

# 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.

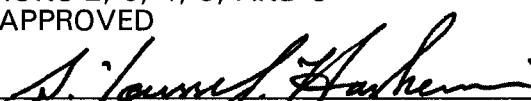
HELICOPTER SERIAL NO. \_\_\_\_\_

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

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- Actual size
- Portrait orientation
- Two-sided
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Note: The date stamped below reflects the revision of this handbook at the time it was assembled. Please refer to <https://robinsonheli.com> for date of most recent revision.

Assembled: \_\_\_\_\_ Lot: \_\_\_\_\_

Aircraft owner name: \_\_\_\_\_

Owner address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Phone: \_\_\_\_\_

E-mail: \_\_\_\_\_

Aircraft serial number: \_\_\_\_\_

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TYPE CERTIFICATE NO. R00015LA

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14 May 25

Manager, Flight Test &amp; Human Factors Branch, AIR-710

Date

Federal Aviation Administration

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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 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.

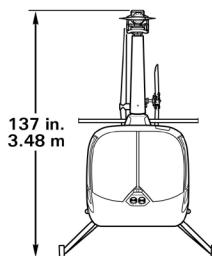
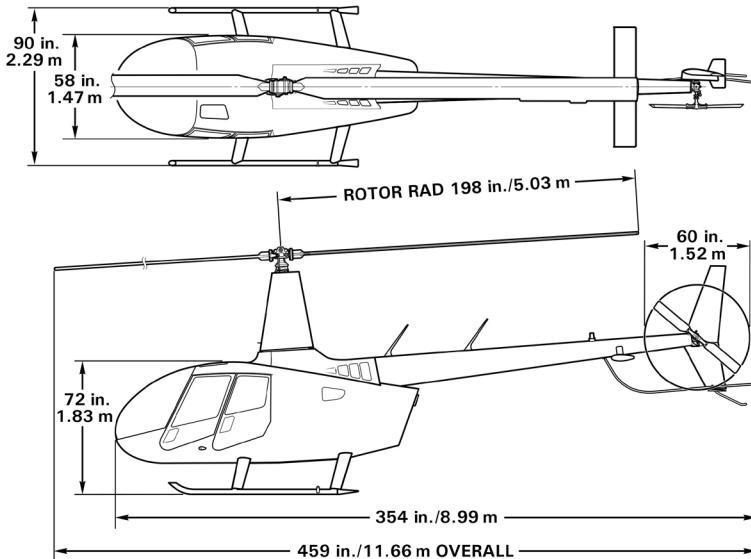
## CAUTIONS AND NOTES

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.

EXTERNAL DIMENSIONS



**R66 EXTERNAL DIMENSIONS  
(LATER AIRCRAFT SHOWN)**

## **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
Precone Angle	1 Degree
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

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
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

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
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

$$^{\circ}\text{F} = 9/5 ({}^{\circ}\text{C}) + 32$$

$${}^{\circ}\text{C} = 5/9 ({}^{\circ}\text{F} - 32)$$

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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 ( $V_{ne}$ )**

2200 lb (998 kg) TOGW or above	130 KIAS
Below 2200 lb (998 kg) TOGW	140 KIAS
Autorotation	100 KIAS

For  $V_{ne}$  reductions with altitude and temperature, see placards on page 2-10. |

**ADDITIONAL AIRSPEED LIMITS**

65 KIAS maximum above 83% torque.

100 KIAS maximum with any combination of cabin doors removed.

**ROTOR SPEED LIMITS****Power On**

Maximum continuous	101% (412 RPM)
Minimum continuous	99% (404 RPM)

**Power Off**

Maximum	106% (432 RPM)
Minimum	88% (359 RPM)

**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 continuous	101 % (6076 RPM)
--------------------	------------------

Minimum continuous power on	99 % (5956 RPM)
-----------------------------	-----------------

Maximum transient overspeed*	106 % (6377 RPM)
------------------------------	------------------

**Measured Gas Temperature (MGT)**

5 minute limit	782 °C
----------------	--------

Continuous limit	706 °C
------------------	--------

Transient limit	843 °C (6 seconds)
-----------------	--------------------

Limit during start	927 °C (10 seconds)
--------------------	---------------------

**Torque**

5 minute limit	100 % (236 lb-ft)
----------------	-------------------

Continuous limit	83 % (196 lb-ft)
------------------	------------------

\* Avoid large, rapid power changes. The engine governor reacts slowly and RPM excursions may occur. Intentional operation outside continuous RPM limits is prohibited.

**POWERPLANT LIMITATIONS (cont'd)****OPERATING LIMITS (cont'd)**

Oil Temperature, Maximum	107°C
Oil Pressure	
Maximum during start and warm up	150 psi
Maximum operating	130 psi
Minimum above 94% N <sub>1</sub>	115 psi
Minimum below 78% N <sub>1</sub>	50 psi
Minimum from 78% to 94% N <sub>1</sub>	90 psi
Oil Quantity, minimum for takeoff	4 qt (3.8 liters)

**WEIGHT LIMITS**

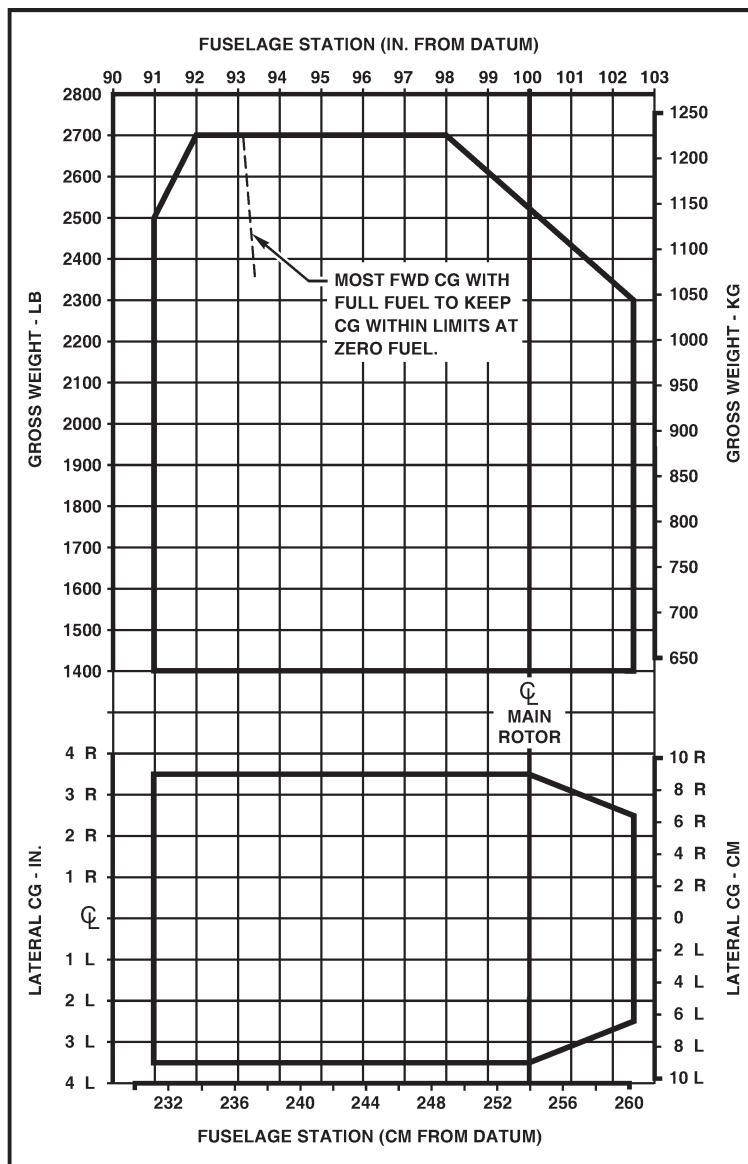
Maximum gross weight	2700 lb (1225 kg)
Minimum gross weight	1400 lb (635 kg)
Maximum per seat	
including under-seat compartment	300 lb (136 kg)
Maximum in any under-seat compartment	50 lb (23 kg)
Baggage Compartment	
Maximum distributed load	50 lb/ft <sup>2</sup> (244 kg/m <sup>2</sup> )
Maximum total 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 (73 kg) 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 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 in the right front seat. A flight instructor may act as pilot in command from the left front seat. Solo flight 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.

A functioning headset must be worn by each pilot.

## 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 -40°C (-40°F) at all altitudes.

### ***NOTE***

See fuel limitations for temperature restrictions.

Flight in known icing conditions 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 A-1 (ASTM D1655)	Anti-icing additive may be required (see below). Not approved for ambient temperatures below $-32^{\circ}\text{C}$ ( $-25^{\circ}\text{F}$ ).
Jet B (ASTM D6615)	Anti-icing additive may be required (see below). Not approved for ambient temperatures above $32^{\circ}\text{C}$ ( $90^{\circ}\text{F}$ ) at altitudes above 5000 feet.
JP-4 (MIL-DTL-5624)	Not approved for ambient temperatures above $32^{\circ}\text{C}$ ( $90^{\circ}\text{F}$ ) at altitudes above 5000 feet.
JP-5 (MIL-DTL-5624)	Not approved for ambient temperatures below $-32^{\circ}\text{C}$ ( $-25^{\circ}\text{F}$ ).
JP-8 (MIL-DTL-83133)	Not approved for ambient temperatures below $-32^{\circ}\text{C}$ ( $-25^{\circ}\text{F}$ ).
No. 3 Jet Fuel (P.R. China GB 6537-2006)	Anti-icing additive may be required (see below). Not approved for ambient temperatures below $-32^{\circ}\text{C}$ ( $-25^{\circ}\text{F}$ ).
TC-1 or PT (Russian Standard GOST 10227)	No temperature restrictions. Aviation fuel additives grades I (Fluid I) and IM (Fluid IM) with a concentration of 0.1 – 0.3% by volume are approved for anti-icing.

Anti-icing additive conforming to MIL-DTL-85470 must be added to Jet A, Jet A-1, Jet B, or No. 3 Jet Fuel when ambient temperature is below  $4^{\circ}\text{C}$  ( $40^{\circ}\text{F}$ ). Check with fuel supplier to determine if supply includes additive. If not, add per manufacturer's instructions.

**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 should not enter red. See color code on page 2-1.

#### AIRSPEED INDICATOR

Green arc	0 to 110 KIAS
Yellow arc*	110 to 140 KIAS
Red cross-hatch	100 KIAS
Red Line	140 KIAS

| \*Earlier airspeed indicators without yellow arc must have the following placard adjacent:

**DO NOT EXCEED 110 KIAS EXCEPT IN SMOOTH AIR**

#### ROTOR TACHOMETER

Lower red line	88%
Green arc	88 to 106%
Upper red line	106%

#### ENGINE TACHOMETER (N<sub>2</sub>)

Yellow arc	75 to 88% **
Power on – transient operation only. (No restrictions during autorotation.)	
Lower red line	99%
Green arc	99 to 101%
Upper red line	101%

| \*\*Earlier tachometers with yellow arc from 78 to 88% must have the following placard adjacent:

**TRANSIENT OPERATION ONLY 75-88% N2  
NO RESTRICTIONS DURING AUTOROTATION**

#### GAS PRODUCER TACHOMETER (N<sub>1</sub>)

Green arc	60 to 105%
Red line	105%
White triangle	16%
(Later tachometers. Recommended fuel ON during normal start)	

**INSTRUMENT MARKINGS (cont'd)**

**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 <sub>1</sub> )	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

**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	OAT - °C									
	-40	-30	-20	-10	0	10	20	30	40	50
ALT-FT	-40	-30	-20	-10	0	10	20	30	40	50
SL	129									127
2000	124		130					126	122	
4000	119	127			129	125	121	117	114	
6000	114	122		125	121	117	113	108		
8000	109	117	121	116	112	107	102	97		
10000	105	112	112	106	101	96	91	86		
12000	100	106	101	95	90					
14000	96	95	89							
16000	90									
BELOW 2200 LB (998 KG) TOGW, ADD 10 KIAS										

NOTE: 65 KIAS MAXIMUM ABOVE 83% TORQUE

AUTOROTATION  $V_{ne}$  - KIAS

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

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

**PLACARDS (cont'd)**

Near fuel gage:

73.6 US GAL  
279 LITERS

In clear view of pilot:

SEE PILOT'S HANDBOOK  
FOR SOLO PILOT WEIGHT  
LESS THAN 160 LB (73 KG)

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

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

**PLACARDS (cont'd)**

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 (23 KG)
- COMBINED SEAT PLUS COMPARTMENT: 300 LB (136 KG)
- MAX FILL LINE

SEE PILOT'S HANDBOOK FOR ADDITIONAL LOADING  
INSTRUCTIONS.

Inside main baggage compartment:

**CAUTION**

- MAXIMUM DISTRIBUTED FLOOR LOAD: 50 LB/FT<sup>2</sup> (244 KG/M<sup>2</sup>)
- MAXIMUM TOTAL COMPARTMENT LOAD: 300 LB (136 KG)

**SECTION 3**  
**EMERGENCY PROCEDURES**  
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## 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 – Landing site is at pilot's discretion based on nature of problem and available landing areas. Flight beyond nearest airport is not recommended.

#### POWER FAILURE – GENERAL

A power failure may be caused by either an engine or drive system failure and will usually be indicated by the low RPM horn. An engine failure may be indicated by a change in noise level, nose left yaw, an 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 airspeed.

#### ***CAUTION***

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

### POWER FAILURE ABOVE 500 FEET AGL

1. Lower collective immediately to maintain rotor RPM.
2. Establish a steady glide at approximately 70 KIAS. (For maximum glide distance or minimum rate of descent, see page 3-3.)
3. Adjust collective to keep RPM between 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 and nose straight ahead.

### POWER FAILURE BELOW 8 FEET AGL

1. Apply right pedal as required to prevent yawing.
2. Allow helicopter 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%.

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.

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

## HEADSET AUDIO FAILURE

If headset audio fails, land as soon as practical.

### ***CAUTION***

For aircraft which provide low RPM horn through the audio system, pilot will not hear horn with a failed headset.

## 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. Cabin heat – OFF (if time permits).
3. **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.
4. If time permits, apply rotor brake to stop rotors.
5. 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. HYD Switch - Verify ON.
2. If hydraulics not restored, HYD Switch - OFF.
3. Adjust airspeed and flight condition as desired for comfortable control.
4. Land as soon as practical. 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. If oil pressure gage confirms pressure loss, land immediately. Otherwise, land as soon as practical. $N_1$ below 50% RPM indicates a possible flameout and an air restart may be attempted.

## 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 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 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 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** Indicates rotor speed below 95% RPM. To restore RPM, immediately lower collective, verify throttle full open and, in forward flight, apply aft cyclic.

**COWL DOOR** Indicates baggage compartment door, fuel filler cowl door, or an engine cowl 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.

**EMU** While annunciator panel test button is depressed, indicates Engine Monitoring Unit status. See description in Section 7.

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

**HYD (if installed)** Indicates hydraulic system is switched off.

## **AUDIO ALERTS**

R66 helicopters provide the following audio alerts:

### **LOW RPM HORN**

Horn is provided by speakers in the side of the instrument console on earlier aircraft or through the audio system on later aircraft. The horn activates simultaneously with LOW RPM on the annunciator panel and indicates rotor speed below 95% RPM. To restore RPM, lower collective, verify throttle full open, and, in forward flight, apply aft cyclic. Horn is disabled when collective is full down.

