the stalled rotor before the chop occurs.

# Safety Notice SN-25

Issued: Dec 86 Rev: Nov 99

CARBURETOR ICE

Carburetor ice can cause engine stoppage and is most likely to occur when there is high humidity or visible moisture and air temperature is below 70°F (21°C). When these conditions exist, the following precautions must be taken:

During Takeoff - Unlike airplanes, which take off at wide open throttle, helicopters take off using only power as required, making them vulnerable to carb ice, especially when engine and induction system are still cold. Use full carb heat (it is filtered) during engine warm-up to preheat induction system and then apply carb heat as required during hover and takeoff to keep CAT gage out of yellow arc.

During Climb or Cruise - Apply carb heat as required to keep CAT gage out of yellow arc.

During Descent or Autorotation -

R22 - Below 18 inches manifold pressure, ignore CAT gage and apply full carb heat.

R44 - Apply carb heat as required to keep CAT gage out of yellow arc and full carb heat when there is visible moisture.

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# Safety Notice SN-26

Issued: Jan 87 Rev: Jun 94

NIGHT FLIGHT PLUS BAD WEATHER CAN BE DEADLY

Many fatal accidents have occurred at night when the pilot attempted to fly in marginal weather after dark. The fatal accident rate during night flight is many times higher than during daylight hours.

When it is dark, the pilot cannot see wires or the bottom of clouds, nor low hanging scud or fog. Even when he does see it, he is unable to judge its altitude because there is no horizon for reference. He doesn't realize it is there until he has actually flown into it and suddenly loses his outside visual references and his ability to control the attitude of the helicopter. As helicopters are not inherently stable and have very high roll rates, the aircraft will quickly go out of control, resulting in a high velocity crash which is usually fatal.

Be sure you NEVER fly at night unless you have clear weather with unlimited or very high ceilings and plenty of celestial or ground lights for reference.

# Safety Notice SN-27

Issued: Dec 87 Rev: Jun 94

SURPRISE THROTTLE CHOPS CAN BE DEADLY

Many flight instructors do not know how to give a student a simulated power failure safely. They may have learned how to respond to a throttle chop themselves, but they haven't learned how to prepare a student for a simulated power failure or how to handle a situation where the student's reactions are unexpected. The student may freeze on the controls, push the wrong pedal, raise instead of lower the collective, or just do nothing. The instructor must be prepared to handle any unexpected student reaction.

Before giving a simulated power failure, carefully prepare your student and be sure you have flown together enough to establish that critical understanding and communication between instructor and student. Go through the exercise together a number of times until the student's reactions are both correct and predictable. Never truly surprise the student. Tell him you are going to give him a simulated power failure a few minutes before, and when you roll off the throttle, loudly announce "power failure". The manifold pressure should be less than 21 inches and the throttle should be rolled off smoothly, never "chopped". Follow through on all controls and tighten the muscles in your right leg to prevent the student from pushing the wrong pedal if he becomes confused. And always assume that you will be required to complete the autorotation entry yourself. Never wait to see what the student does. Plan to initiate the recovery within one second, regardless of the student's reaction.

There have been instances when the engine has quit during simulated engine failures. As a precaution, always perform the simulated engine failure within glide distance of a smooth open area where you are certain you could complete a safe touch-down autorotation should it become necessary. Also, never practice simulated power failures until the engine is thoroughly warmed up. Wait until you have been flying for at least 15 to 20 minutes.

# Safety Notice SN-28

Issued: Jul 88 Rev: Jun 94

## LISTEN FOR IMPENDING BEARING FAILURE

An impending ball or roller bearing failure is usually preceded by a noticeable increase in noise. The noise will almost always start at least several hours before the bearing actually fails and long before there is any increase in the bearing temperature. To detect a possible failure of a drive system bearing, the pilot should open his right door, uncover his right ear, and listen to the sound of the drive system both during start-up and during shutdown. After the pilot becomes familiar with the normal sound of the drive system, he should be able to detect the noise made by a failing bearing. The failing bearing will produce a loud whine, rumble, growl, or siren sound. Upon hearing an unusual noise, the pilot must immediately ground the aircraft and have the bearings thoroughly inspected by a qualified mechanic. Failure of a bearing in flight could result in a serious accident.

Do not rely on Telatemps. A failing bearing will not run hot enough to black out the Telatemps until it actually starts to disintegrate and is grinding steel on steel. This may occur only seconds before complete failure.

