R66

PILOT'S OPERATING HANDBOOK

AND FAA APPROVED ROTORCRAFT FLIGHT MANUAL

RTR 661

THE R66 IS FAA APPROVED IN NORMAL CATEGORY BASED ON 14 CFR PARTS 21 and 27. THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY 14 CFR PARTS 21, 27, AND 36 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 25, 2010

ROBINSON HELICOPTER COMPANY
TORRANCE, CALIFORNIA

CLASS J
SUBSCRIPTION SERVICE

If you wish to receive future changes to the R66 Pilot's Operating Handbook and copies of Safety Notices, send a check or money order for U.S. $15.00 to:

ROBINSON HELICOPTER COMPANY
2901 Airport Drive
Torrance, CA 90505

You will receive all changes to the handbook and Safety Notices for a period of one year.

Please print your name, address and telephone number in the space provided below and return this page together with your check or money order.

OCT 2 5 2010
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LOG OF PAGES APPROVED BY FAA
TYPE CERTIFICATE NO. R00015LA

	Page No.	Approval Date	Page No.	Approval Date
Cover	i	25 Oct 10		
Log of Pages	ii	25 Oct 10		
Section 2 Limitations	2-i	25 Oct 10	2-7	25 Oct 10
	2-1	25 Oct 10	2-8	25 Oct 10
	2-2	25 Oct 10	2-9	26 Oct 10
	2-3	25 Oct 10	2-10	26 Oct 10
	2-4	25 Oct 10	2-11	25 Oct 10
	2-5	25 Oct 10	2-12	25 Sep 10
	2-6	25 Oct 10		
Section 3 Emergency Procedures	3-i	25 Oct 10	3-6	25 Oct 10
	3-1	25 Oct 10	3-7	25 Oct 10
	3-2	25 Oct 10	3-8	25 Oct 10
	3-3	25 Oct 10	3-9	25 Oct 10
	3-4	25 Oct 10	3-10	25 Oct 10
	3-5	25 Oct 10		
Section 4 Normal Procedures	4-i	25 Oct 10	4-8	25 Oct 10
	4-1	25 Oct 10	4-9	25 Oct 10
	4-2	25 Oct 10	4-10	25 Oct 10
	4-3	25 Oct 10	4-11	25 Oct 10
	4-4	25 Oct 10	4-12	25 Oct 10
	4-5	25 Oct 10	4-13	25 Oct 10
	4-6	25 Oct 10	4-14	25 Oct 10
	4-7	25 Oct 10		
Section 5 Performance	5-i	25 Oct 10	5-7	25 Oct 10
	5-1	25 Oct 10	5-8	25 Oct 10
	5-2	25 Oct 10	5-9	25 Oct 10
	5-3	25 Oct 10	5-10	25 Oct 10
	5-4	25 Oct 10	5-11	25 Oct 10
	5-5	25 Oct 10	5-12	25 Oct 10
	5-6	25 Oct 10		
Section 9 Supplements	9-i	25 Oct 10		

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LOG OF PAGES
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	Page No.	Revision Date	Page No.	Revision Date
Section 1 General	1-i	25 Oct 10	1-6	25 Oct 10
	1-1	25 Oct 10	1-7	25 Oct 10
	1-2	25 Oct 10	1-8	25 Oct 10
	1-3	25 Oct 10	1-9	25 Oct 10
	1-4	25 Oct 10	1-10	25 Oct 10
	1-5	25 Oct 10		
Section 6 Weight and Balance	6-i	25 Oct 10	6-5	25 Oct 10
	6-1	25 Oct 10	6-6	25 Oct 10
	6-2	25 Oct 10	6-7	25 Oct 10
	6-3	25 Oct 10	6-8	25 Oct 10
	6-4	25 Oct 10		
Section 7 Systems Description	7-i	25 Oct 10	7-14	25 Oct 10
	7-1	25 Oct 10	7-15	25 Oct 10
	7-2	25 Oct 10	7-16	25 Oct 10
	7-3	25 Oct 10	7-17	25 Oct 10
	7-4	25 Oct 10	7-18	25 Oct 10
	7-5	25 Oct 10	7-19	25 Oct 10
	7-6	25 Oct 10	7-20	25 Oct 10
	7-7	25 Oct 10	7-21	25 Oct 10
	7-8	25 Oct 10	7-22	25 Oct 10
	7-9	25 Oct 10	7-23	25 Oct 10
	7-10	25 Oct 10	7-24	25 Oct 10
	7-11	25 Oct 10	7-25	25 Oct 10
	7-12	25 Oct 10	7-26	25 Oct 10
	7-13	25 Oct 10		
Section 8 Handling and Maintenance	8-i	25 Oct 10	8-8	25 Oct 10
	8-1	25 Oct 10	8-9	25 Oct 10
	8-2	25 Oct 10	8-10	25 Oct 10
	8-3	25 Oct 10	8-11	25 Oct 10
	8-4	25 Oct 10	8-12	25 Oct 10
	8-5	25 Oct 10	8-13	25 Oct 10
	8-6	25 Oct 10	8-14	25 Oct 10
	8-7	25 Oct 10		
Section 10 Safety Tips	10-i	25 Oct 10	10-3	25 Oct 10
	10-1	25 Oct 10	10-4	25 Oct 10
	10-2	25 Oct 10		

SECTION 1

GENERAL

CONTENTS

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 14 CFR parts 21, 27, and 36. 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.