### **HIGH RPM WARBLE**

On later aircraft, a warble (high/low tone) in the audio system indicates rotor speed is approaching the 106% RPM limit. Raise collective as required to control RPM.

### **HIGH TORQUE/MGT BEEP**

On later aircraft, a beeping tone in the audio system indicates either engine torque above 100% or MGT above 782°C (above 5-minute limits). Lower collective to reduce power.

A beeping tone during start indicates MGT above 860°C. To avoid exceeding 927°C start limit, immediately pull fuel cutoff OFF, wait ten seconds, then turn igniter switch OFF to stop starter.

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NORMAL PROCEDURES  
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## SECTION 4

## NORMAL PROCEDURES

## RECOMMENDED AIRSPEEDS

Takeoff and Climb	60 KIAS
Maximum Range	100 KIAS*
Maximum Cruise (Do not exceed except in smooth air, and then only with caution)	110 KIAS*
Significant turbulence	60 to 70 KIAS
Landing Approach	60 KIAS
Autorotation	60 to 70 KIAS

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

## DAILY OR PREFLIGHT CHECKS

Remove ground handling wheels and all covers and tie-downs. Remove even small accumulations of frost, ice, or snow, especially from rotor blades. Check maintenance records to verify aircraft is airworthy. 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 abnormal wear. Verify no fretting at rivets and 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 temperature increase that cannot be attributed to a change in operating conditions (mechanics draw a reference line to the right of the highest temperature square which has darkened in operation). Verify torque stripes on critical fasteners are not broken or missing.

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

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
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 no fuel odor in baggage compartment
  - 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

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

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

**CAUTION**

Do not pull down on blades to teeter rotor. To lower a blade, push up on opposite blade.

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 filler 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

**NOTE**

If shut down for more than 15 minutes, engine oil level may read low. Motor engine with starter for 30 seconds and re-check before adding oil.

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

7. Nose

- Verify pitot tube clear
- Verify windshield clean and undamaged
- Check yaw string

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***

Ensure compartments under occupied seats are not filled above maximum fill line.

***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.

**COLD WEATHER OPERATION**

Special precautions should be taken if the helicopter is to be started after a cold soak below 4°C (40°F). Since a cold battery has significantly reduced capacity, pre-heating the battery is recommended. Use auxiliary ground power if available. For consistent starts, use fuels optimized for cold weather (Jet B, JP-4). A fuel anti-icing additive may be required (see Section 2). After start, ensure engine oil temperature is 0°C minimum before increasing RPM above idle.

If cold soaked below -18°C (0°F), pre-heat the battery and engine fuel control area. The engine fuel control area may be pre-heated using a space heater. When cold soaked to -35°C (-31°F) and heated with a 3000 BTU/hr (900 W) space heater, it will require approximately 20 minutes to pre-heat the fuel control unit.

***CAUTION***

Do not use an open flame heater to pre-heat the engine or battery.

***CAUTION***

Ice in engine fuel control air circuits following a cold soak may cause uncontrolled engine acceleration during starting. If uncontrolled acceleration occurs, pull fuel cutoff OFF to shut down engine, then restart engine.

**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
<b>Fuel cutoff</b> . . . . .	<b>Pull OFF</b>
<b>Throttle</b> . . . . .	<b>Closed</b>
Start button . . . . .	Push and release, begin timing
$N_1$ . . . . .	15%, increasing
MGT . . . . .	Below 150°C
Fuel cutoff . . . . .	Push ON
Successful ignition . . . . .	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; 16%  $N_1$  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.

25% $N_1$ . . . . .	Main rotor rotating
Oil pressure . . . . .	Increasing
$N_1$ . . . . .	Stable at 65 to 67%
Fuel cutoff guard . . . . .	Install, begin timing idle
Ground power (if used) . . . . .	Disconnect
Generator . . . . .	ON
Avionics switch, headsets . . . . .	ON
Annunciator panel test . . . . .	All lights on
Audio alerts (if equipped) . . . . .	Test
Engine anti-ice check . . . . .	Annunciator light
Doors (if installed) . . . . .	Closed and latched
Cyclic/collective friction . . . . .	OFF
Hydraulic system . . . . .	Check
Lift collective slightly . . . . .	Low RPM horn
Warm-up . . . . .	Verify at least one minute idle
Throttle . . . . .	Increase slowly to full open
$N_1$ deceleration check . . . . .	as desired
$N_2/R$ . . . . .	Stable at 100% (beep as required)
Annunciator lights . . . . .	Out
Engine gages . . . . .	Normal operating range

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

***CAUTION***

For aircraft which provide low RPM horn through the audio system, a headset for each pilot is required to hear the horn.

***NOTE***

Time between starter engagement and idle should normally not exceed 40 seconds. If time exceeds 40 seconds but engine continues to accelerate, start attempt may be extended to one minute. If  $N_1$  is below 58% after one minute (or after 40 seconds if engine is not accelerating), pull fuel cutoff OFF, wait for MGT drop, and turn igniter (key) switch OFF to stop starter. To avoid overheating, allow one minute delay between start attempts. After three attempts, allow 30 minutes before next attempt.

***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***

One minute warm-up at idle not required within 15 minutes of last shutdown.

***NOTE***

When opening throttle, a target torque of at least 25% is recommended to minimize time transitioning through  $N_2$  yellow arc.

***CAUTION***

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

**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.
4. Beep RPM as required to 100%.
5. Check gages in green and note hover torque.
6. 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 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.

**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.

## CRUISE

1. Beep RPM as required to 100%.
2. Set torque as desired with collective. Observe torque, MGT, and airspeed limits. Maximum recommended cruise speed is 110 KIAS.
3. Verify gages in green, no cautions or warnings.
4. Engine anti-ice as required.

### ***CAUTION***

Do not exceed 110 KIAS except in smooth air and then only with caution. In turbulence, use lower airspeed. If turbulence is significant or becomes uncomfortable for the pilot, use 60 to 70 KIAS.

### ***NOTE***

Avoid large, rapid power changes. The engine governor reacts slowly and RPM excursions may occur.

### ***NOTE***

When loaded near aft CG limit, slight yaw oscillation during cruise can be stopped by applying a small amount of left pedal.

**PRACTICE AUTOROTATION - POWER RECOVERY*****CAUTION***

Verify a recent  $N_1$  deceleration check was performed prior to conducting autorotations. Do not close throttle above 10,000 feet density altitude or with cabin heat ON (see Section 2).

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

***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.

***CAUTION***

If entering autorotation with a rapid collective input, close throttle before lowering collective to avoid an  $N_2$  overspeed.

***CAUTION***

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

***NOTE***

For maximum glide distance and minimum rate of descent configurations, see Section 3.

## 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 frequently when practicing autorotations with ground contact. Rapid wear of skid shoes may occur.

## 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.

**DESCENT, APPROACH, AND LANDING**

1. Reduce power with collective as desired. Observe airspeed limits. Maximum recommended airspeed is 110 KIAS except in smooth air.

***CAUTION***

Do not initiate a descent with forward cyclic. This can produce a low-G condition. Always initiate a descent by lowering collective.

2. Make final approach into wind at lowest practical rate of descent with initial airspeed of 60 knots.
3. 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.)
4. From hover, lower collective gradually until ground contact.
5. 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.

***CAUTION***

Hold throttle closed if passenger is entering or exiting left front seat with engine running and left seat collective installed.

### 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***

Applying rotor brake less than one minute after fuel cutoff may cause heat damage to brake shoes and gearbox oil seal.

#### ***NOTE***

After engine shutdown, pilot should uncover one ear and listen for unusual noise which may indicate impending failure of a bearing or other component.

#### ***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<sub>1</sub> DECELERATION CHECK**

The deceleration check is performed on the ground to confirm proper fuel control operation. The check should be performed during the preflight run-up if autorotations are planned during the flight and again during shutdown. A failed check is an indication that the engine may flame out during an autorotation entry. Perform check as follows:

1. Collective full down.
2. Throttle open, N<sub>2</sub>/R at 100%.
3. If N<sub>1</sub> is below 80%, lift collective slightly to set N<sub>1</sub> at 80%.
4. Rapidly close throttle and measure time for N<sub>1</sub> to reach 70% RPM. Minimum allowable time is two seconds.

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

## AVOIDING HOT STARTS

Exceeding temperature limits during a turbine start (a "hot start") can cause severe engine damage requiring expensive repairs.

During a start, airflow through the engine controls the temperature of the combusting fuel. Spinning the compressor with the starter provides the required airflow. During an aborted start, fuel flow is stopped by pulling the fuel cutoff but the starter must continue providing airflow through the engine to control temperature. The R66 start circuit automatically keeps the starter engaged without the need to keep the starter button depressed.

Normal engine starts should have peak MGT below 800°C for cold engines or below 850°C for warm engines. If start temperatures are above these or are trending higher, engine maintenance may be required. Reduced power assurance margins accompanied by high start temperatures may indicate a dirty compressor. Fuel control adjustments can also affect start temperature. Consult a qualified turbine mechanic to diagnose any abnormal start characteristics.

Always follow the Starting Engine checklist and pay close attention to engine instruments during a start. Do not attempt a start when rushed or distracted.

### BEFORE INITIATING A START:

- Verify battery voltage is normal. If battery voltage is low (less than approximately 24.5 volts for lead-acid or 26.0 volts for lithium-ion), use ground power and/or replace battery.
- Verify fuel cutoff is pulled completely off.
- Verify twist grip is completely closed (rotated toward pilot).

**AVOIDING HOT STARTS (cont'd)****DURING A START:**

- DO NOT push fuel cutoff on until  $N_1$  is smoothly rising through 16%. If starter is sluggish or will not achieve 16%, do not introduce fuel. Switch starter off using igniter (key) switch.
- If engine is warm from a previous flight, DO NOT push fuel cutoff on until MGT is below 150°C. As starter accelerates engine to 16%  $N_1$ , MGT typically falls below 150°C. However, extra time may be required to allow residual temperature to decrease.
- After pushing fuel cutoff on, CONTINUOUSLY MONITOR MGT and KEEP HAND ON FUEL CUTOFF until  $N_1$  is above 60%.
- PULL FUEL CUTOFF IMMEDIATELY if MGT approaches 900°C. This is the most important action for stopping a hot start and should be an instinctive reaction. Wait at least 10 seconds or until MGT has decreased below 150°C. Then, switch starter off using igniter (key) switch.
- Never push fuel cutoff back on if it has been pulled off. Finish aborting the start.

## 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 feet per minute, 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.

**SECTION 5  
PERFORMANCE  
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## SECTION 5

### PERFORMANCE

#### GENERAL

Hover controllability has been substantiated in 17 knot wind from any direction up to 11,000 feet (3350 meters) density altitude. Refer to hover performance charts for allowable gross weight.

#### **CAUTION**

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

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

#### USE OF CHARTS

##### DENSITY ALTITUDE CHART

Aerodynamic performance of a helicopter rotor system is greatly affected by air density, usually stated as density altitude. Density altitude can be read from the chart using known pressure altitude and temperature. For example, the helicopter altitude limit is 14,000 feet density altitude and maximum temperature limit is ISA + 35°C. The chart shows that 14,000 feet density altitude is over 16,000 feet pressure altitude at -40°C but only 10,200 feet pressure altitude at maximum ambient temperature of 30°C.

$V_{ne}$  tables in Section 2 indicate "no flight" for altitude/temperature combinations which exceed 14,000 feet density altitude or ISA + 35°C limits. Note that the actual maximum allowable temperature at a given altitude may be greater than what is given in the tables. For example, the Density Altitude Chart shows maximum allowable temperature at 2,000 feet pressure altitude is 46°C.  $V_{ne}$  at this condition may be estimated by extrapolation from the table.

## **USE OF CHARTS (cont'd)**

### **POWER ASSURANCE CHART**

The power assurance chart shows maximum allowable MGT at a specified torque. If observed MGT is greater than indicated by the chart, the engine may not be producing the power necessary to achieve the performance data given in this section without exceeding MGT limits.

A power assurance check may be done in a hover or in forward flight and should be performed at the maximum practical power for best accuracy. The chart assumes no generator load and stabilized conditions. Temperature stabilization may take up to two minutes. Generator load should be minimal or the generator may be switched OFF during the check. An example on the chart shows correct use.

The chart may also be read in reverse, giving the minimum allowable torque at a specified MGT. It may be useful to use the chart to predict the torque available at MGT limits for a given pressure altitude and OAT.

### **HOVER PERFORMANCE**

In-ground-effect (IGE) and out-of-ground-effect (OGE) hover performance is given in the Hover Ceiling vs. Gross Weight charts on pages 5-7 and 5-8, respectively. Note that hover performance is limited by the MGT five-minute limit, not by torque or tail rotor authority. Hover performance is substantiated up to 11,000 feet (3350 meters) density altitude; however, data is presented beyond 11,000 feet density altitude only to determine performance with engine anti-ice, cabin heat, and/or generator loads over 50 amps. With anti-ice and cabin heat OFF, maximum IGE hover gross weight is 2700 lb (1225 kg) up to 11,000 feet density altitude at any OAT within limits.

To correct for anti-ice, cabin heat, and/or high generator load, increase the actual OAT as specified on the charts. The following example illustrates the calculation of an effective OAT when anti-ice and cabin heat are turned ON, and there is a 90-amp generator load (40 amps over the 50-amp load on which the charts are based):

## USE OF CHARTS (cont'd)

## HOVER PERFORMANCE (cont'd)

Pressure altitude:	9000 ft
Actual OAT:	0°C
Anti-ice ON correction:	10°C
Cabin heat ON correction:	20°C
90-amp load correction	(90-50)/20 = 2°C
Effective OAT:	0 + 10 + 20 + 2 = 32°C

9000 ft pressure altitude and 32°C OAT are therefore used with the charts, giving a maximum weight of 2580 lb (1170 kg) for IGE hover and 2320 lb (1050 kg) for OGE hover.

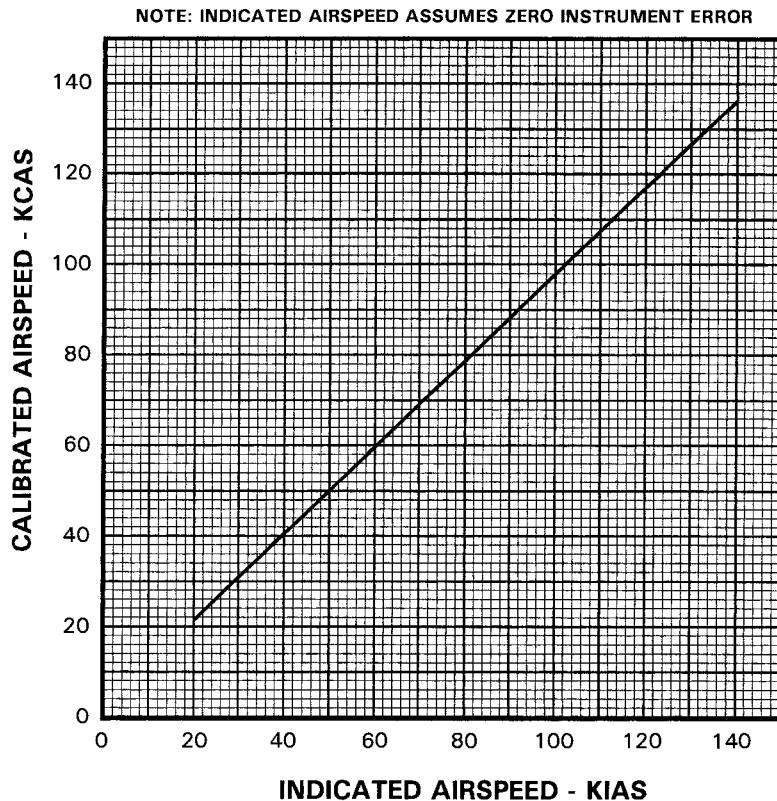
If wind is present, subtract an additional 100 lb (45 kg) IGE and 50 lb (23 kg) OGE per note on chart. This provides a power margin for transient control inputs up to 17 knot wind regardless of azimuth.