## CLUTCH LIGHT WARNING

It is normal for the clutch light to occasionally come on while in flight for a short time (period varies between aircraft, but is usually not more than 3 or 4 seconds) to re-tension the vee-belts as they become warm and stretch slightly. However, if the clutch light **flickers** or **stays on** for a longer time than usual, it can indicate a belt or bearing failure in the vee-belt drive. If that occurs, immediately pull the CLUTCH circuit breaker. Select the closest safe landing site and make a normal power-on landing. Be prepared to enter autorotation should failure of the drive system occur. The smell of burning rubber may also indicate an impending belt failure.

After landing, perform a normal shutdown. Check the vee-belt drive to insure that the belts are in their grooves and not broken or deteriorating. Check the upper and lower actuator bearings for seal damage. Also check the Telatemp indicator readings. If there is seal damage or the temperature reading is unusually high have the aircraft inspected by a mechanic before further flight.

# Safety Notice SN-29

Issued: Mar 93 Rev: Jun 94

AIRPLANE PILOTS HIGH RISK WHEN FLYING HELICOPTERS

There have been a number of fatal accidents involving experienced pilots who have many hours in airplanes but with only limited experience flying helicopters.

The ingrained reactions of an experienced airplane pilot can be deadly when flying a helicopter. The airplane pilot may fly the helicopter well when doing normal maneuvers under ordinary conditions when there is time to think about the proper control response. But when required to react suddenly under unexpected circumstances, he may revert to his airplane reactions and commit a fatal error. Under those conditions, his hands and feet move purely by reaction without conscious thought. Those reactions may well be based on his greater experience, ie., the reactions developed flying airplanes.

For example, in an airplane his reaction to a warning horn (stall) would be to immediately go forward with the stick and add power. In a helicopter, application of forward stick when the pilot hears a horn (low RPM) would drive the RPM even lower and could result in rotor stall, especially if he also "adds power" (up collective). In less than one second the pilot could stall his rotor, causing the helicopter to fall out of the sky.

Another example is the reaction necessary to make the aircraft go down. If the helicopter pilot must suddenly descend to avoid a bird or another aircraft, he rapidly lowers the collective with very little movement of the cyclic stick. In the same situation, the airplane pilot would push the stick forward to dive. A rapid forward movement of the helicopter cyclic stick under these conditions would result in a low "G" condition which could cause mast bumping, resulting in separation of the rotor shaft or one blade striking the fuselage. A similar situation exists when terminating a climb after a pull-up. The airplane pilot does it with forward stick. The helicopter pilot must use his collective or a very gradual, gentle application of forward cyclic.

To stay alive in the helicopter, the experienced airplane pilot must devote considerable time and effort to developing safe helicopter reactions. The helicopter reactions must be stronger and take precedence over the pilot's airplane reactions because everything happens faster in a helicopter. The pilot does not have time to realize he made the wrong move, think about it, and then correct it. It's too late; the rotor has already stalled or a blade has already struck the airframe and there is no chance of recovery. To develop safe helicopter reactions, the airplane pilot must practice each procedure over and over again with a competent instructor until his hands and feet will always make the right move without requiring conscious thought. AND, ABOVE ALL, HE MUST NEVER ABRUPTLY PUSH THE CYCLIC STICK FORWARD.

Also see Safety Notices SN-11 and SN-24.

# Safety Notice SN-30

Issued: Jun 94

LOOSE OBJECTS CAN BE FATAL

A recent fatal accident occurred when the pilot allowed her kneeboard to go out the left door and strike the tail rotor. Any loose object striking the tail rotor can cause failure of a tail rotor blade. Loss or damage of a tail rotor blade may cause a severe out-of-balance vibration which can separate the tail rotor gearbox or entire tail assembly from the tailcone, resulting in a catastrophic accident. R22 accidents have been caused by fuel caps, map cases, birds, and other objects striking the tail rotor. Before each flight perform the following:

1) Walk completely around the aircraft checking fuel caps, tail rotor, and for anything which could catch a skid, such as a connected static line.

2) Stow or secure all loose objects in the cabin.

3) Firmly latch all doors.

4) And, never fly with a left door removed. (Remove only the right door for ventilation.)

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# Safety Notice SN-31

Issued: Dec 96

GOVERNOR CAN MASK CARB ICE

With throttle governor on, carb ice will not become apparent as a loss of either RPM or manifold pressure. The governor will automatically adjust throttle to maintain constant RPM which will also result in constant manifold pressure. When in doubt, apply carb heat as required to keep CAT out of yellow arc during hover, climb, or cruise, and apply full carb heat when manifold pressure is below 18 inches.