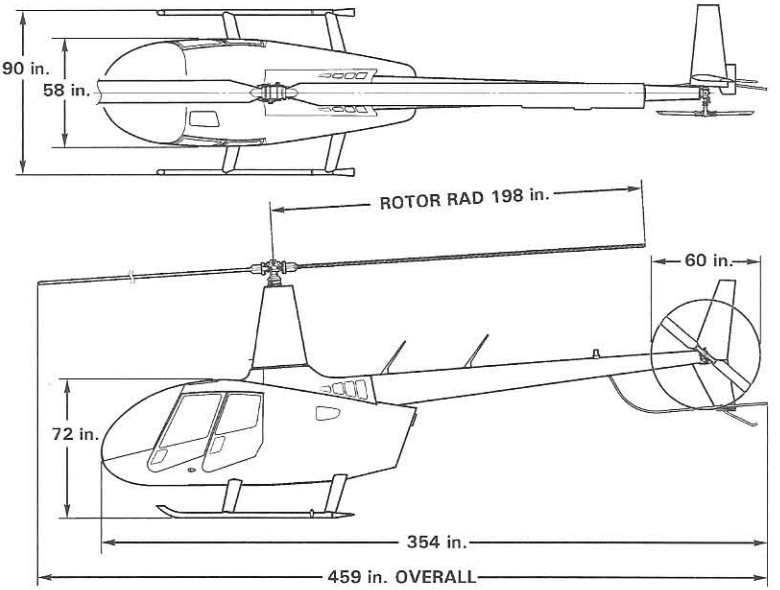
This handbook has been divided into ten numbered sections. Limitations and emergency procedures have been placed ahead of normal procedures, performance, and other sections to provide easier access to that information. Provisions for expansion of the handbook have been made by deliberate omission of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

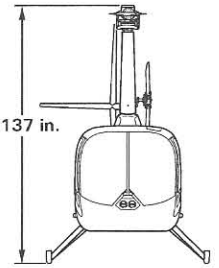
CAUTIONS AND NOTES

Cautions and Notes emphasize important information and are used as follows:

CAUTION Equipment damage, injury, or death can result if procedure or instruction is not followed.

NOTE Provides emphasis or supplementary information.





THREE VIEW OF R66 HELICOPTER

DESCRIPTIVE DATA

MAIN ROTOR

Articulation	Free to teeter and cone, rigid in plane
Number of Blades	2
Diameter	33 feet
Blade Chord	11.5 inches inboard, 12.2 inches outboard
Blade Twist	-4 degrees
Tip Speed at 100% RPM	705 feet per second

TAIL ROTOR

Articulation	Free to teeter, rigid in plane
Number of Blades	2
Diameter	60 inches
Blade Chord	5.5 inches (constant)
Blade Twist	0
Tip Speed at 100% RPM	635 feet per second

DRIVE SYSTEM

Engine to Drive Line	Sprag type overrunning clutch, spiral-bevel gears with 13:37 speed reducing ratio
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: Rolls-Royce 250-C300/A1
commercial designation RR300
(FAA type certificate no. E4CE)

Type: Free-turbine turboshaft

Manufacturer's rating: 300 SHP

R66 5 minute takeoff rating: 270 SHP

R66 continuous rating: 224 SHP

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 Section 5 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 mean sea level, 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 indicated by the altimeter (corrected for instrument error) when the barometric subscale is set to 29.92 inches of mercury (1013.2 mb).
Density Altitude	Altitude 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.
SHP	Shaft Horsepower is actual power delivered by the engine output shaft. (Shown by torque meter as percentage of 270 horsepower when N_2 is 100%).

PERFORMANCE DEFINITIONS (cont'd)

RPM	Revolutions Per Minute or speed of engine or rotor. Shown on R66 tachometers in percent. 100% engine output shaft (N_2) RPM = 6016. 100% gas generator (N_1) RPM = 50970. 100% main rotor RPM = 408.
N_1	Engine gas generator (compressor) RPM.
N_2	Engine output shaft RPM.
MGT	Measured Gas Temperature (in turbine section).
MCP	Maximum Continuous Power (83% torque in the R66).
TOP	Takeoff Power (100% torque, limited to 5 minutes in the R66).
TOGW	Takeoff Gross Weight.
OAT	Outside Air Temperature.
GPH	Gallons Per Hour.
AGL	Above Ground Level.
IGE	In Ground Effect.
OGE	Out of Ground Effect.

WEIGHT AND BALANCE DEFINITIONS

Reference Datum	A vertical plane from which horizontal distances are measured for balance purposes. The longitudinal reference datum is 100 inches forward of the main rotor shaft centerline for the R66.
Station	Fore-and-aft location along the helicopter fuselage given in terms of distance in inches from the longitudinal reference datum.
Arm	Horizontal distance from a reference datum to the center of gravity (CG) of an item.
Moment	The weight of an item multiplied by its arm.
Center of Gravity (CG)	Location on the fuselage (usually expressed in inches from the reference datum) at which the helicopter would balance. CG is calculated by dividing total helicopter moment by total helicopter weight.
CG Limits	Extreme CG locations within which the helicopter must be operated at a given weight.
Usable Fuel	Fuel available for flight planning.
Unusable Fuel	Fuel remaining in the tank that cannot reliably provide uninterrupted fuel flow in the critical flight attitude.
Standard Empty Weight	Weight of a standard helicopter including unusable fuel, full operating fluids, and full engine 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 gross weight and basic empty weight.