## CLIMB PERFORMANCE

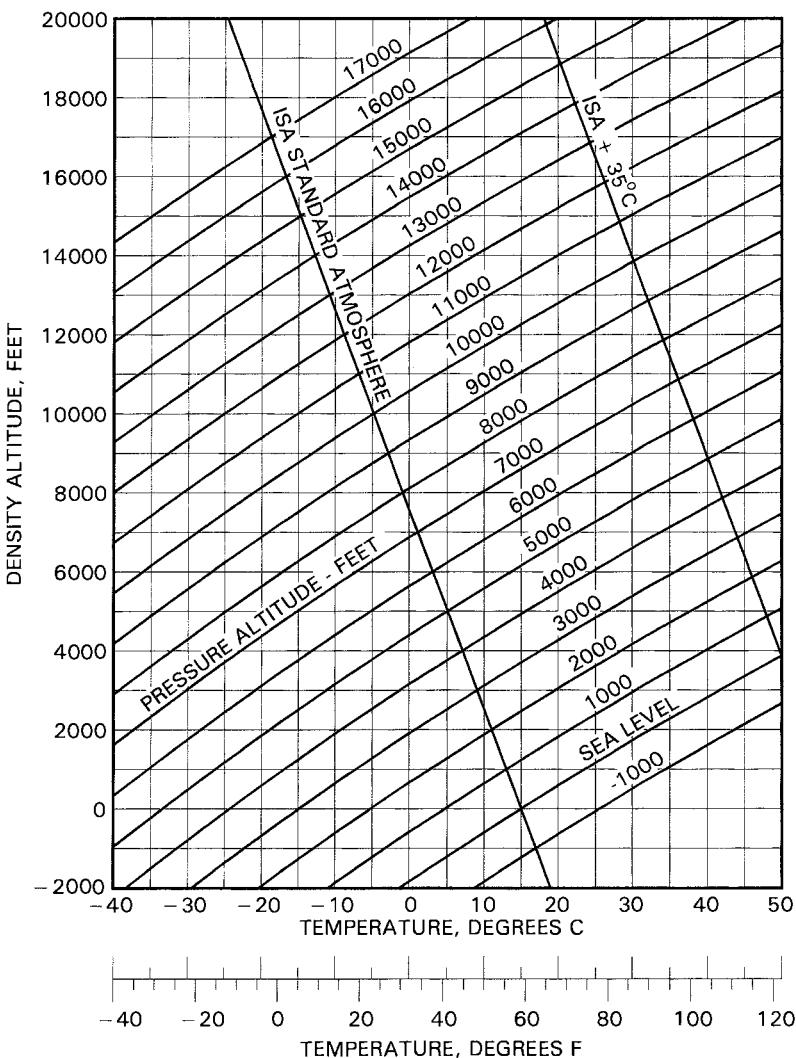
Climb performance charts are given for 2700 lb (1225 kg) and 2200 lb (998 kg) gross weight at 60 KIAS climb speed and maximum continuous torque or MGT (whichever is less). Each chart gives the potential reduction in climb rate due to anti-ice and cabin heat. The charts assume a 50-amp generator load; generator load has only a small effect on climb rate. Note that predicted climb rate is approximate; variations in aircraft and operating conditions may significantly affect performance.

## HIGH-VELOCITY DIAGRAM

The height-velocity diagram is given for maximum gross weight at sea level and at 7800 feet (2380 meters) density altitude. An appropriate line for altitudes between sea level and 7800 feet may be estimated by interpolation. For example, a line with a hover point at 600 feet AGL may be used for 3900 feet density altitude.



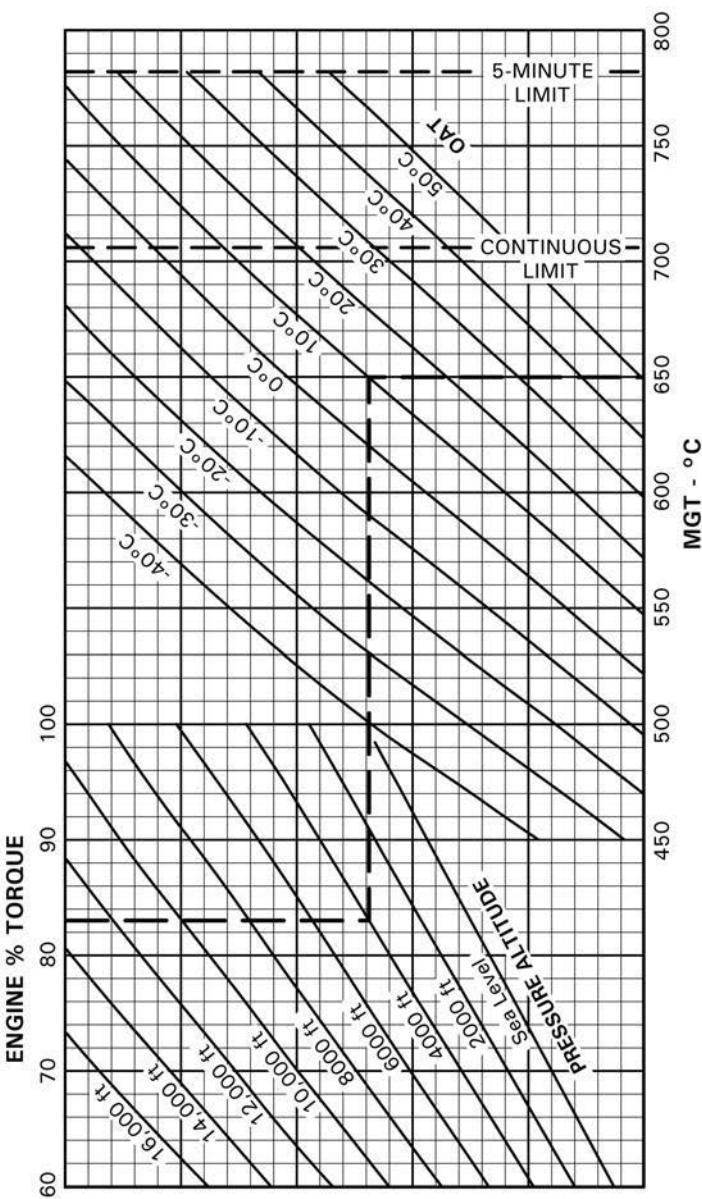
AIRSPEED CALIBRATION CURVE



DENSITY ALTITUDE CHART

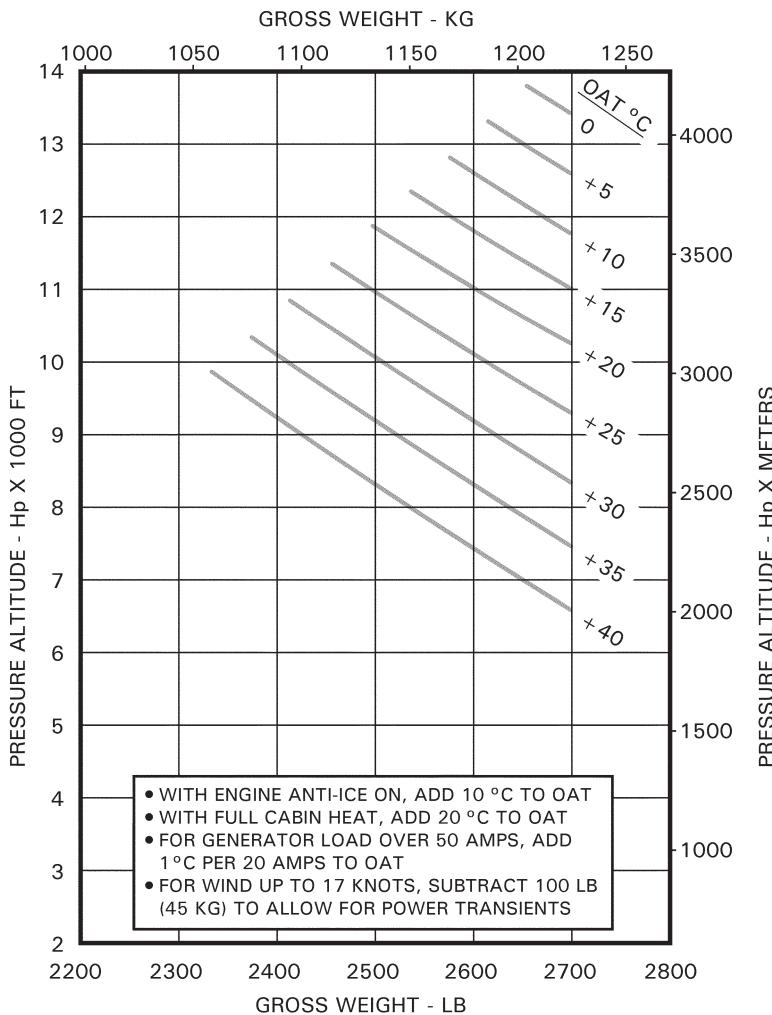
NOTES: USE CHART IN HOVER OR LEVEL FLIGHT  
HEATER AND ANTI-ICE OFF  
NO GENERATOR LOAD

EXAMPLE: ENTER CHART AT OBSERVED TORQUE (83%)  
READ DOWN TO PRESSURE ALTITUDE (4000 ft)  
READ ACROSS TO OBSERVED OAT (10°C)  
READ DOWN TO MAX ALLOWABLE MGT (650°C)



POWER ASSURANCE CHART

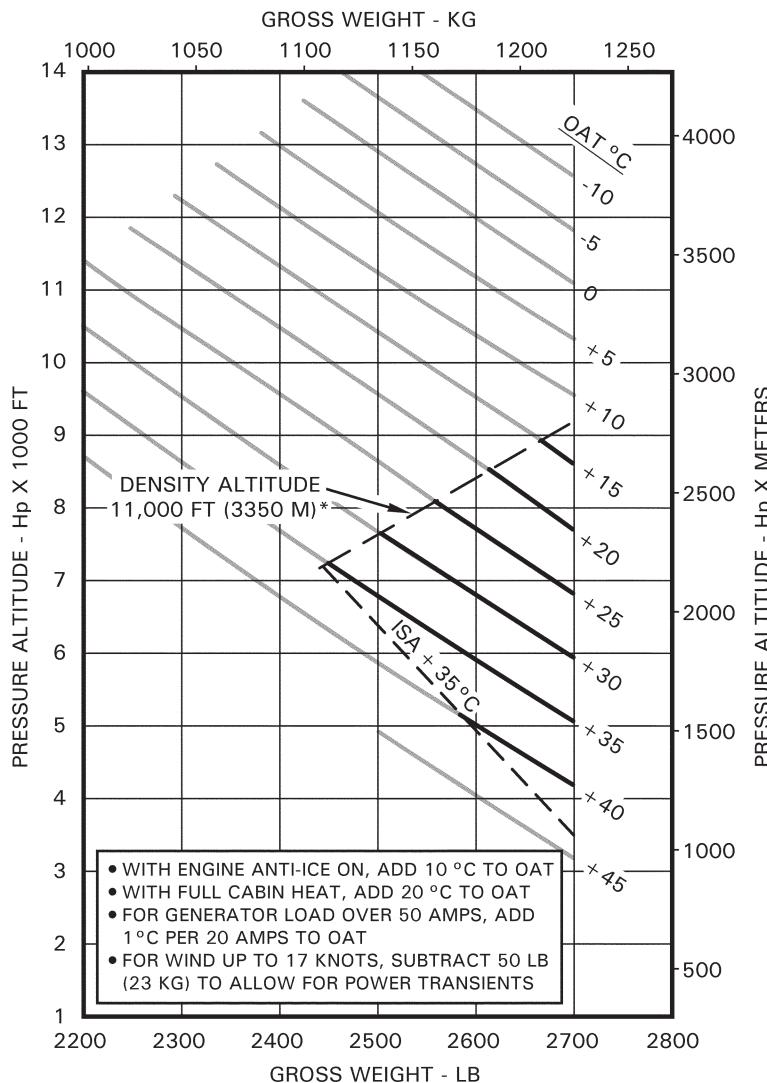
IN GROUND EFFECT AT 2 FOOT SKID HEIGHT AND ZERO WIND  
MGT 5-MINUTE LIMIT  
ENGINE ANTI-ICE AND CABIN HEAT OFF  
50 AMP GENERATOR LOAD



### IGE HOVER CEILING VS. GROSS WEIGHT

**NOTE:** Hover performance substantiated up to 11,000 feet (3350 meters) density altitude. Data is presented only to determine performance with engine anti-ice, cabin heat and/or generator loads over 50 amps.

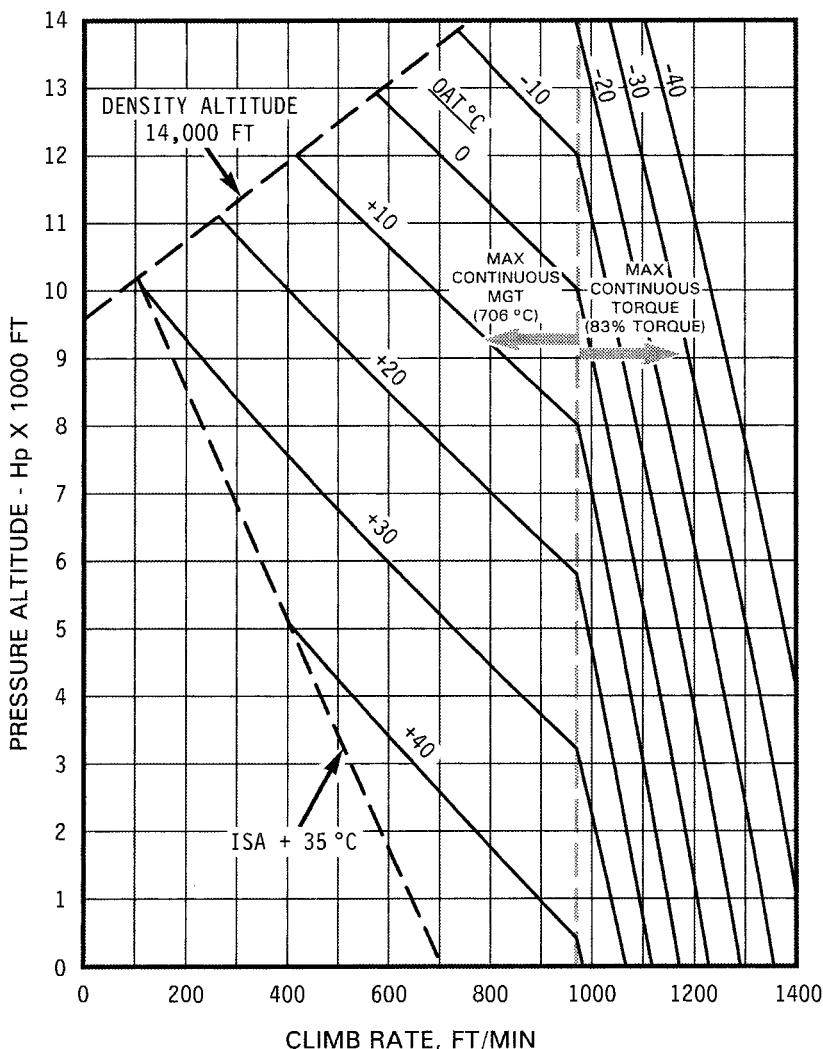
OUT OF GROUND EFFECT, ZERO WIND  
MGT 5-MINUTE LIMIT  
ENGINE ANTI-ICE AND CABIN HEAT OFF  
50 AMP GENERATOR LOAD



### OGE HOVER CEILING VS. GROSS WEIGHT

\*Hover performance substantiated up to 11,000 feet (3350 meters) density altitude. Data beyond ISA + 35°C and above 11,000 feet density altitude is presented only to determine performance with engine anti-ice, cabin heat, and/or generator loads over 50 amps.