Also remember, if carb heat assist is used it will reduce carb heat when you lift off to a hover and the control may require readjustment in flight.

# Safety Notice SN-32

Issued: Mar 98

HIGH WINDS OR TURBULENCE

Flying in high winds or turbulence should be avoided but if unexpected turbulence is encountered, the following procedures are recommended:

1) Reduce airspeed to between 60 or 70 KIAS.

2) Tighten seat belt and firmly rest right forearm on right leg to prevent unintentional control inputs.

3) Do not overcontrol. Avoid large or abrupt control movements. Allow aircraft to go with the turbulence, then restore level flight with smooth gentle control inputs.

4) Leave governor on and do not chase RPM or airspeed. Momentary RPM or airspeed excursions are to be expected.

5) Avoid flying on the downwind side of hills, ridges, or tall buildings where the turbulence will likely be most severe.

6) Never fly into a blind or box canyon during high winds.

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# Safety Notice SN-33

Issued: Mar 98

VEE-BELTS TURNING ROTOR DURING ENGINE START-UP

New vee-belts on R22 or R44 helicopters may cause the rotor to turn during engine start. This places unnecessary load on starter and may produce high torsional stresses in drive train. The following procedure is recommended with new belts:

1) During shutdown, do not disengage clutch.

2) After master switch is off, put clutch switch in DISENGAGE position.

3) Prior to next flight, wait for clutch to disengage before starting engine.

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# Safety Notice SN-34

Issued: Mar 99

PHOTO FLIGHTS - VERY HIGH RISK

There is a misconception that photo flights can be flown safely by low time pilots. Not true. There have been numerous fatal accidents during photo flights, including several involving R22 helicopters.

Often, to please the photographer, an inexperienced pilot will slow the helicopter to less than 30 KIAS and then attempt to maneuver for the best picture angle. While maneuvering, the pilot may lose track of airspeed and wind conditions. The helicopter can rapidly lose translational lift and begin to settle. An inexperienced pilot may raise the collective to stop the descent. This can reduce RPM thereby reducing power available and causing an even greater descent rate and further loss of RPM. Rolling on throttle will increase rotor torque but not power available due to the low RPM. Because tail rotor thrust is proportional to the square of RPM, if the RPM drops below 80% nearly one-half of the tail rotor thrust is lost and the helicopter will rotate nose right. Suddenly the decreasing RPM also causes the main rotor to stall and the helicopter falls rapidly while continuing to rotate. The resulting impact is usually fatal.

Photo flights should only be conducted by well trained, experienced pilots who:

1) Have at least 500 hours pilot-in-command in helicopters and over 100 hours in the model flown;

2) Have extensive training in both low RPM and settling-with-power recovery techniques;

3) Are willing to say no to the photographer and only fly the aircraft at speeds, altitudes, and wind angles that are safe and allow good escape routes.

Please reread Safety Notice SN-24

# Safety Notice SN-35

Issued: Apr 99

FLYING NEAR BROADCAST TOWERS

Electrical system malfunctions have occurred in aircraft, including R22 and R44 helicopters, when flying near high intensity broadcast towers. While transmission tower location and height are marked on aeronautical charts, transmitter power is not.

Early indications of a high power radio field include strong interference in the intercom system and aircraft radio receivers. Increasing field strength may cause random illumination of warning lights and erratic governor and tachometer operation. If the pilot has removed his hand from the collective to adjust the radio due to the interference, initial erratic operation of the governor may go unnoticed. Under these conditions, the governor may roll the throttle to idle or open it rapidly, overspeeding the engine and rotor.

The following precautions should be taken to reduce the risk from high power radio transmitters:

1) Do not fly near broadcast towers.

2) Do not become distracted trying to adjust the radio or intercom to reduce interference. Keep one hand on the collective and throttle, and be prepared to switch off the governor and assume manual throttle control.

3) Although permanent damage is unlikely, check electrical system thoroughly following a flight through a high power radio field.

# Safety Notice SN-36

Issued: Nov 00

OVERSPEEDS DURING LIFTOFF

Helicopters have been severely damaged by RPM overspeeds during liftoff. The overspeeds caused a tail rotor drive shaft vibration which led to immediate failure of shaft and tailcone. Throughout the normal RPM range, tail rotor shaft vibration is controlled by damper bearing. However, damper is not effective above 120% RPM.