CONVERSION TABLES

METRIC TO ENGLISH

Multiply	By	To Obtain
centimeters (cm)	0.3937	inches (in)
kilograms (kg)	2.2046	pounds (lb)
kilometers (km)	0.5400	nautical miles (nm)
kilometers (km)	0.6214	statute miles (mi)
liters (l)	0.2642	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)	0.3048	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)	0.4536	kilograms (kg)
quarts (qt)	0.9464	liters (l)
statute miles (mi)	1.6093	kilometers (km)

1 nautical mile = 1.1508 statute miles

1 statute mile = 0.8690 nautical mile

TEMPERATURE

°F = 9/5 (°C) + 32
°C = 5/9 (°F - 32)

SECTION 2

LIMITATIONS

CONTENTS

SECTION 2

LIMITATIONS

GENERAL

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 as a normal category rotorcraft under FAA Type Certificate No. R00015LA as Model R66.

COLOR CODE FOR INSTRUMENT MARKINGS

Red	Operating limit. Edge of red line indicates limit. Pointer should not enter red during normal operation.
Red Cross-Hatch	Power-off V_{ne}.
Yellow	Precautionary or special operating procedure range.
Green	Normal operating range.

AIRSPEED LIMITS

NEVER-EXCEED AIRSPEED (V_{ne})

Up to 3000 feet density altitude:

2200 lb TOGW or above	130 KIAS
Below 2200 lb TOGW	140 KIAS

Up to 9000 feet density altitude:

Autorotation	100 KIAS

For higher altitudes see placards on page 2-9.

ADDITIONAL AIRSPEED LIMITS

65 KIAS maximum above 83% torque.

100 KIAS maximum with any combination of cabin doors removed.

ROTOR SPEED LIMITS

	TACHOMETER READING	ACTUAL RPM
Power On		
Maximum	101%	412
Minimum	99%	404
Power Off		
Maximum	106%	432
Minimum	88%	359

POWERPLANT LIMITATIONS

ENGINE

One Rolls-Royce Model 250-C300/A1

OPERATING LIMITS

Gas generator speed (N_1)	
Maximum	105% (53,519 RPM)
Output shaft speed (N_2)	
Maximum	101% (6076 RPM)
Minimum power on	99% (5956 RPM)
Measured Gas Temperature	
Maximum during start	927°C (10 second limit above 810°C)
Maximum operating	782°C (5 minutes) 706°C (continuous)
Oil Temperature, Maximum	107°C
Oil Pressure	
Maximum during start and warm up	150 psi
Maximum operating	130 psi
Minimum above 94% N_1	115 psi
Minimum below 78% N_1	50 psi
Minimum from 78% to 94% N_1	90 psi
Oil Quantity, minimum for takeoff	4 qt
Torque	
5 minute limit	100% (236 lb-ft)
Continuous limit	83% (196 lb-ft)

WEIGHT LIMITS

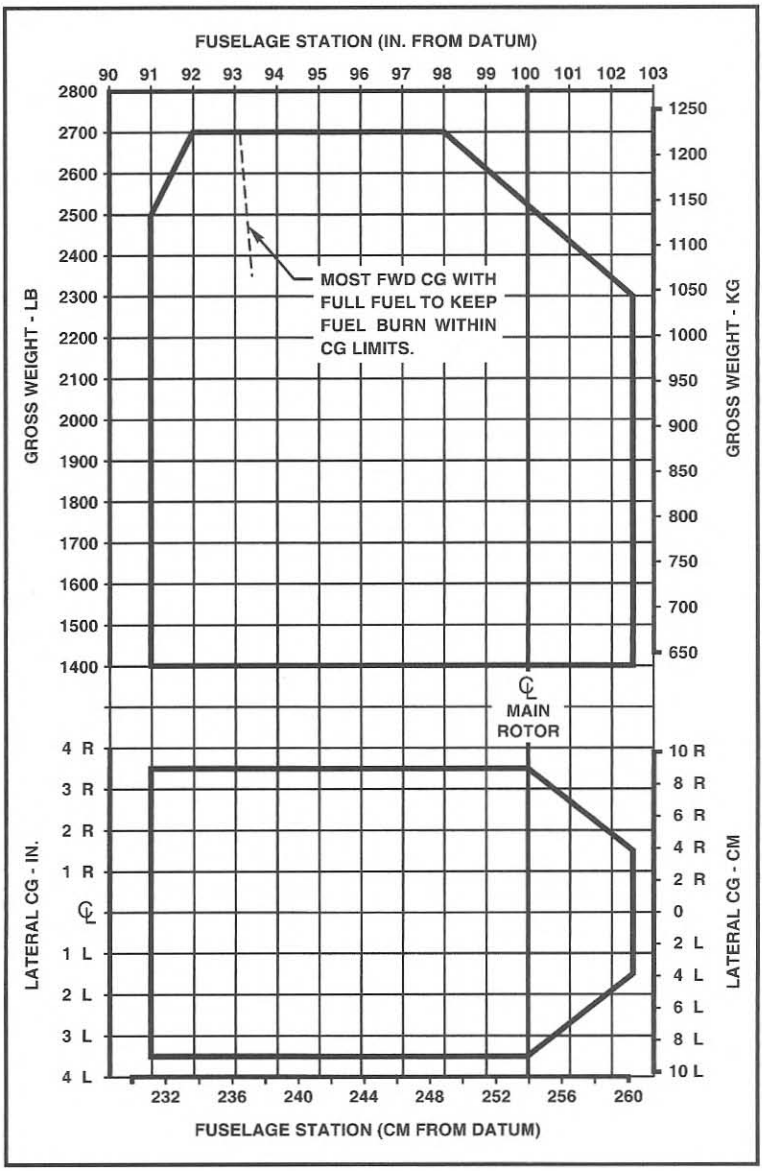
Maximum gross weight	2700 lb (1225 kg)
Minimum gross weight	1400 lb (635 kg)
Maximum per seat including under-seat compartment	300 lb (136 kg)
Maximum in any under-seat compartment	50 lb (23 kg)
Baggage Compartment	
Maximum distributed load	50 lb/ft^2 (244 kg/m^2)
Maximum total load	300 lb (136 kg)

CENTER OF GRAVITY LIMITS

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

NOTE

With all doors installed and no load in baggage compartment, a solo pilot weight of 160 lb or greater will ensure CG within limits. For lower pilot weight, compute weight and balance; removable ballast may be required to obtain CG at or forward of aft limit. (See Loading Instructions in Section 6).