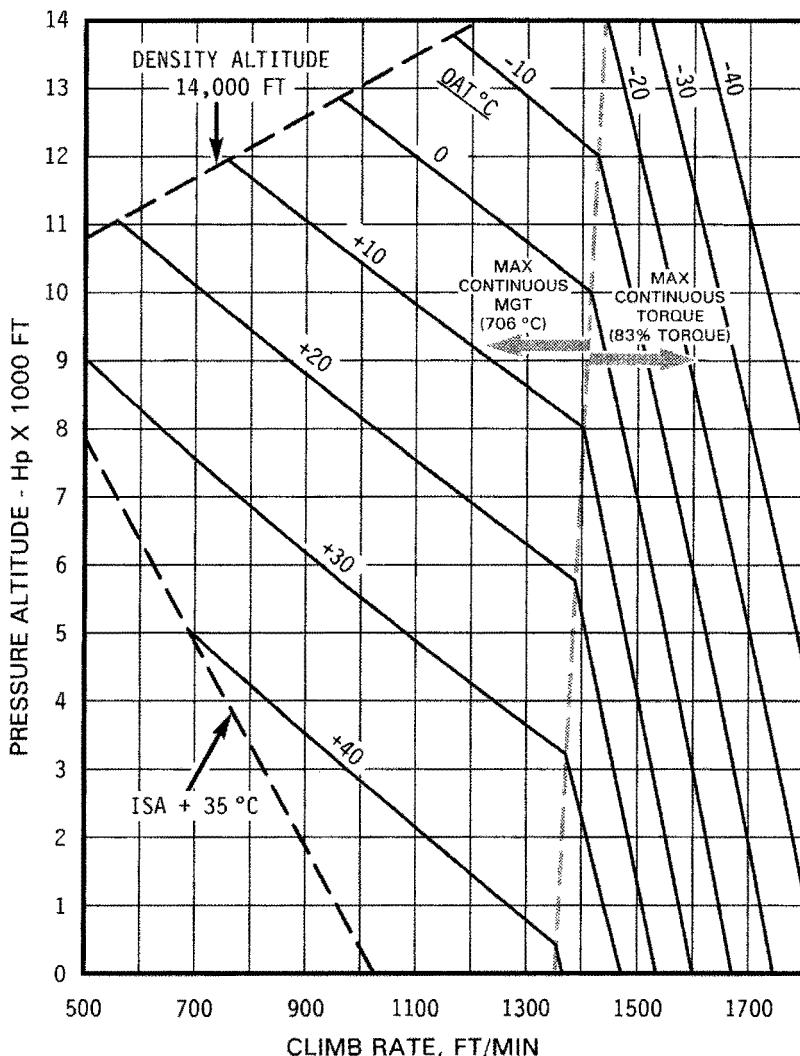
MAXIMUM CONTINUOUS TORQUE OR MAXIMUM CONTINUOUS MGT  
60 KIAS CLIMB SPEED  
ENGINE ANTI-ICE AND CABIN HEAT OFF



ENGINE ANTI-ICE MAY REDUCE CLIMB RATE UP TO 300 FT/MIN  
FULL CABIN HEAT MAY REDUCE CLIMB RATE UP TO 600 FT/MIN

CLIMB PERFORMANCE, 2700 LB GROSS WEIGHT

MAXIMUM CONTINUOUS TORQUE OR MAXIMUM CONTINUOUS MGT  
60 KIAS CLIMB SPEED  
ENGINE ANTI-ICE AND CABIN HEAT OFF

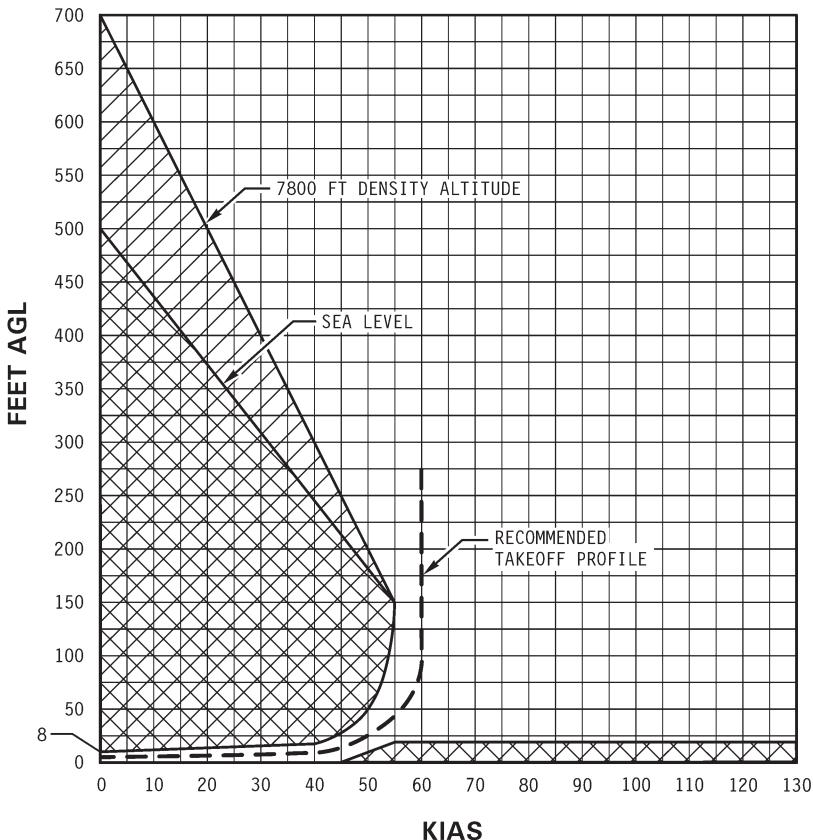


ENGINE ANTI-ICE MAY REDUCE CLIMB RATE UP TO 400 FT/MIN  
FULL CABIN HEAT MAY REDUCE CLIMB RATE UP TO 700 FT/MIN

CLIMB PERFORMANCE, 2200 LB GROSS WEIGHT

DEMONSTRATED CONDITIONS:  
SMOOTH HARD SURFACE  
WIND CALM  
2700 LB GROSS WEIGHT  
HOVER POWER + 10% TORQUE FOR TAKEOFF

AVOID OPERATION IN CROSS-HATCHED AREAS



HEIGHT - VELOCITY DIAGRAM

**NOISE CHARACTERISTICS**

The following noise levels comply with 14 CFR Part 36, Appendix H and ICAO Annex 16, Volume 1, Chapter 8 noise requirements and were obtained from FAA-approved data from actual noise tests.

Model: R66  
Engine: Rolls-Royce Model 250-C300/A1  
Gross Weight: 2700 lb (1225 kg)

Configuration		$V_h$ KTAS	Noise Level (EPNdB)		
			Flyover	Takeoff	Approach
Earlier Version	Clean	117	84.5	87.8	87.8
	Dirty	108	84.8	87.8	88.6
Later Version	Clean	117	84.2	86.2	86.1
	Dirty	109	84.6	87.1	89.5

**Notes:**

1. Configurations are:
  - Earlier version - Horizontal Stabilizer is mounted adjacent to tail gear box.
  - Later version - Horizontal Stabilizer is mounted under tailcone forward of tailrotor.
2. The dirty configuration has air conditioning and four doors with bubble windows installed, and landing gear strut fairings removed.

These noise levels meet the requirements for a Stage 3 helicopter as defined in 14 CFR Part 36.

***NOTE***

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

**SECTION 6  
WEIGHT AND BALANCE  
CONTENTS**

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**SECTION 6**

**WEIGHT AND BALANCE**

**GENERAL**

The helicopter must be flown only within weight and balance limits specified in Section 2. Loadings outside these limits can result in insufficient control travel for safe operation.

The center of gravity may be adjusted by adding removable ballast (any appropriate item of mass) to the baggage compartment and any under seat stowage area. Recalculate weight and balance after adding ballast, and verify ballast meets baggage compartment/stowage area limits given in Section 2.

Loaded helicopter weight and balance can be determined using the method given under **LOADING INSTRUCTIONS**.

In accordance with FAA procedures, the detail weight and balance data of this section are not subject to FAA approval. The loading instructions of this section, however, have been approved by the FAA as satisfying all requirements for instructions on loading of the rotorcraft within approved limits of weight and center of gravity and on maintaining the loading within such limits.

**CAUTION**

Fuel burn causes CG to move forward during flight. Always determine safe loading with empty fuel as well as with takeoff fuel. Payload may be limited by forward CG as fuel is burned.

### WEIGHT AND BALANCE RECORD

The following form should be used to maintain a continuous record of your helicopter's weight and balance. Each time an item of equipment is removed or installed, an entry must be made and the new empty CG determined. The original factory weight and configuration is supplied with each helicopter on the Weight and Balance Summary/Equipment List (RF 134) at the end of this section. The RF 134 Weight and Balance Summary provides the first entry in the Weight and Balance Record.

#### ***NOTE***

Calculated CG of empty weight plus 160 lb pilot must be STA 102.5 or forward. Following modification, adjustment to fixed nose ballast may be required. See R66 Maintenance Manual.

## WEIGHT AND BALANCE RECORD (cont'd)

## LOADING INSTRUCTIONS

The following table may be used when calculating loaded helicopter weight and CG position.

COMMON ITEM WEIGHT &amp; CG

Item	Weight (lb)	Longitudinal arm (in.)	Lateral arm (in.) ( + = right side)
Pilot (right forward seat)		49.0*	12.2
Left forward passenger		49.0*	-12.2
Aft outboard passengers		80.0	$\pm$ 16.0
Aft center passenger		78.0	0.0
Baggage under forward seats		42.0	$\pm$ 12.2
Baggage under aft seats		82.0	$\pm$ 15.0
Baggage in baggage compartment		107.0	0.0
Fuel		102.5	-3.0
Forward doors	7.5 each	49.5	$\pm$ 26.8
Aft doors	7.0 each	75.2	$\pm$ 27.2
Removable controls (cyclic, collective, pedals)	2.0	31.0	-13.0
Items on accessory mount bars		23.0	$\pm$ 14.0

\* If additional 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 center of gravity. A worksheet is provided on the page following the sample calculation for a weight and balance calculation for your helicopter. Calculated weight and balance must be compared with the CG limits given in Section 2 to determine safe loading. Both takeoff and empty fuel conditions must be within limits.

Lateral CG usually falls well within limits for conventional loadings. If an unusual lateral installation or loading occurs, lateral CG should be checked against the CG limits given in Section 2. The lateral reference 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	Weight (lb)	Location		Moment	
		Long. Arm (in.)	Lat. Arm (in.) + = Right Side	Long. (in.-lb)	Lat. (in.-lb)
Basic empty weight	1290			140610	431
Remove forward right door	- 7.5	49.5	26.8	- 371	- 201
Remove forward left door		49.5	- 26.8		
Remove aft right door		75.2	27.2		
Remove aft left door		75.2	- 27.2		
Remove left seat controls		31.0	- 13.0		
Pilot (forward right seat)	170	49.0	12.2	8330	2074
Left forward passenger	170	49.0	- 12.2	8330	- 2074
Aft right passenger	170	80.0	16.0	13600	2720
Aft center passenger	130	78.0	0.0	10140	0
Aft left passenger	170	80.0	- 16.0	13600	- 2720
Baggage under forward right seat	10	42.0	12.2	420	122
Baggage under forward left seat	10	42.0	- 12.2	420	- 122
Baggage under aft right seat	10	82.0	15.0	820	150
Baggage under aft left seat	10	82.0	- 15.0	820	- 150
Baggage in main baggage comp.	50	107.0	0.0	5350	0
Items on accessory mount bars	5	23.0	14.0	115	70
<b>Zero usable fuel weight and CG</b>	<b>2187.5</b>	<b>92.4</b>	<b>0.1</b>	<b>202184</b>	<b>300</b>
Usable main fuel at 6.7 lb/gal.	493.1	102.5	- 3.0	50543	- 1479
<b>Takeoff Gross Weight and CG</b>	<b>2680.6</b>	<b>94.3</b>	<b>- 0.4</b>	<b>252612</b>	<b>- 1179</b>

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

## LOADING INSTRUCTIONS (cont'd)

LOADING CALCULATION WORKSHEET

Item	Weight (lb)	Location		Moment	
		Long. Arm (in.)	Lat. Arm (in.) + = Right Side	Long. (in.-lb)	Lat. (in.-lb)
Basic empty weight					
Remove forward right door		49.5	26.8		
Remove forward left door		49.5	-26.8		
Remove aft right door		75.2	27.2		
Remove aft left door		75.2	-27.2		
Remove left seat controls		31.0	-13.0		
Pilot (forward right seat)		49.0	12.2		
Left forward passenger		49.0	-12.2		
Aft right passenger		80.0	16.0		
Aft center passenger		78.0	0.0		
Aft left passenger		80.0	-16.0		
Baggage under forward right seat		42.0	12.2		
Baggage under forward left seat		42.0	-12.2		
Baggage under aft right seat		82.0	15.0		
Baggage under aft left seat		82.0	-15.0		
Baggage in main baggage comp.		107.0	0.0		
Items on accessory mount bars		23.0			
<b>Zero usable fuel weight and CG</b>					
Usable fuel quantity at 6.7 lb/gal.		102.5	-3.0		
<b>Takeoff Gross Weight and CG</b>					

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

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**SECTION 7**  
**SYSTEMS DESCRIPTION**

**GENERAL**

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

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

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

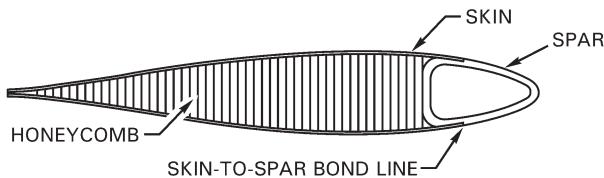
The engine is located aft of the main baggage compartment. The engine compartment is isolated from the rest of the airframe by firewalls in front of and above the engine.

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

Optional doors with large bubble windows intended for use during external load operations have specific operating limitations and procedures. See Cargo Hook Equipment Supplement.