Mechanical correlation can cause overspeed during liftoff if RPM is increased to normal flight settings and collective raised before governor is switched on. Overspeeds can also occur if throttle is gripped too firmly during liftoff causing governor to be overridden. Inexperienced pilots, who are most likely to be nervous or distracted, are particularly susceptible to this type of overspeed.

To avoid overspeeds during liftoff:

1. Always confirm governor on before increasing RPM above 80%.
2. Verify governor stabilizes engine RPM near top of green arc.
3. Maintain relaxed grip on throttle allowing governor to control RPM.

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# Safety Notice SN-37

Issued: Dec 01

EXCEEDING APPROVED LIMITATIONS CAN BE FATAL

Many pilots do not understand metal fatigue. Each time a metal component is loaded to a stress level above its fatigue limit, hidden damage occurs within the metal. There is no inspection method which can detect this invisible fatigue damage. The first indication will be a tiny microscopic crack in the metal, often hidden from view. The crack will grow with each repetition of the critical stress until the part suddenly breaks. Crack growth will occur quite rapidly in drive system parts from the high frequency torsional loads. It will also occur rapidly in rotor system components due to the high centrifugal force on the blades and hub. Damaging fatigue cycles occur with every revolution of an overloaded drive shaft or rotor blade.

If a pilot exceeds the power or airspeed limits on a few occasions without failure, he may be misled into believing he can safely operate at those high loads. Not true. Every second the limitations are exceeded, more stress cycles occur and additional fatigue damage can accumulate within the metal. Eventually, a fatigue crack will begin and grow until a sudden failure occurs. If the pilot is lucky, the part will have reached its approved service life and be replaced before failure. If not, there will likely be a serious or fatal accident.

**WARNING**

1) Always operate the aircraft well below its approved Vne (never exceed speed), especially in turbulent wind conditions.

2) Do not operate the engine above its placarded manifold pressure limits.

3) Do not load the aircraft above its approved gross weight limit.

4) **The most damaging conditions occur when flying or maneuvering at high airspeeds combined with high power settings.**

# Safety Notice SN-38

Issued: Jul 2003 Rev: Oct 2004

PRACTICE AUTOROTATIONS CAUSE MANY TRAINING ACCIDENTS

Each year many helicopters are destroyed practicing for the engine failure that very rarely occurs.

Many practice autorotation accidents occur when the helicopter descends below 100 feet AGL without all the proper conditions having been met. As the aircraft descends through 100 feet AGL, make an immediate power recovery unless all of the following conditions exist:

1) Rotor RPM in middle of green arc
2) Airspeed stabilized between 60 and 70 KIAS
3) A normal rate of descent, usually less than 1500 ft/min
4) Turns (if any) completed

Instructors may find it helpful to call out "RPM, airspeed, rate of descent" prior to passing through 100 feet. At density altitudes above 4000 feet, increase the decision point to 200 feet AGL or higher.

A high percentage of training accidents occur after many consecutive autorotations. To maintain instructor focus and minimize student fatigue, limit practice to no more than 3 or 4 consecutive autorotations.

There have been instances when the engine has quit during practice autorotation. To avoid inadvertent engine stoppage, do not roll throttle to full idle. Reduce throttle smoothly for a small visible needle split, then hold throttle firmly to override governor. Recover immediately if engine is rough or engine RPM continues to drop.

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# Safety Notice SN-39

Issued: Jul 2003

UNUSUAL VIBRATION CAN INDICATE A MAIN ROTOR BLADE CRACK

A catastrophic rotor blade fatigue failure can be averted if pilots and mechanics are alert to early indications of a fatigue crack. Although a crack may be internal to blade structure and not visible, it will likely cause a significant increase in rotor vibration prior to final failure. If a rotor is smooth after balancing but then goes out of balance again within a few flights, it should be considered suspect. Have the rotor system thoroughly examined by a qualified mechanic before further flight.

If main rotor vibration rapidly increases or becomes severe during flight, make an immediate safe landing. Do not attempt to continue flight to a convenient destination.

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# Safety Notice SN-40

Issued: Jul 2006

POSTCRASH FIRES

There have been a number of cases where helicopter or light plane occupants have survived an accident only to be severely burned by fire following the accident. To reduce the risk of injury in a postcrash fire, it is strongly recommended that a fire-retardant Nomex flight suit, gloves, and hood or helmet be worn by all occupants.