CENTER OF GRAVITY LIMITS

FLIGHT AND MANEUVER LIMITATIONS

Aerobatic flight prohibited.

CAUTION

Abrupt control inputs may produce high fatigue stresses and cause catastrophic failure of a critical component.

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 roll.

Maximum operating density altitude 14,000 feet.

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

Closing throttle (twist grip) in flight prohibited above 10,000 feet density altitude to avoid possible engine flameout.

Closing throttle (twist grip) in flight prohibited with cabin heat ON to avoid possible engine flameout.

Minimum crew is one pilot. Solo from right seat only.

Forward left seat belt must be buckled.

Operation up to 100 KIAS approved with any combination of cabin doors removed. All seat belts must be buckled and loose items in cabin must be properly secured during doors-off flight.

FLIGHT AND MANEUVER LIMITATIONS (cont'd)

When installed, the appropriate GPS unit pilot's guide must be available for the flight crew when navigation is based on its use.

Traffic information provided by a multifunction GPS unit is advisory only. Do not use this information alone for traffic avoidance maneuvers.

KINDS OF OPERATION LIMITATIONS

VFR day and night operations are 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 United States.

ENVIRONMENTAL LIMITATIONS

Maximum ambient temperature for operation is ISA plus 35°C (ISA plus 63°F), limited to 50°C (122°F).

Minimum ambient temperature for operation is -10°C (14°F) at all altitudes.

NOTE

See fuel limitations for temperature restrictions.

Flight in known icing conditions is prohibited.

Flight in falling or blowing snow is prohibited.

Engine anti-ice must be on for operation in visible moisture in ambient temperatures at or below 4°C (40°F).

FUEL LIMITATIONS

APPROVED FUEL GRADES

Grade (Specification)	Operating Limits
Jet A or Jet A1 (ASTM D 1655)	Anti-icing additive may be required (see below). Not approved for ambient temperatures below -32°C (-25°F).
Jet B (ASTM D 6615)	Anti-icing additive may be required (see below). Not approved for ambient temperatures above 32°C (90°F) at altitudes above 5000 feet.
JP-4 (MIL-DTL-5624)	Not approved for ambient temperatures above 32°C (90°F) at altitudes above 5000 feet.
JP-5 (MIL-DTL-5624)	Not approved for ambient temperatures below -32°C (-25°F).
JP-8 (MIL-DTL-83133)	Not approved for ambient temperatures below -32°C (-25°F).

Anti-icing additive conforming to MIL-DTL-85470 must be added to Jet A, Jet A1, or Jet B when ambient temperature is below 4°C (40°F). Check with fuel supplier to determine if supply includes additive. If not, add per manufacturer's instructions.

NOTE

For consistent starts below 4°C, it may be necessary to pre-heat aircraft, use external power, and/or use fuels optimized for cold weather (Jet B, JP-4).

FUEL CAPACITY

Total capacity: 74.6 US gallons (282 liters)
Usable capacity: 73.6 US gallons (279 liters)

INSTRUMENT MARKINGS

NOTE

Red lines offset so instrument pointer does not enter red. See color code on page 2-1.

AIRSPEED INDICATOR	
Green arc	0 to 140 KIAS
Red cross-hatch	100 KIAS
Red line	140 KIAS
ROTOR TACHOMETER	
Lower red line	88%
Green arc	88 to 106%
Upper red line	106%
ENGINE TACHOMETER (N_2)	
Yellow Arc (transient operation only when above 38% torque)	78 to 88%
Lower red line	99%
Green arc	99 to 101%
Upper red line	101%
GAS PRODUCER TACHOMETER (N_1)	
Green arc	60 to 105%
Red line	105%
MEASURED GAS TEMPERATURE	
Green arc	150 to 706°C
Yellow arc (5 minute limit)	706 to 782°C
Red line	782°C
Red dot (start limit)	927°C
ENGINE OIL TEMPERATURE	
Green arc	0 to 107°C
Red line	107°C
ENGINE OIL PRESSURE	
Lower red line	50 psi
Yellow arc (below 78% N_1)	50 to 90 psi
Green arc	90 to 130 psi
Yellow arc (start and warm up)	130 to 150 psi
Upper red line	150 psi

INSTRUMENT MARKINGS (cont'd)

TORQUE

Green arc	0 to 83%
Yellow arc (5 minute limit)	83 to 100%
Red line	100%

AMMETER

Green arc	0 to 160 amps
Red line	160 amps

PLACARDS

Adjacent to pilot's cyclic grip:

POWER-ON V_{ne} - KIAS

PRESS ALT-FT	OAT- C°									
	-40	-30	-20	-10	0	10	20	30	40	50
SL										127
2000			130					126	122	
4000					129	125	121	117	114	
6000				125	121	117	113	108		
8000		125	121	116	112	107	102	97		
10000	121	117	112	106	101	96	91	86		
12000	112	106	101	95	90					
14000	101	95	89	NO FLIGHT						
16000	90	NO FLIGHT								
BELOW 2200 LB TOGW, ADD 10 KIAS										

NOTE: 65 KIAS MAXIMUM ABOVE 83% TORQUE

AUTOROTATION V_{ne} - KIAS

PRESS ALT-FT	OAT- C°									
	-40	-30	-20	-10	0	10	20	30	40	50
6000			100							
8000						99	94	89		
10000				98	93	88	83	78		
12000		98	93	87	82					
14000	93	87	81	NO FLIGHT						
16000	82	NO FLIGHT								

Note: Values at temperatures below -10°C are for reference only.