## ROTOR SYSTEMS

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



MAIN ROTOR BLADE CONSTRUCTION

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

## DRIVE SYSTEM

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

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

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

## POWERPLANT INSTALLATION

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

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

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

### ***NOTE***

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

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

### ***NOTE***

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

## POWERPLANT INSTALLATION (cont'd)

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

## FLIGHT CONTROLS

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

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

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

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

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

## REMOVABLE FLIGHT CONTROLS

- | Left seat pilot controls may be removed and installed by maintenance personnel or pilots as follows:
  - | 1. To remove cyclic grip, remove quick-release pin by depressing button and pulling, then pull outward on left grip while supporting cyclic center post. Rotate right-side cyclic cross tube clockwise to stop, depress stop pin under cyclic pivot, and continue clockwise rotation one turn to wind up balance spring. To install removable cyclic grip, use reverse procedure.

### ***NOTE***

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

### ***CAUTION***

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

### ***CAUTION***

- | After removing cyclic grip, place plastic cap on exposed cyclic cross tube to prevent possible injury to left seat passenger.
- 2. To remove collective, push boot aft to expose locking pins. Depress locking pins and pull forward on stick. To install, use reverse procedure. It may be necessary to rotate stick slightly to allow pins to snap into place.

### ***CAUTION***

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

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

## HYDRAULIC SYSTEM

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

A sight glass for pre-flight fluid level checks is incorporated in the reservoir and accessible via a left side cowl door. A vented filler cap is located on top of the reservoir.

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

### **NOTE**

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

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

## CONTROL FRICTION ADJUSTMENT

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

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

### **CAUTION**

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

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

## ENGINE CONTROLS

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

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

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

## ENGINE CONTROLS (cont'd)

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

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

## ENGINE ANTI-ICE

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

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

### ***NOTE***

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

**STARTER AND IGNITION SYSTEM**

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

When the igniter key switch is in the enable position, depressing the start button causes a normal start sequence with the starter latching on and the igniter firing. Above 58 percent  $N_1$  RPM, the igniter will fire while the start button is depressed. The start button may be depressed any time while in flight to active the igniter. Note that the GEN annunciator will illuminate momentarily when the start button is depressed with  $N_1$  above 58 percent.

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

**NOTE**

Do not engage starter with generator circuit breaker pulled. Starter will have reduced power and may overheat.

**NOTE**

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

**FUEL SYSTEM**

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

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

**NOTE**

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

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

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

### FUEL SYSTEM (cont'd)

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

### ELECTRICAL SYSTEM

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

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

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

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

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

### ELECTRICAL SYSTEM (cont'd)

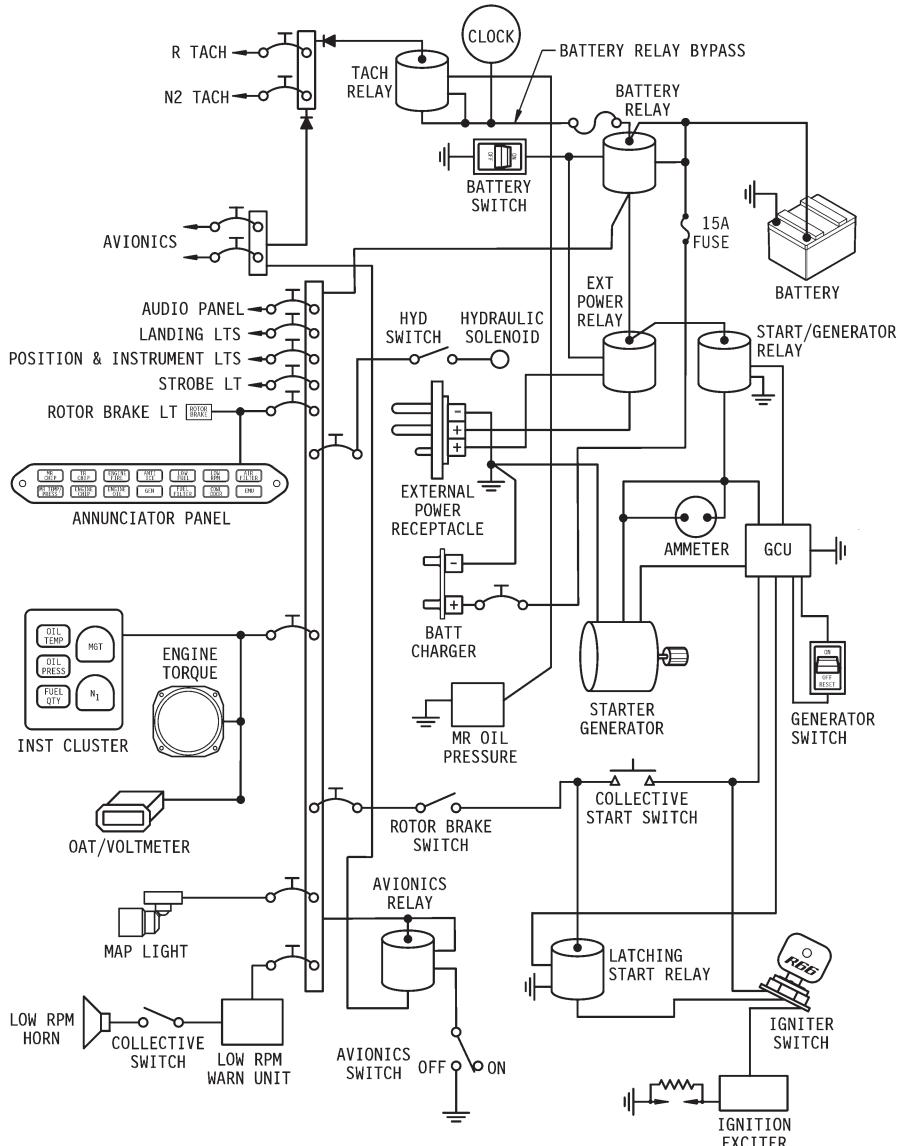
A generator control unit (GCU) controls starter-generator function. Below 58 percent  $N_1$  RPM, the GCU is in start mode regardless of generator switch position. Above 58 percent, the GCU automatically switches to generate mode. The generator switch should normally be off for starting to prevent applying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

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

#### *NOTE*

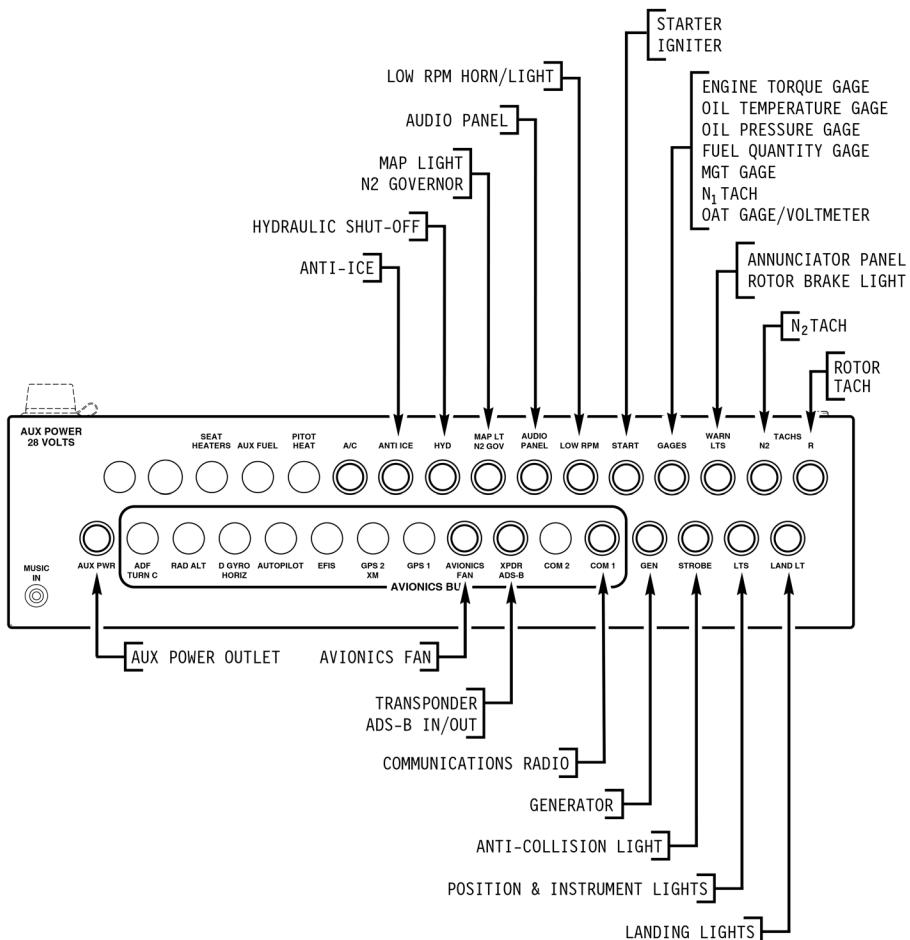
A GEN light may indicate a broken generator shaft. With a broken shaft, it will not be possible to re-start the helicopter after shutdown.

## ELECTRICAL SYSTEM (cont'd)



## ELECTRICAL SYSTEM

ELECTRICAL SYSTEM (cont'd)



CIRCUIT BREAKER PANEL – TYPICAL

## LIGHTING SYSTEM

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

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

### ***NOTE***

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

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

## EXTERNAL POWER RECEPTACLE

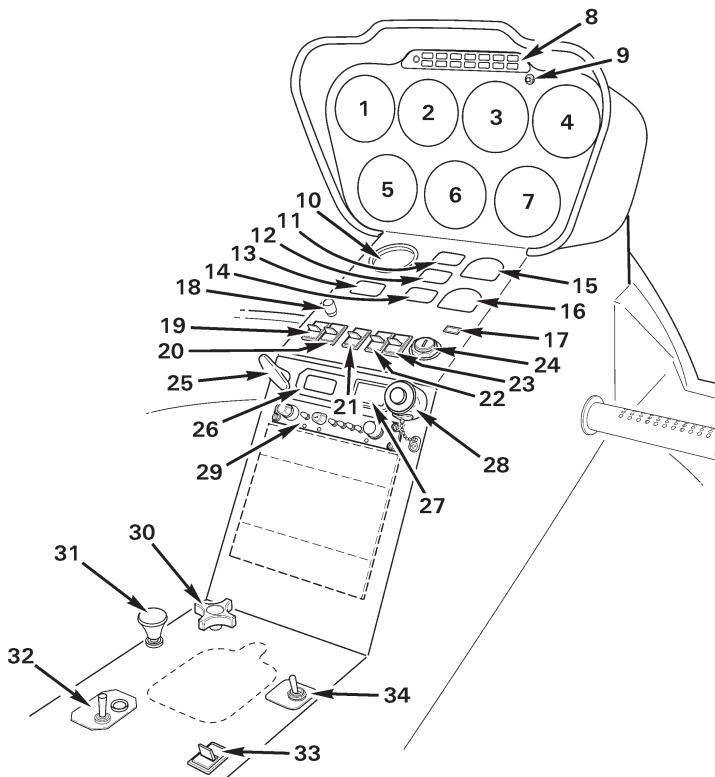
A 28-volt SAE AS35061-style receptacle is provided for external power. On earlier aircraft, the receptacle is located inside the right engine cowl door. On later aircraft, the receptacle is located in the cabin outboard of the pilot's seat. When the battery is switched on, the external power relay and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

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

## INSTRUMENT PANEL

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

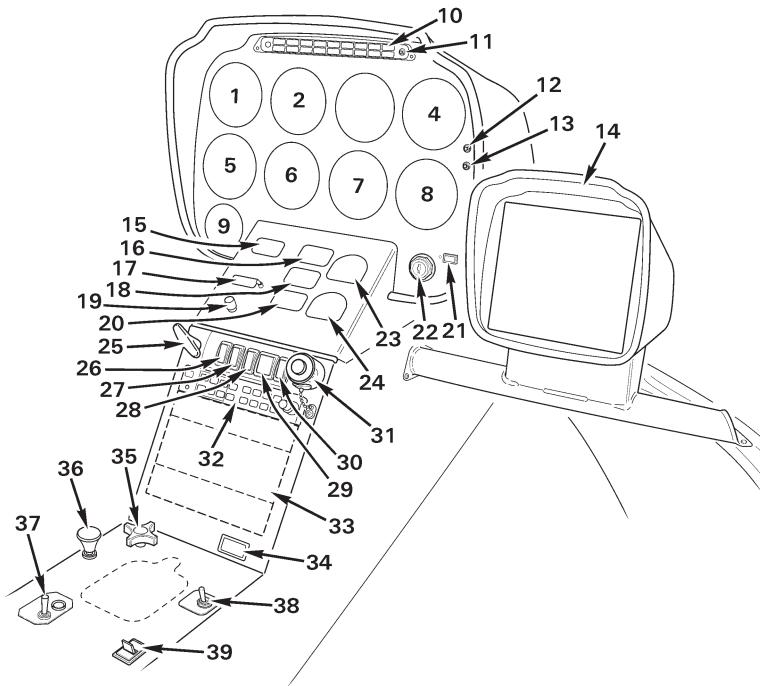
Views of typical instrument panels are given on the following pages. Additional views of panels with electronic flight displays are found in the Optional Avionics Supplement in Section 9. Pilots should familiarize themselves with panel layout and equipment installations for each specific aircraft that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



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

**INSTRUMENT PANEL – TYPICAL (EARLIER AIRCRAFT)**

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



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

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

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

## ANNUNCIATOR PANEL

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



### TYPICAL ANNUNCIATOR PANEL

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

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

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

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

**ANNUNCIATOR PANEL (cont'd)**

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

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

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

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

**AUDIO ALERTS**

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

### AUDIO ALERTS (cont'd)

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

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

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

### AUDIO SYSTEM

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

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

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

## OPTIONAL AVIONICS

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

## DUAL TACHOMETER

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

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

## PITOT-STATIC SYSTEM

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

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

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

## ENGINE MONITORING UNIT

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

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

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

**CABIN HEATING AND VENTILATION**

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

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

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

***CAUTION***

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

## SEATS, BELTS, AND BAGGAGE

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

Heated seat bottoms and backrests for the forward seats and outboard rear seats are an option. Switches to control low and high heat settings are located on the panel above the right-side collective boot. The seat heaters operate only when the generator switch is in the ON position to reduce the likelihood of inadvertently draining the battery before the engine is started.

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

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

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

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

**SEATS, BELTS, AND BAGGAGE (cont'd)**

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

**LANDING GEAR**

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

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

Abrasion-resistant wear shoes are mounted on the bottom of the skids. These shoes should be inspected periodically, particularly if autorotation landings have been performed. Have skid shoes replaced whenever the thinnest point in the wear area is less than 0.05 inches (1.3 mm).

Optional mirrors may be installed near the forward end of one or both landing gear skid tubes. Each mirror is mounted on a friction ball joint and may be adjusted to the desired angle.

## **ROTOR BRAKE**

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

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

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

### ***CAUTION***

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

## ADS-B EQUIPMENT

An Automatic Dependent Surveillance Broadcast (ADS-B) capable transponder is installed on later aircraft. The transponder transmits GPS position information to air traffic control to supplement radar/transponder information.

ADS-B “Out” capability is required for operation in certain airspace. ADS-B equipment installed at the factory meets the requirements of 14 CFR § 91.227. ADS-B Out operation is mostly automatic and requires little pilot action. Malfunctions will be annunciated on the transponder and/or GPS. Refer to transponder and GPS manufacturer’s documentation for further details on ADS-B Out equipment operation.

### ***NOTE***

ADS-B Out equipment installed at the factory operates on frequency 1090 MHz. This frequency is also accepted for ADS-B Out equipment in most countries outside the United States.

### ***NOTE***

The ability to turn off ADS-B Out broadcasts is provided via transponder controls. However, ADS-B Out is required in certain airspace. ADS-B Out should not be selected off unless directed by air traffic control.

ADS-B equipment may also receive traffic information from other ADS-B equipped aircraft and (depending on specific equipment and country of operation) additional traffic and weather information from ground stations. ADS-B equipment that receives information is known as ADS-B “In”, is not required by regulations, and is optional.

ADS-B In functionality requires a suitable display such as a moving map GPS or Multi-Function Display (MFD). ADS-B In equipment installed at the factory receives both approved US frequencies (978 MHz and 1090 MHz). Refer to avionics manufacturer’s documentation for details on ADS-B In equipment operation.

### EMERGENCY LOCATOR TRANSMITTER (OPTIONAL)

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

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

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

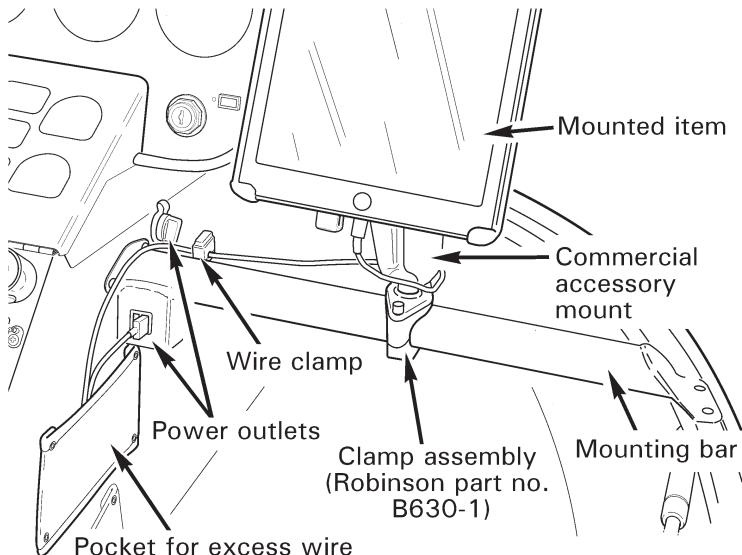
If the ELT is inadvertently activated, use the momentary RESET & TEST position of the remote switch to stop transmission and reset the unit. The red indicator will extinguish when unit is reset.

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

**ACCESSORY MOUNTS (OPTIONAL)**

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

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



## COCKPIT CAMERA (OPTIONAL)

An optional video camera may be installed in the cabin ceiling. The camera records 4K video, intercom/comm audio, and GPS position both internally and to a removable flash drive inserted in the front of the camera housing. The internal memory retains only recent video and is not user accessible. Recording starts automatically when the helicopter battery is switched on and stops when it is switched off.

Recording to the flash drive can be stopped or audio muted using the record and audio switches on the front of the camera housing. Do not remove the flash drive while a recording is in progress as this will corrupt the video file. To remove a flash drive when the helicopter battery switch is on, first stop the recording using the record switch and wait for the blue light to stop flashing.

A blue flashing light on the camera housing indicates video is being recorded to the flash drive. A green steady light indicates the camera is powered and operating normally. The green light will change to an amber flashing light if an internal camera fault is detected, in which case video may not be recorded.

Video recorded on the flash drive can be viewed on a Windows PC or Mac computer. Video is recorded in sequential 4 GB files with each file approximately 25 minutes in length. Video files are labeled HELICAM\_xxxx.MP4, where xxxx is a sequential number. GPS position and altitude are optionally displayed in the video and are also recorded separately to files labeled HELICAM\_xxxx.GPX. A 128 GB flash drive (as supplied with helicopter) will record approximately 10 hours of video. When full, the earliest video file is overwritten with the last recording.

### ***NOTE***

Flash drives must meet the criteria described in the *Cockpit Camera User Guide* in order to function reliably.

### COCKPIT CAMERA (OPTIONAL) (cont'd)

The *Cockpit Camera User Guide* is available on the Robinson website, [www.robinsonheli.com](http://www.robinsonheli.com), and includes additional information on camera operation, playback options, and troubleshooting.

### CYCLIC GUARD (OPTIONAL)

The optional cyclic guard is a bar that extends from the inboard corner of the left front seat to the instrument console. It is intended to act as a barrier to help prevent inadvertent interference with the cyclic control. The guard also provides a hand grip for a passenger's right hand.

In order to access the under seat compartment with the guard installed, pull the silver spring knob at the forward end of the guard and allow the aft end to rotate down away from the seat hinge. To re-secure the guard, lift the aft end and allow the spring knob to lock back in place.

It is recommended that the guard be installed whenever a non-pilot passenger occupies the left front seat. A pilot flying from the left seat may find that the guard contacts the right leg when feet are on the pedals. The guard should be removed prior to flight if the pilot finds it objectionable.

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SECTION 8  
HANDLING AND MAINTENANCE  
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**SECTION 8  
HANDLING AND MAINTENANCE**

**GENERAL**

This section outlines procedures recommended for handling, servicing, and maintaining the R66 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. These publications are available on RHC's website: [www.robinsonheli.com](http://www.robinsonheli.com).

Federal Regulations place responsibility for maintenance of a helicopter on the owner and operator. The owner/operator must insure that all maintenance is performed by qualified mechanics and in accordance with the R66 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
3. Current Weight and Balance

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.

## RECORDING TIME IN SERVICE

It is the operator's responsibility to maintain a record of time in service for the engine, airframe, and all life-limited components, as well as the number of start cycles for the engine. Two hourmeters are provided: the hourmeter on the console records all run time including ground idle and is provided for reference. The hourmeter located outboard of the pilot's seat is collective-activated and records run time only when the collective is raised off the down stop. The collective-activated hourmeter may be used to determine time in service for maintenance purposes, including time in service for all life-limited components.

## REQUIRED INSPECTIONS

Federal Regulations require most civil aircraft of U.S. registry to undergo a complete inspection every twelve months. This annual inspection must be signed off by a mechanic with Inspection Authorization (IA). In addition to the annual inspection, the R66 Maintenance Manual requires a complete inspection after every 100 hours of operation.

The R66 helicopter includes many unique features. Without special training, Airframe and Powerplant (A&P) mechanics are not qualified to perform the above inspections. Only appropriately rated personnel who have successfully completed a factory-approved maintenance course, or are under the direct supervision of such personnel, should perform maintenance, repairs, or inspections on the R66 helicopter.

The helicopter 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 R66 Maintenance Manual and Instructions for Continued Airworthiness. The engine also has life limits based on both time in service and start cycles. These limits are found in the RR300 Series Operation and Maintenance Manual (OMM).

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**

14 CFR Part 43 of the Federal Regulations allows a certificated pilot to perform preventive maintenance. Preventive maintenance is defined in the above regulations, and, as they apply to the R66 helicopter, include the following:

1. Remove or replace cowling or inspection panels.
2. Replace bulbs, reflectors, and lenses of position and landing lights.
3. Replace the following filters: Engine air, engine oil, fuel, main gearbox oil, and hydraulic fluid.
4. Change or replenish the following: Engine oil, main and tail gearbox oil, and hydraulic fluid.
5. Inspect and clean chip detectors.
6. Service or replace battery.
7. Replace wear shoes on landing gear skids.
8. Clean or refinish exterior of aircraft.

Although the work above 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 R66 Maintenance Manual.

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 R66 helicopter make any modification inadvisable. Dynamic characteristics and susceptibility to fatigue of the rotor, drive, and control systems make any modifications 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. The electronic tachometers and other instruments may be affected by other electronic devices and their reliability and accuracy is essential for safe operation of the helicopter. Installation of unauthorized electrical devices can result in a hazardous condition.

Because of these potential hazards, Robinson Helicopter Company does not authorize 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 may be maneuvered on the ground using ground handling wheels. Ground handling wheels are attached inboard of the landing gear skid tubes forward of the rear struts. Recommended tire pressure is 60 psi (4 bar). Wheels must be removed for flight.

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 gearbox and a second to push on the fuselage. On later aircraft, a handhold is provided inside the right-side engine cowl door. 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.

### ***CAUTION***

Horizontal stabilizer protrudes outboard beyond landing gear skid. Ensure stabilizer clearance during ground handling.

## PARKING

1. Place cyclic control in neutral position and apply friction.
2. Put collective full down and apply friction.
3. Align rotor blades approximately fore and aft. Apply rotor brake. Use blade tie-downs in windy conditions.

### ***CAUTION***

If using rotor blade tie-downs, do not overtighten tie-down straps (5 lb max tension). Do not pull down on blades to teeter rotor. To lower a blade, push up on opposite blade.

4. To prevent degradation of windshields (particularly impact-resistant windshields) due to UV light, use of a cabin cover is recommended when parked outside.
5. During storm conditions, helicopter should be hangared or moved to a safe area.

## CABIN DOORS

All four cabin doors may be removed and installed by maintenance personnel or pilots. To remove a door, disconnect door strut by lifting inboard end of strut while holding door in full open position, remove cotter rings in upper and lower hinge pins, and then lift door off. To install doors, use reverse procedure. Adjust weight and balance as required when removing or installing doors.

## **ENGINE OIL AND FILTER**

Full oil quantity is six quarts and minimum quantity for takeoff is four quarts. Quantity is indicated as follows:

Six quart indication is top of knurled section of dipstick.  
Four quart indication is bottom of knurled section of dipstick or center of oil tank sight gage.

If shut down for more than 15 minutes, some oil may drain from the oil tank to the engine giving a false low oil quantity indication. If oil level appears low, motor the engine with the starter (ignition switch off) for 30 seconds and re-check level before adding oil.

Only turbine engine oil per specification AS 5780 HPC is approved. The following products are known to meet the specification and are approved by Rolls-Royce.

<u>Product</u>	<u>Manufacturer</u>
MJO 254 or MJO 387	Exxon Mobil Lubricants
BPTO 2197	Air BP Lubricants
ETO 2197	Eastman Chemical Company

The engine oil filter is located on top of the engine and is accessible via a right side cowl door. A red indicator pin (impending bypass indicator) extends from the end of the filter housing if the filter becomes contaminated. Operation with a contaminated filter may allow oil to bypass the filter element. Oil will still be supplied to the engine but will be unfiltered. If erroneous indication is suspected, the bypass indicator may be reset by pushing it back in. If the indicator extends during next engine run or flight, service the filter. Refer to RR300 Series Operation and Maintenance Manual for servicing instructions.

Recommended engine oil change intervals are every 400 hours or 12 months. See R66 Maintenance Manual.

## HYDRAULIC FLUID

Hydraulic fluid level is indicated by a sight gage in the reservoir. The sight gage can be viewed by opening a left side cowl door. A light activated by a switch at the door illuminates the sight gage. A filler/vent cap is located on top of the reservoir. If hydraulic fluid is not visible in the reservoir sight gage with helicopter sitting level, add Robinson part number A257-15 fluid (MIL-PRF-5606) per R66 Maintenance Manual.

### *NOTE*

Sight gage reading will be higher with system hot.

## GEARBOX OIL AND FILTER

Main and tail gearbox oil quantities are indicated by sight gages. The main gearbox sight gage is on the left side of the gearbox and can be viewed by opening a left side cowl door. A light activated by a switch at the door illuminates the sight gage. The tail gearbox sight gage is located at the aft end of the tail gearbox. Both gearboxes use Robinson P/N A257-22 oil. Both gearboxes should be filled to center of sight gage with helicopter sitting level.

A filler plug is provided on top of each gearbox. See R66 Maintenance Manual for oil addition instructions.

The main gearbox oil filter is located in the gearbox compartment and is accessible via a left side cowl door. A red indicator pin (impending bypass indicator) extends from the end of the filter housing if the filter becomes contaminated. Operation with a contaminated filter may allow oil to bypass the filter element. Oil will still be supplied to the gearbox but will be unfiltered. If erroneous indication is suspected, the bypass indicator may be reset by pushing it back in. If indicator extends during next run-up or flight, service filter. Refer to R66 Maintenance Manual for servicing instructions.

**AIR FILTER**

The engine air filter element may be removed for cleaning as required. The standard foam filter element should be cleaned when visibly dirty or when contamination is indicated by the AIR FILTER annunciator. It should be replaced if foam is visibly damaged or deteriorated. The optional high-efficiency pleated-element filter should be cleaned if the sight gage indicator approaches the red line. It should also be cleaned and replaced per the schedule provided in the R66 Maintenance Manual. Servicing procedures for both styles of filter are provided in the Maintenance Manual.

***NOTE***

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

**COMPRESSOR RINSE AND WASH**

The engine requires periodic compressor rinses when operated in a corrosive atmosphere. Compressor washes must be completed at specified intervals or when engine performance is not satisfactory. Refer to R66 Maintenance Manual for compressor rinse and compressor wash procedures and recommended intervals.

**FUEL BLADDERS**

The fuel tank is equipped with a crash-resistant flexible bladder. The bladder is subject to deterioration, which may cause it to leak or seep fuel as it ages. To prolong bladder life, the fuel tank should be topped off when the helicopter is stowed to keep the bladder material from drying out. Extreme heat and water adversely affect the material. Therefore, ensure the sump is drained of water and use a hangar for stowage when possible.

## FUEL

Approved fuel grades and capacity are given in Section 2.

The aircraft should be electrically grounded prior to fueling. Grounding provisions are provided inside the fuel filler cowl door for a grounding clip or an M83413/4-1 style plug. Attach the ground cable before removing the filler cap.

On later helicopters, a fuel quantity dipstick is stowed inside the fuel filler cowl door. The dipstick is used by fully inserting it into fuel tank until the handle rests on the filler port, then blocking the vent hole on top of the handle and lifting it out of the tank far enough to see the fuel level in the tube. The dipstick indicates usable fuel quantity in U.S. gallons and is accurate only when the helicopter is parked on level ground. The dipstick will read high if the left side of the aircraft is low.

A quick drain located at the fuel tank low point is accessible via a cowl door on the left side of the aircraft. A small quantity of fuel should be drained using the quick drain prior to the first flight each day and after refueling. On later helicopters, a glass tube stowed inside the upper aft cowl door is provided which may be used to catch fuel samples. Drain enough fuel to remove any water or contaminants. If fuel contamination is suspected, continue to drain fuel until all contamination is eliminated.

The engine is equipped with a fuel filter. A switch at the filter illuminates the FUEL FILTER annunciator if the filter becomes contaminated. Fuel will continue to flow to the engine with a contaminated filter but may bypass the filter element. Refer to RR300 Series Operation and Maintenance Manual for filter servicing instructions.

**BATTERY**

The 24-volt battery is located in a compartment in the left side of the baggage compartment. The battery is sealed and does not require fluid level checks.

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.

The battery may be charged using the external power receptacle located inside the right engine cowl door. For charging currents less than 10 amps, power connected to the receptacle will flow directly to the battery without the aircraft battery switch ON. Later aircraft have a special receptacle for the Batteryminder charger (Robinson part number MT990-1 for 120-volt AC power or MT990-2 for 240-volt AC power). Use of this charger will ensure a fully-charged battery and will maximize battery life.

For information on battery replacement or capacity checks, see R66 Maintenance Manual.

**FIRE EXTINGUISHER (OPTIONAL)**

The optional fire extinguisher (model RT-A400) should be weighed monthly to verify it contains a sufficient charge of extinguishing agent. Results should be recorded on the decal affixed to the extinguisher or in other maintenance records. If weight falls below 500 grams, remove extinguisher from service.