PLACARDS (cont'd)

Near fuel tank filler cap:

FUEL

GRADE JET A, JET A1, JET B, OR
AS SPECIFIED IN PILOT'S HANDBOOK

ANTI-ICE ADDITIVE MAY BE REQUIRED
SEE PILOT'S HANDBOOK

Near fuel gage:

73.6 US GAL

In clear view of pilot:

SEE PILOT'S HANDBOOK FOR SOLO
PILOT WEIGHT LESS THAN 160 LB

THIS ROTORCRAFT APPROVED FOR
DAY AND NIGHT VFR OPERATIONS

LOW-G PUSHOVERS PROHIBITED

On removable cyclic grip:

SOLO FROM RIGHT SEAT ONLY

On or near collective controls:

NO STOWAGE
KEEP AREA CLEAR

PLACARDS (cont'd)

In clear view of all occupants:

NO SMOKING

Inside cabin above each cabin door:

EXIT

Inside each cabin door near door handle:

TO CLOSE: SLIDE HANDLE AFT AND DOWN
TO OPEN: LIFT HANDLE AND SLIDE FORWARD

Near lock on rear cabin doors:

PUSH TO LOCK
DO NOT LOCK IN FLIGHT

Inside each under-seat compartment:

CAUTION

DO NOT EXCEED THE FOLLOWING:
- COMPARTMENT CAPACITY: 50 LB MAX
- COMBINED SEAT PLUS COMPARTMENT: 300 LB MAX
- MAX FILL LINE

SEE PILOT'S HANDBOOK FOR ADDITIONAL LOADING INSTRUCTIONS.

PLACARDS (cont'd)

Inside main baggage compartment:

CAUTION

- MAXIMUM DISTRIBUTED FLOOR LOAD: 50 LB/FT ^{2}
- MAXIMUM TOTAL COMPARTMENT LOAD: 300 LB

On underside of each main rotor blade tip:

NEVER PULL DOWN
PUSH UP OPPOSITE BLADE

SECTION 3

EMERGENCY PROCEDURES

CONTENTS

SECTION 3

EMERGENCY PROCEDURES

DEFINITIONS

Land Immediately – Land on the nearest clear area where a safe 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 maintenance may be performed.

POWER FAILURE – GENERAL

A power failure may be caused by either an engine or drive system failure and will usually be indicated by the low RPM horn. An engine failure may be indicated by a change in noise level, nose left yaw, an engine oil pressure light, or decreasing N_1 or N_2 RPM. A drive system failure may be indicated by an unusual noise or vibration, nose right or left yaw, or decreasing rotor RPM while N_2 RPM is increasing.

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

CAUTION

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

CAUTION

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

POWER FAILURE ABOVE 500 FEET AGL

1. Lower collective immediately to maintain RPM and enter normal autorotation.
2. Establish a steady glide at 60 to 70 KIAS (90 KIAS for maximum glide).
3. Adjust collective to keep RPM between 95 and 106% or apply full down collective if light weight prevents attaining above 95%.
4. Select landing spot and, if altitude permits, maneuver so landing will be into wind.
5. A restart may be attempted at pilot's discretion if sufficient time is available (See "Air Restart Procedure", page 3-3).
6. If unable to restart, turn unnecessary switches and fuel valve off.
7. At about 40 feet AGL, begin cyclic flare to reduce rate of descent and forward speed.
8. At about 8 feet AGL, apply forward cyclic to level ship and raise collective just before touchdown to cushion landing. Touch down in level attitude with nose straight ahead.

POWER FAILURE BETWEEN 8 FEET AND 500 FEET AGL

1. Lower collective immediately to maintain rotor RPM.
2. Adjust collective to keep RPM between 95 and 106% or apply full down collective if light weight prevents attaining above 95%.
3. Maintain airspeed until ground is approached, then begin cyclic flare to reduce rate of descent and forward speed.
4. At about 8 feet AGL, apply forward cyclic to level ship and raise collective just before touchdown to cushion landing. Touch down in level attitude with 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.

AIR RESTART PROCEDURE

CAUTION

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

An immediate restart may be attempted by pressing the start button if N_1 is above 20% (within approximately 10 seconds of power loss). It is not necessary to close throttle or pull fuel cutoff for immediate restart.

If N_1 has decayed to 20% or below, use the following procedure:

1. Fuel cutoff - Pull OFF.
2. Throttle - Closed.
3. Start button - Push and release.
4. N_1 15% or above - push fuel cutoff ON.
5. After peak MGT - throttle full open.

EMERGENCY WATER LANDING – POWER OFF

1. Follow same procedures as for power failure over land until contacting water. If time permits, unlatch doors prior to water contact.
2. Apply lateral cyclic when aircraft contacts water to stop rotors.
3. Release seat belt and quickly clear aircraft when rotors stop.

EMERGENCY WATER LANDING – 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 battery and generator OFF.
6. Close throttle.
7. Keep aircraft level and apply full collective as aircraft contacts water.
8. Apply lateral cyclic to stop rotors.
9. Release seat belt and quickly clear aircraft when rotors stop.

LOSS OF TAIL ROTOR THRUST IN FORWARD FLIGHT

Failure is usually indicated by nose right yaw which cannot be corrected by applying left pedal.