The extinguisher is rated for a storage and operating temperature of 120°F (49°C). If operating conditions would expose extinguisher to higher temperatures (e.g. parking in the sun in a hot climate), remove extinguisher and store it in a cooler area between flights.

**CLEANING HELICOPTER****CLEANING EXTERIOR INCLUDING ROTOR BLADES**

The helicopter should be washed with mild soap and water. Harsh abrasives, alkaline soaps, or detergents should not be used because they 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 and salt residue 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. Apply carnauba wax to rotor blades and renew wax when water no longer beads on blade surface. Any good automotive wax may be used to preserve other 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.

***CAUTION***

Windshield surface must be hydrophobic (water repellent) for good visibility in rain. When using a new cleaning or polishing product on windshield, verify water beads on surface before flying.

5. On acrylic windows (standard windshield), 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.

***NOTE***

Impact-resistant windshields are made from polycarbonate with a protective hardcoat and cannot be polished.

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

**CLEANING HELICOPTER (cont'd)**

**CLEANING CARPETS**

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

**STORAGE**

The helicopter requires special preparation for long-term storage (greater than 30 days). Contact your maintenance provider to determine appropriate procedures prior to storage.

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SECTION 9  
SUPPLEMENTS

OPTIONAL EQUIPMENT SUPPLEMENTS

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

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NON-U.S. SUPPLEMENTS

The following supplements contain additional information required by certain countries:

Argentine Supplement	IAC AR Supplement
Brazilian Supplement	Israeli Supplement
Canadian Supplement	UK CAA Supplement
EASA Supplement	Ukrainian Supplement
FATA Supplement (Russia)	Uruguayan Supplement

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FAA APPROVED  
R66 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 25, 2010

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\*Manufacturer's data, not FAA approved.

**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 R66 is not certified for flight into known or suspected icing conditions.

***NOTE***

Continued use of pitot heat following a generator failure will significantly increase battery drain.

**SECTIONS 5 AND 6**      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.

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FAA APPROVED  
R66 PILOT'S OPERATING HANDBOOK

AIR CONDITIONING SUPPLEMENT

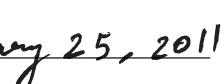
This supplement must be included in the FAA-approved Pilot's Operating Handbook when cabin air conditioning is installed.

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:

  
Manager, Flight Test Branch, ANM-160L  
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Transport Airplane Directorate

DATE:

  
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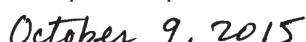
\* Manufacturer's data, not FAA approved.

REVISIONS

APPROVED BY:

  
 Manager, Flight Test Branch ANM-160L  
Federal Aviation Administration  
Los Angeles Aircraft Certification Office,  
Transport Airplane Directorate

DATE:

  
October 9, 2015

## 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

### POWER FAILURE - GENERAL

If time permits, switch air conditioning OFF to maximize glide performance.

## SECTION 4: NORMAL PROCEDURES

### BEFORE STARTING ENGINE

| Add:

A/C switch ..... OFF

### 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 seven outlets may be directed as desired.

#### *NOTE*

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

## SECTION 5: PERFORMANCE

### IGE HOVER CEILING VS. GROSS WEIGHT

With air conditioning on, add 2°C to OAT.

### OGE HOVER CEILING VS. GROSS WEIGHT

With air conditioning on, add 2°C to OAT.

### CLIMB PERFORMANCE, 2700 LB (1225 KG) GROSS WEIGHT |

Air conditioning operation may reduce climb rate up to 50 ft/min.

### CLIMB PERFORMANCE, 2200 LB (998 KG) GROSS WEIGHT |

Air conditioning operation may reduce climb rate up to 60 ft/min.

**SECTION 6: WEIGHT AND BALANCE** No change.

**SECTION 7: SYSTEMS DESCRIPTION**

The cabin air conditioning system consists of a compressor mounted to the main gearbox, a condenser and two fans mounted in the lower forward area of the engine compartment, an evaporator mounted to the front of the rear center seat, two fans mounted under the seat, an overhead outlet duct, and interconnecting lines and hoses. The system uses R-134a refrigerant.

The compressor is belt-driven from the tail rotor driveshaft and is equipped with an electromagnetic clutch. When the system is OFF, the compressor clutch is disengaged, allowing the compressor pulley to freewheel.

The fans under the rear seat draw warm cabin air through the evaporator where it is cooled. The cooled air is blown through ducts behind the center rear seat and 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. The compressor disengages when the collective is fully lowered to ensure that aircraft performance is not affected when entering autorotation. The compressor will reengage ten seconds after the collective was lowered or when the collective is raised from the full down position, whichever occurs first. 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 on the compressor. Normal charge is 2.25 lb (1.02 kg) R-134a | refrigerant. Refer to R66 Maintenance Manual for complete system service procedures.

### ***CAUTION***

System must only be serviced by qualified personnel following R66 Maintenance Manual procedures.

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FAA APPROVED  
R66 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  
Los Angeles Aircraft Certification Office,  
Transport Airplane Directorate

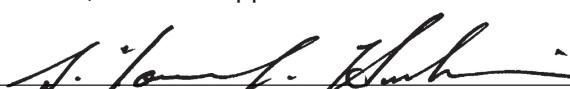
DATE:

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## LOG OF REVISIONS

Page No.	Date	Page No.	Date
9-3.1	19 Dec 2016	9-3.10	9 Oct 2015
9-3.2*	19 Dec 2016	9-3.11	19 Dec 2016
9-3.3	9 Oct 2015	9-3.12	14 Nov 2014
9-3.4	19 Dec 2016	9-3.13	9 Oct 2015
9-3.5	14 Nov 2014	9-3.14*	9 Oct 2015
9-3.6	9 Oct 2015	9-3.15*	9 Oct 2015
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9-3.8	14 Nov 2014	9-3.17*	19 Dec 2016
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\* Manufacturer's data, not FAA approved.

REVISIONS  
APPROVED BY:

Manager, Flight Test Branch ANM-160L  
Federal Aviation Administration  
Los Angeles Aircraft Certification Office,  
Transport Airplane Directorate

DATE:

December 19, 2016

**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. Intentional (non-emergency) water landings for other than training purposes are not recommended.

***NOTE***

The pop-out floats are not certified for ditching. Some countries may prohibit certain over-water operations.

## SECTION 2: LIMITATIONS

### AIRSPEED LIMITS

NEVER-EXCEED AIRSPEED ( $V_{NE}$ ) – FLOATS STOWED

All Weights	130 KIAS
Autorotation	100 KIAS

For  $V_{NE}$  reductions with altitude and temperature, see placards on page 9-3.5.

### ADDITIONAL AIRSPEED LIMITS

65 KIAS maximum above 83% torque.

With floats stowed, 100 KIAS maximum with any combination of cabin doors removed.

80 KIAS maximum for float inflation.

80 KIAS maximum with floats inflated.

115 KIAS maximum with float system armed (safety catch in READY position). |

## SECTION 2: LIMITATIONS (cont'd)

### WEIGHT LIMITS

Maximum weight  
for intentional water operations      2200 lb (998 kg)

### FLIGHT AND MANEUVER LIMITATIONS

Maximum altitude decrease with floats inflated is 4000 feet.

#### ***CAUTION***

Altitude loss greater than 4000 feet may cause floats to lose shape and rigidity due to atmospheric pressure increase. Do not inflate floats above 4000 feet AGL.

Intentional water operations at weights above 2200 lb (998 kg) are prohibited.

Intentional water operations in waves greater than 1 foot (0.3 m), trough to crest, are prohibited.

Water takeoff after an emergency water landing is prohibited unless waves are less than 1 foot (0.3 m), trough to crest, and there are no indications of damage. Subsequent flight is limited to ferrying to the nearest suitable area for inspection.

### KINDS OF OPERATION LIMITATIONS

Except for an actual emergency, night operation with floats inflated is prohibited.

### INSTRUMENT MARKINGS

#### AIRSPEED INDICATOR

Green arc	0 to 110 KIAS
Yellow arc*	110 to 130 KIAS
Red cross-hatch	100 KIAS
Red line	130 KIAS

\*Earlier airspeed indicators without yellow arc must have the following placard adjacent:

**DO NOT EXCEED 110 KIAS EXCEPT IN SMOOTH AIR**

## SECTION 2: LIMITATIONS (cont'd)

## PLACARDS

Adjacent to pilot's cyclic grip:

POWER-ON V<sub>ne</sub> - KIAS

PRESS	OAT - °C									
	-40	-30	-20	-10	0	10	20	30	40	50
ALT-FT										
SL	129									127
2000	124		130					126	122	
4000	119	127			129	125	121	117	114	
6000	114	122		125	121	117	113	108		
8000	109	117	121	116	112	107	102	97		
10000	105	112	112	106	101	96	91	86		
12000	100	106	101	95	90					
14000	96	95	89							NO FLIGHT
16000	90									

NOTE: 65 KIAS MAXIMUM ABOVE 83% TORQUE  
DO NOT EXCEED 80 KIAS WITH FLOATS INFLATEDAUTOROTATION V<sub>ne</sub> - KIAS

PRESS	OAT - °C									
	-40	-30	-20	-10	0	10	20	30	40	50
ALT-FT										
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									

Near inflation lever:

DO NOT INFLATE FLOATS ABOVE 80 KIAS

## SECTION 3: EMERGENCY PROCEDURES

### POWER FAILURE – GENERAL

#### ***CAUTION***

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

#### ***CAUTION***

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

### POWER FAILURE ABOVE 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. Adjust collective to keep RPM between 95 and 106% or apply full down collective if light weight prevents attaining above 95%.
4. If altitude permits, maneuver into wind.
5. Inflate floats.

#### ***CAUTION***

Do not inflate floats above 80 KIAS.

Do not exceed 80 KIAS with floats inflated.

6. At about 40 feet AGL, begin cyclic flare.
7. 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.
8. Maintain cyclic in touchdown position and do not lower collective full down until forward motion has stopped.

**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. Adjust collective to keep RPM between 95 and 106% or apply full down collective if light weight prevents attaining above 95%.
4. If altitude permits, maneuver into wind.
5. Inflate floats.

***CAUTION***

Do not inflate floats above 80 KIAS.

Do not exceed 80 KIAS with floats inflated.

6. Maintain airspeed until water is approached, then begin cyclic flare.
7. 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.
8. Maintain cyclic in touchdown position and do not lower collective full down until forward motion has stopped.

### 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.

With floats inflated, best glide ratio is about 5.2:1 or one nautical mile per 1200 feet AGL.

#### EMERGENCY WATER LANDING – POWER OFF

See procedures for power failures in this supplement.

#### EMERGENCY WATER LANDING – POWER ON

1. Reduce airspeed to below 80 KIAS.
2. Inflate floats.

#### ***CAUTION***

Do not inflate floats above 80 KIAS.

Do not exceed 80 KIAS with floats inflated.

3. Make normal approach and landing to water.

**SECTION 4: NORMAL PROCEDURES****DAILY OR PREFLIGHT CHECKS****9. Pop-Out Floats**

- Check float and cover condition
- Check hose and fitting condition
- Check pressure in pressure cylinder
- Verify safety pin at pressure cylinder removed
- Set inflation lever safety READY or LOCKED as desired

***CAUTION***

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

**COLD WEATHER OPERATION**

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

**FLOAT INFLATION**

The red inflation lever located under the pilot's collective is equipped with a safety catch to prevent inadvertent float inflation. Prior to overwater flight, place the safety catch in the READY position. With the safety catch in the READY position, floats may be inflated by squeezing inflation lever.

Over land, safety catch should be reset to LOCKED position.

***CAUTION***

Observe 115 KIAS speed limitation when safety catch is in READY position.

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

**FLOAT INFLATION (cont'd)**

***CAUTION***

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

***NOTE***

Some flapping of float covers during flight with floats inflated is normal. To minimize wear, consider removing covers if an extended flight with inflated floats is required.

**SECTION 4: NORMAL PROCEDURES (cont'd)****OPERATION ON WATER**

Intentional (non-emergency) operation on water is limited to maximum wave heights of 1 foot (0.3 m) (trough to crest). Maximum recommended water taxi speed is 5 knots. Some application of collective is required.

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. Avoid salt water if possible.

There may be limited tail rotor clearance to water, particularly at aft CG. Also, even small waves may cause enough rocking to dip the tail rotor in the water. If tail rotor contact with water is suspected, have tail rotor inspected prior to further flight. (If no noticeable change in vibration occurs after suspected water contact, helicopter may be repositioned to nearest convenient inspection site.)

***CAUTION***

Except for actual emergencies, maximum weight for water operation is 2200 lb.

***CAUTION***

Engine thrust will cause helicopter to drift forward. Some application of collective with aft cyclic input is required to stop drift.

***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.

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

## PRACTICE AUTOROTATION – WITH GROUND CONTACT

Same as in basic manual. Autorotations with floats stowed 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 TO WATER

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

## **CAUTION**

There may be limited tail rotor clearance to water, particularly at aft CG. Applying excessive aft cyclic may cause tail rotor to contact water.

## SHUTDOWN PROCEDURE

Add:

Inflation lever safety . . . . . LOCKED

## SECTION 5: PERFORMANCE

### **CLIMB PERFORMANCE, 2700 LB (1225 KG) GROSS WEIGHT |**

Stowed or inflated floats may reduce climb rate by as much as 250 feet per minute.

### **CLIMB PERFORMANCE, 2200 LB (998 KG) GROSS WEIGHT |**

Stowed or inflated floats may reduce climb rate by as much as 300 feet per minute.

**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 Summary provided with the helicopter. If pressure cylinder is removed, update Weight and Balance Record. A charged pressure cylinder weighs 11.4 lb. The longitudinal arm of the cylinder is 79.6 inches from datum and the lateral arm is +8.3 inches from datum.