1. Immediately enter autorotation.
2. Maintain at least 70 KIAS if practical.
3. Select landing site, close throttle, and perform autorotation landing.

NOTE

When a suitable landing site is not available, the vertical stabilizers 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 IN HOVER

Failure is usually indicated by right yaw which cannot be stopped by applying left pedal.

1. Immediately close throttle to reduce yaw rate and allow aircraft to settle.
2. Raise collective just before touchdown to cushion landing.

ENGINE FIRE DURING START OR SHUTDOWN

Fire may be indicated by excessive MGT or by engine fire warning light.

1. Fuel cutoff – Pull OFF.
2. Start button – Push and release.
3. Fuel valve knob – Pull OFF.
4. Battery switch – OFF when MGT decreases to 150°C or if fire worsens.
5. If time permits, apply rotor brake to stop rotors.
6. Exit aircraft.

ENGINE FIRE IN FLIGHT

1. Immediately enter autorotation.
2. **If engine is running,** land immediately, then pull fuel cutoff OFF and pull fuel valve knob OFF.
   If engine stops running, pull fuel cutoff OFF, pull fuel valve knob OFF, and complete autorotation landing.
3. If time permits, apply rotor brake to stop rotors.
4. Exit aircraft.

ELECTRICAL FIRE

1. Battery and generator switches – OFF.
2. Open cabin vents.
3. Land Immediately.
4. Pull fuel cutoff OFF and pull fuel valve knob OFF.
5. If time permits, apply rotor brake to stop rotors.
6. Exit aircraft.

NOTE

Low RPM warning system is inoperative with battery and generator switches both OFF.

TACHOMETER FAILURE

If rotor or N_2 tachometer malfunctions in flight, use remaining tach to monitor RPM. If it is not clear which tach is malfunctioning or if both tachs malfunction allow power turbine governor to control RPM and land as soon as practical.

NOTE

The rotor tach, N_2 tach, and low RPM warning horn are each on separate circuits. A special circuit allows the battery to supply power to the tachs with the battery and generator switches both OFF.

HYDRAULIC SYSTEM FAILURE

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

1. 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. A run-on landing is recommended if a suitable landing surface is available.

POWER TURBINE GOVERNOR FAILURE

Governor failure is indicated by a rise or fall of N_2 RPM. If N_2 overspeeds, attempt to control RPM with throttle. If N_2 underspeeds, verify throttle is full open and reduce collective to control RPM. If governor failure is suspected, land as soon as practical.

If manual RPM control is not possible, lower collective, close throttle, and complete autorotation landing per power failure procedures.

RED WARNING INDICATORS

MR TEMP/ PRESS	Indicates excessive temperature or low oil pressure in main gearbox. Land immediately.
ENGINE FIRE	Indicates possible fire in engine compartment. See procedures on page 3-6.
ENGINE OIL	Indicates loss of engine oil pressure. N_1 below 50% RPM indicates a possible flameout and an air restart may be attempted. If oil pressure gage confirms pressure loss, land immediately.

AMBER CAUTION INDICATORS

MR CHIP	Indicates metallic particles in main gearbox. See note below.
TR CHIP	Indicates metallic particles in tail gearbox. See note below.
ENGINE CHIP	Indicates metallic particles in engine. See note below.

NOTE

If chip light is accompanied by any indication of a problem such a 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 gearbox must be refilled with new oil). Hover for at least 30 minutes. If chip light comes on again, have affected gearbox serviced before further flight.

AMBER CAUTION INDICATORS (cont'd)

GEN — Indicates generator failure. Turn off non-essential electrical equipment and switch GEN to RESET and back to ON. If light stays on, land as soon as practical.

LOW FUEL — Indicates approximately five gallons of usable fuel remaining. The engine will run out of fuel after 10 minutes at cruise power.

CAUTION

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

FUEL FILTER — Indicates fuel filter contamination. If no other indication of a problem exists, land as soon as practical. If light is accompanied by erratic engine operation, land immediately.

LOW RPM — A horn and caution light indicate that rotor speed is below 95% RPM. To restore RPM, immediately lower collective, verify throttle full open and, in forward flight, apply aft cyclic. Horn is disabled when collective is full down.

COWL DOOR — Indicates fuel filler cowl door, right engine cowl door, or baggage compartment door is not closed. Land as soon as practical.

AIR FILTER — Indicates air filter contamination or blockage. Engine is operating on unfiltered air via filter bypass doors. Land as soon as practical and inspect filter.

ROTOR BRAKE — Indicates rotor brake is engaged. Release immediately in flight or before starting engine.

SECTION 4

NORMAL PROCEDURES

CONTENTS

SECTION 4

NORMAL PROCEDURES

RECOMMENDED AIRSPEEDS

Takeoff and Climb	60 KIAS
Maximum Range	100 KIAS*
Landing Approach	60 KIAS
Autorotation	70 KIAS

*Certain conditions may require lower airspeed. See V_{ne} placard in Section 2.

DAILY OR PREFLIGHT CHECKS

Remove all covers and tiedowns. Remove even small accumulations of frost, ice, or snow, especially from rotor blades and engine intake area. An 8-foot step ladder is recommended for preflight inspection of the main rotor; however, the main rotor hub may be reached by using the steps built into three cowl doors on the left side of the cabin.

Check general condition of aircraft and verify no visible damage, fluid leakage, or wear beyond normal limits. 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 tail gearbox Telatemp shows no unexplainable temperature increase (indicated by darkened squares beyond the reference line) during prior flight.

1. Pilot's Station
   Battery switch ON
   Check fuel quantity
   MR temp/press, engine oil, gen, low RPM lights on
   Test annunciator panel, all lights on
   Check strobe, nav, landing lights
   Battery switch OFF
   Release rotor brake
   Adjust tail rotor pedals, pins secure

DAILY OR PREFLIGHT CHECKS (cont'd)

2. Fuselage Right Side and Engine Compartment
   - Verify no visible damage
   - Verify door hinge cotter rings installed
   - Check landing gear strut fairings, skid, skid shoes
   - Verify static port clear
   - Check baggage compartment loading and security
   - Verify baggage door latched
   - Verify engine air filter clean
   - Verify no fluid leaks
   - Verify all air ducts secure
   - Check engine oil filter impending bypass indicator
   - Check engine fuel control linkage
   - Verify exhaust secure and no cracks
   - Verify cowl door latched

3. Tailcone, Empennage, and Tail Rotor
   - Verify all antennas and lights secure
   - Verify empennage secure, no cracks
   - Verify tail rotor guard secure, no cracks
   - Verify tail skid secure, no damage
   - Check tail rotor gearbox oil quantity and Telatemp
   - Verify drive system continuity by rotating tail rotor
   - Verify no damage to tail rotor blades
   - Verify no looseness at pitch links, bellcrank
   - Check condition of elastomeric teeter bearing
   - Verify teeter bearing bolt does not rotate

4. Belly
   - Verify all antennas and panels secure
   - Verify aft crosstube cover properly installed
   - Verify generator cooling air filter clean

5. Main Rotor
   - Verify no damage to blades
   - Verify paint covers bond line
   - Verify no leaks at pitch change boots
   - Verify all fasteners secure
   - Verify no excessive looseness at scissors, rod ends

DAILY OR PREFLIGHT CHECKS (cont'd)

6. Fuselage Left Side and Engine Compartment
   - Verify no visible damage
   - Verify door hinge cotter rings installed
   - Check landing gear strut fairings, skid, skid shoes
   - Verify static port clear
   - Verify fuel quantity and fuel cap secure
   - Verify engine air filter clean and secure
   - Check engine, main gearbox, hydraulic oil levels
   - Check gearbox oil filter impending bypass indicator
   - Check engine and gearbox oil coolers
   - Check engine governor control linkage
   - Verify no fluid leaks
   - Sample fuel, drain water and contaminants
   - Verify all cowl doors latched

7. Nose
   - Verify pitot tube clear
   - Verify windshield clean and undamaged

8. Cabin Area
   - Verify no loose items
   - Verify all items clear of controls
   - Verify left seat controls removed or properly installed
   - Verify seatbelts for unoccupied seats buckled

CAUTION

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

CAUTION

Fill compartments under unoccupied seats before using compartments under occupied seats. Do not exceed fill line for occupied seats. Avoid placing hard objects in compartment which could injure occupant if seat collapses during a hard landing.

DAILY OR PREFLIGHT CHECKS (cont'd)

CAUTION

Ensure all cabin doors are unlocked before flight to allow rescue or exit in an emergency. Aft door locks have a green stripe to indicate door unlocked.

CAUTION

Shorter pilots may require cushion to obtain full travel of all controls. Verify aft cyclic travel is not restricted.

BEFORE STARTING ENGINE

Seat belts	Fastened
Fuel valve	ON, guard installed
Cyclic/collective friction	OFF
Cyclic, collective, pedals	Full travel free
Collective	Full down, friction ON
Cyclic	Neutral, friction ON
Pedals	Neutral
Rotor brake	Disengaged
Circuit breakers	In
Cabin heat, anti-ice, pitot heat	OFF
Landing lights	OFF
Avionics, generator switches	OFF
Altimeter	Set
Hydraulic switch	ON

GROUND POWER START

Have ground personnel connect ground power to external receptacle prior to engaging starter and disconnect once idle is stabilized prior to switching generator ON. Ground power is connected to the helicopter's electrical system when battery switch is ON. Starts using ground power assist follow the same procedure as normal starts.

NOTE

If generator is switched ON prior to disconnecting ground power, high generator loads and reduction in idle speed may occur.

STARTING ENGINE AND RUN-UP

Battery, strobe switches . . . . . ON
Igniter (key) . . . . . Enable
Area . . . . . Clear
Fuel cutoff . . . . . **Pull OFF**
Throttle . . . . . **Closed**
Start button . . . . . Push and release
N_1 . . . . . 12 to 15%, increasing
MGT . . . . . Below 150°C
Fuel cutoff . . . . . Push on
Light-off . . . . . Within three seconds
MGT . . . . . Monitor, observe limits

CAUTION

Excessive MGT will cause severe engine damage. Do not push fuel cutoff ON unless N_1 has reached adequate speed and is increasing. 15% N_1 is recommended; 12% N_1 minimum may be used in cold weather. If MGT reaches limit during start or light-off does not occur within three seconds, immediately pull fuel cutoff OFF, wait ten seconds, then turn igniter switch OFF to stop starter.

Oil pressure . . . . . Increasing
N_1 . . . . . Stable at 65 to 67%
Fuel cutoff guard . . . . . Installed
Ground power (if used) . . . . . Disconnect
Generator . . . . . ON
Avionics switch, headsets . . . . . ON
Annunciator panel test . . . . . All lights on
Engine anti-ice check . . . . . Annunciator light
Doors . . . . . Closed and latched
Cyclic/collective friction . . . . . OFF
Hydraulic system . . . . . Check
Lift collective slightly . . . . . Low RPM horn
Warm-up . . . . . One minute idle
Throttle . . . . . Increase slowly to full open
N_2/R . . . . . Stable at 100% (beep as required)
Annunciator lights . . . . . Out
Engine gages . . . . . Normal operating range

STARTING ENGINE AND RUN-UP (cont'd)

CAUTION

When opening throttle, avoid exceeding 50% torque. On slippery surfaces, be prepared to counter nose-right rotation with left pedal.

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

Time between starter engagement and stabilized idle should normally not exceed one minute. If time exceeds one minute and engine has stopped accelerating, pull fuel cutoff OFF, wait for MGT drop, and turn igniter (key) switch OFF to stop starter. To avoid overheating, starter time should be limited to: one minute on, one minute off, one minute on, 30 minutes off. One minute limit may be exceeded if engine is accelerating.

TAKEOFF PROCEDURE

1. Verify doors latched, hydraulics ON, and RPM stabilized at 100%.
2. Engine anti-ice as required per Section 2.
3. Clear area. Slowly raise collective until aircraft is light on skids. Reposition cyclic as required for equilibrium, then gently lift aircraft into hover. Note hover torque.
4. Beep RPM as required to 100%.
5. Check gages in green, lower nose, and accelerate to climb speed following profile shown by height-velocity diagram in Section 5. Takeoff torque should not exceed 10% above hover torque.

NOTE

Takeoff portion of height-velocity diagram was demonstrated at 10% above hover torque to prevent excessive nose-down attitude.

NOTE

Periodically performing power assurance check (see Section 5) may provide indication of engine deterioration or air filter blockage.

CRUISE

1. Beep RPM as required to 100%.
2. Set torque as desired with collective. Observe torque, MGT, and V_{ne} limits.
3. Verify gages in green, no cautions or warnings.
4. Engine anti-ice as required.

NOTE

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

DOORS-OFF OPERATION

Maximum airspeed with any 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.

CAUTION

Ensure all seat belts are buckled during door-off flight. Rear outboard seat bottoms may lift if not restrained.

CAUTION

Flight with left door(s) removed is not recommended. Loose objects exiting left doors may damage tail rotor.

NOTE

Door removal on opposite sides of aircraft allows cross flow in cabin and increases cabin noise levels.

HYDRAULICS-OFF TRAINING

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

CAUTION

With hydraulics switched OFF, controlling helicopter in a hover may be difficult due to control system feedback forces.

CAUTION

Before switching hydraulics from OFF to ON, relax force on cyclic and collective to avoid overcontrolling.

PRACTICE AUTOROTATION – POWER RECOVERY

CAUTION

Verify a recent N_1 deceleration check was performed prior to conducting autorotations. Observe cabin heat and altitude limitation for closing throttle per Section 2.

1. Close throttle and lower collective to down stop.
2. Adjust collective to keep rotor RPM in green arc.
3. Airspeed 60 to 70 KIAS.
4. At about 40 feet AGL, begin cyclic flare to reduce rate of descent and forward speed and roll throttle smoothly on to recover engine power.
5. At about 8 feet AGL, apply forward cyclic to level aircraft, and raise collective to control descent.

CAUTION

Engine may require several seconds to spool up to full power during power recoveries.

CAUTION

Simulated engine failures require prompt lowering of collective to avoid dangerously low rotor RPM. Catastrophic rotor stall could occur if rotor RPM drops below 80% plus 1% per 1000 feet of altitude.

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 keep throttle closed throughout maneuver. Always contact ground with skids level and nose straight ahead.

NOTE

Have landing gear skid shoes inspected more frequently when practicing autorotations with ground contact. Rapid wear of skid shoes may occur.

MAXIMUM GLIDE DISTANCE CONFIGURATION

1. Airspeed approximately 90 KIAS.
2. Rotor RPM approximately 90%.

Best glide ratio is about 5.5:1 or one nautical mile per 1100 feet AGL.

MINIMUM RATE OF DESCENT CONFIGURATION

1. Airspeed approximately 60 KIAS.
2. Rotor RPM approximately 90%.

Minimum rate of descent is about 1300 feet per minute. Glide ratio is about 4.5:1 or one nautical mile per 1350 feet AGL.

CAUTION

Increase rotor RPM to 95% minimum or full down collective when autorotating below 500 feet AGL.

NOTE

Low RPM horn will sound when RPM is below 95% unless collective is full down.

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 feet per minute 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 closing throttle.

CAUTION

Never leave helicopter flight controls unattended while engine is running.

SHUTDOWN PROCEDURE

Collective down . . . . . Friction ON
Throttle closed . . . . . N_1 deceleration check
Cyclic and pedals neutral . . . . . Friction ON
Cool down. . . . . Two minute idle
Fuel cutoff . . . . . Pull OFF, monitor MGT

CAUTION

Rapid MGT increase following shutdown indicates residual fire in combustor. Follow "Engine Fire During Start or Shutdown" procedure per Section 3.

Sprag clutch check . . . . . Verify N_2/R needles split
Wait one minute . . . . . Apply rotor brake
Avionics, generator, battery, igniter 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 possibility of unintentional hydraulics-off liftoff. Switch OFF only for pre-takeoff controls check or hydraulics-off training.

N_1 DECELERATION CHECK

The deceleration check is performed on the ground to confirm proper fuel control operation. The check should be performed after the last flight of the day. Improper deceleration may cause engine flameout during an autorotation entry. Perform check as follows:

1. Collective full down.
2. Throttle open, N_2/R at 100% RPM.
3. Rapidly close throttle and measure time for N_1 to reach 67% RPM. Minimum allowable time is five seconds.

If deceleration time is less than five seconds, switch generator OFF and perform two more checks to confirm time. If confirmed time is less than five seconds, have helicopter serviced.

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 practical, 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 when, in the pilot's judgement, they would result in an unsafe flight path.