**SECTION 7: SYSTEMS DESCRIPTION**

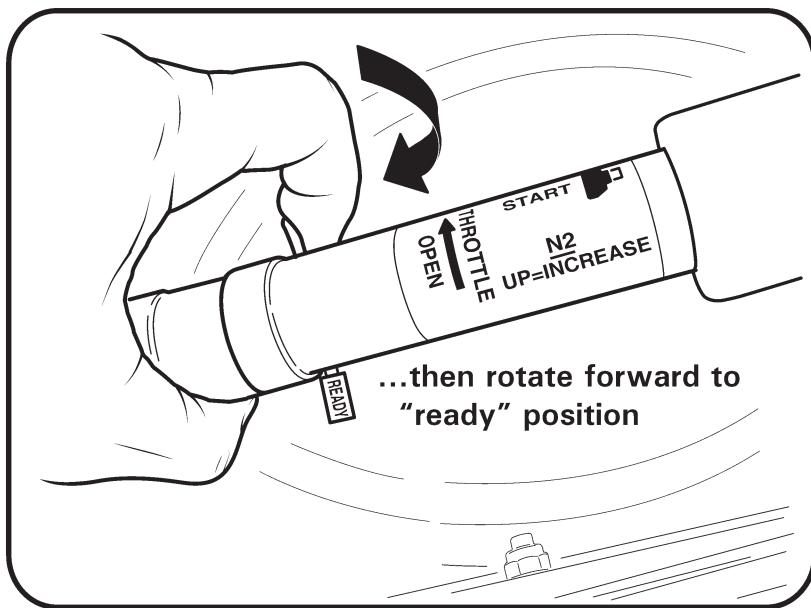
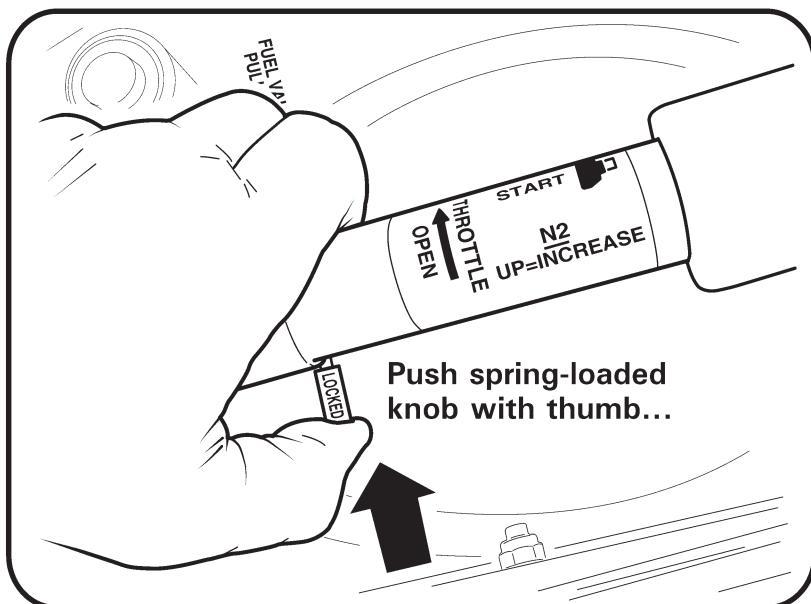
The pop-out float system consists of inflatable floats stowed in protective covers along the skid tubes, a pressure cylinder located in the compartment under the right rear seat, flexible hoses from the cylinder to the floats, an inflation lever located on the pilot's collective, an enlarged stabilizer installed at the base of the lower vertical stabilizer, and an end plate installed at the tip of the horizontal stabilizer. Sealed inspection panels and drains with check valves are installed on the cabin belly.

The pressure cylinder is of aluminum construction reinforced with carbon filament windings and is charged with helium. Proper pressure is indicated on a placard on the cylinder, and pressure can be checked using the gage on the cylinder valve.

A safety catch on the inflation lever can be set to prevent inadvertent actuation. With the safety catch in the READY position, floats are inflated by squeezing firmly on the inflation lever. (Approximately 20 lb force is required.) Float inflation time is approximately 2-3 seconds. With the safety catch in the LOCKED position, the inflation lever is locked out.

To operate the safety catch, push spring-loaded knob with thumb while rotating U-shaped pin with forefinger as shown in figure.

SECTION 7: SYSTEMS DESCRIPTION (cont'd)



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

The pop-out floats are intended for safety during over-water flights. They are not certified for ditching.

***NOTE***

Floats maintain full pressure for at least 1 hour after inflation and typically maintain shape for several hours. Monitor float pressure if helicopter remains on water for an extended period. Verify adequate pressure (approximately 0.5 to 2 psi) prior to takeoff after an extended period of inflation.

***NOTE***

Flotation stability has been substantiated for emergency water landings up to a significant wave height of 8 feet (2.4m) corresponding to World Meteorological Organization Sea State 4. However, due to random variations in real-world wind and wave conditions, there is always some chance of capsizing. Be prepared to evacuate rapidly if necessary.

## SECTION 8: HANDLING AND MAINTENANCE

### GROUND HANDLING

With floats installed, special ground handling wheels (Robinson part number MT980-1 and MT980-2) are required.

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.

### ***CAUTION***

With the safety pin installed, it is not possible to inflate the floats using the cockpit inflation lever. The safety pin is for use during maintenance and cylinder transport only and must be removed at all other times.

### 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 R66 Maintenance Manual for periodic inspection, float repacking, and cylinder recharge instructions.

### CLEANING HELICOPTER

Clean helicopter exterior per section 8 of the basic manual immediately following operation in salt water. Clean under-seat baggage compartments if damp.

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FAA APPROVED  
R66 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:

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

DATE: *September 7, 2012*

## LOG OF REVISIONS

Page No.	Date	Page No.	Date
9-4.1	03 APR 20	9-4.7*	03 APR 20
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9-4.4	03 APR 20	9-4.10*	03 APR 20
9-4.5	19 DEC 16	9-4.11*	19 DEC 16
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\* Manufacturer's data, not FAA approved.

REVISIONS  
APPROVED BY:

Nevada Jo Ryan

Digitally signed by Nevada Jo  
Ryan  
Date: 2020.04.03 12:13:07 -07'00'

Manager, West Flight Test Section, AIR-716  
Federal Aviation Administration  
Los Angeles, CA

DATE: 03 APR 2020

## **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, a flat screen monitor for viewing camera images, a video recorder, and a belly-mounted searchlight. Optional FM transceivers, a PA/Siren, Lojack equipment, and a GPS mapping system may also be installed. A dedicated, non-essential electrical bus distributes power to police equipment, and extended landing gear provides additional ground clearance for the camera and searchlight.

There are two basic cockpit configurations. See descriptions in Section 7 of this supplement.

## **SECTION 2: LIMITATIONS**

### **AIRSPEED LIMITS**

**NEVER-EXCEED AIRSPEED ( $V_{ne}$ )**

All weights	130 KIAS
Autorotation	100 KIAS

For  $V_{ne}$  reductions with altitude and temperature, see placards on page 9-4.3.

### **FLIGHT AND MANEUVER LIMITATIONS**

For cockpit configuration without left-hand cyclic grip, pilot in command must occupy right seat (see configuration description in Section 7).

## SECTION 2: LIMITATIONS (cont'd)

## INSTRUMENT MARKINGS

## AIRSPEED INDICATOR

Green arc	0 to 110 KIAS
Yellow arc*	110 to 130 KIAS
Red cross-hatch	100 KIAS
Red line	130 KIAS

\* Earlier airspeed indicators without yellow arc must have the following placard adjacent:

DO NOT EXCEED 110 KIAS EXCEPT IN SMOOTH AIR

## 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	129									127
2000	124			130				126	122	
4000	119	127			129	125	121	117	114	
6000	114	122		125	121	117	113	108		
8000	109	117	121	116	112	107	102	97		
10000	105	112	112	106	101	96	91	86		
12000	100	106	101	95	90					
14000	96	95	89							
16000	90									
										NO FLIGHT

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							
16000	82									
										NO FLIGHT

## SECTION 2: LIMITATIONS (cont'd)

### PLACARDS (cont'd)

Inside right rear under-seat compartment:

NO STOWAGE

On camera controller:

STOW DURING TAXI,  
TAKEOFF, AND LANDING

Inside main baggage compartment:

#### CAUTION

- MAXIMUM DISTRIBUTED FLOOR LOAD: 50 LB/FT<sup>2</sup> (244 KG/M<sup>2</sup>)
- MAXIMUM TOTAL COMPARTMENT LOAD: 250 LB (113 KG)

or

#### CAUTION

- MAXIMUM TOTAL BAGGAGE LOAD:  
WITHOUT AUX FUEL TANK INSTALLED: 250 LB (113 KG)  
WITH LARGE (43.5 GAL) AUX TANK INSTALLED: 50 LB (22KG)  
WITH SMALL (23.2 GAL) AUX TANK INSTALLED: 150 LB (68 KG)
- MAXIMUM DISTRIBUTED FLOOR LOAD: 50 LB/FT<sup>2</sup> (244 KG/M<sup>2</sup>)

## SECTION 3: EMERGENCY PROCEDURES

### MAXIMUM GLIDE DISTANCE CONFIGURATION

With police equipment installed, best glide ratio is about 5.1:1 or one nautical mile per 1200 feet AGL.

### MINIMUM RATE OF DESCENT CONFIGURATION

With police equipment installed, minimum rate of descent is about 1400 feet per minute. Glide ratio is about 4.3:1 or one nautical mile per 1400 feet AGL.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

Add to item 2, Fuselage Right Side:

Verify searchlight secure.

Add to item 6, Fuselage Left Side:

Verify siren secure.

Add to item 7, Nose:

Verify camera and fairing secure.

### TAKEOFF PROCEDURE

Stow camera controller during taxi and takeoff.

### APPROACH AND LANDING

Stow camera controller.

#### *NOTE*

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

## SECTION 5: PERFORMANCE

### CLIMB PERFORMANCE, 2700 LB GROSS WEIGHT

Police equipment may reduce climb rate by as much as 160 ft/min.

### CLIMB PERFORMANCE, 2200 LB GROSS WEIGHT

Police equipment may reduce climb rate by as much as 200 ft/min.

## 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

### **GENERAL**

The R66 is a four-place helicopter when police equipment is installed.

Basic descriptions of police equipment and systems are given below. More detailed information can be found in manufacturer's documents supplied with individual pieces of equipment.

### **FLIGHT CONTROLS**

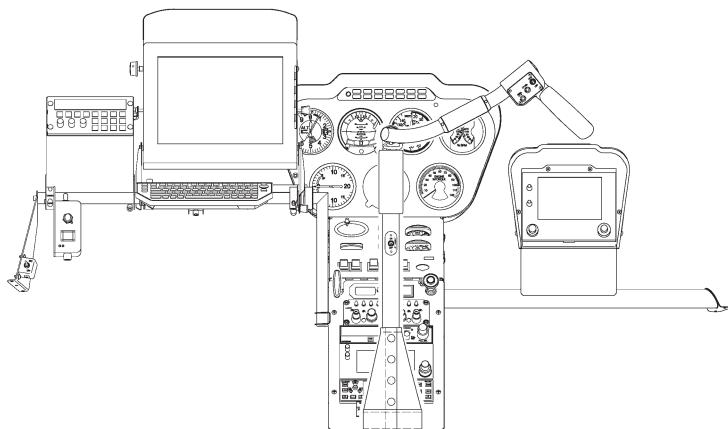
Some aircraft have a cockpit configuration that does not include the left side cyclic grip in order to prevent interference with the observer's LCD monitor.

### **INSTRUMENT PANEL**

There are two basic cockpit configurations as shown on the following page. One configuration uses a modified cyclic control without a left-side grip because the flat screen monitor would interfere. The second configuration uses the standard cyclic control with a left-side grip.

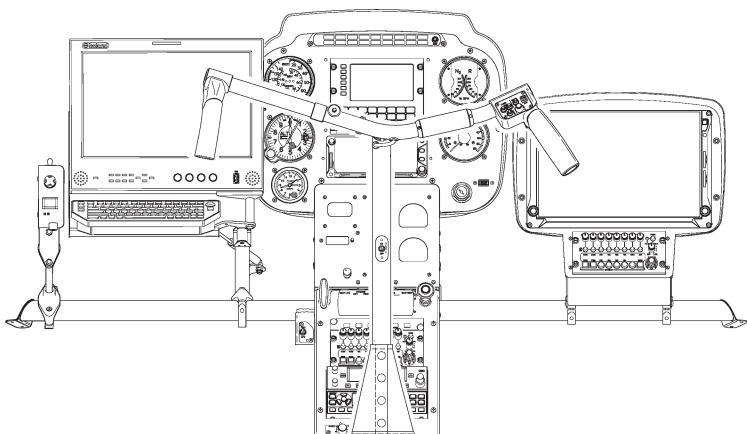
For the pilot-side flight display, a Robinson part no. D327-5 light filter may be used to reduce reflections in the windshield at night. The light filter is installed by clipping it to the front of the display. Filter use is at pilot discretion.

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



**CONFIGURATION WITHOUT LH CYCLIC GRIP**

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



**CONFIGURATION WITH LH CYCLIC GRIP**

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

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

### ELECTRICAL SYSTEM

An additional circuit breaker panel on the ledge just forward of the pilot's seat contains all circuit breakers for police equipment. Depending on installed police options, the outboard section of the aft row of circuit breakers may be a 14-volt bus 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.

#### ***NOTE***

Police circuit breaker panel will not be powered by police equipment master switch unless avionics switch is also on.

Wiring for police equipment is in a separate harness and occupies portions of the main baggage compartment, right side under seat compartments, and right rear footwell. Protective covers isolate the wiring harness as appropriate.

### AUDIO SYSTEM

Audio control panel(s) to accommodate police radios and other equipment are installed. The audio system receives power from the audio breaker on the main (left hand) circuit breaker panel. It is not connected to the police equipment master switch.

A transmit switch for the left front seat is provided on the floor near the observer's right heel. An intercom switch for the left front seat is provided either near the observer's right heel or at the outboard base of the seat box. An optional transmit switch for the left rear seat is also available. The optional switch is handheld on a cord which plugs into a jack beneath the left rear seat ICS button. Transmit functionality is tied to the selection on the observer's audio panel.

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

### SEATS, BELTS, AND BAGGAGE

The center rear seat has been replaced with an arm rest and storage console.

Baggage is not permitted in the right rear under-seat compartment due to electronic equipment and wiring in that compartment.

An interior wall has been added to the main baggage compartment to create an electronic equipment compartment at the aft end.

### LANDING GEAR

Extended forward landing gear struts provide additional ground clearance for the camera and searchlight. The ground clearance at the tail is reduced by approximately 8 inches with the helicopter parked.

### 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 main baggage compartment behind the interior wall. The camera is operated by the observer in the left front seat via a handheld controller. A tray and strap forward of the circuit breaker panel are provided for controller stowage when not in use.

A flat screen LCD monitor is located in front of the left front seat to display camera images.

For the earlier cockpit configuration, the monitor is equipped with a visor to minimize glare. The monitor mount is hinged to retract forward and down, out of the observer's way, when not in use.

For the later cockpit configuration, the monitor has no visor but is easily dimmed using a knob on its front face. The monitor mount is hinged on its inboard edge, and the monitor folds back against the left side of the instrument console, out of the observer's way, when not in use.

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

### | **DIGITAL VIDEO RECORDER (OPTIONAL)**

The digital video recorder (DVR) is mounted just aft of the space between the front backrests and controlled by a switch at the observer's station. The DVR can record images from the camera and play them back on the LCD monitor.

### **SEARCHLIGHT**

The searchlight is installed on a motorized gimbal under the belly. The searchlight power junction box is located in the right rear under-seat compartment. The searchlight is steerable in azimuth and elevation and is operated from the left front seat via a remote control. 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 hot. Exposure to the beam at close range for more than a few seconds can result in burns.

### **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.

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

### PA/SIREN SYSTEM (OPTIONAL)

A 100-watt speaker is located on the aircraft belly near the left rear landing gear strut. The PA system control panel is located in the avionics stack and allows the pilot or observer to select PA, radio, yelp, or siren for broadcast through the speaker.

### FM TRANSCEIVERS (OPTIONAL)

A multi-band FM transceiver may be mounted either next to the LCD monitor or in the main avionics stack. The FM transceiver band(s) are selectable from the audio control panel(s).

### LOJACK (OPTIONAL)

The Lojack installation consists of a receiver installed in the main baggage compartment behind the interior wall, 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.

### GPS MAPPING SYSTEM (OPTIONAL)

The GPS mapping computer is installed in the main baggage compartment behind the interior wall and allows an overhead view of the helicopter's area of operation to be displayed on the LCD monitor. The computer contains a database of streets, landmarks, and topography enabling direct navigation to street addresses and other points on the ground. The computer is accessed using a keyboard below the LCD monitor. An optional inertial monitoring unit can interface with the computer to keep the camera and/or searchlight trained on a fixed ground location while the helicopter maneuvers.

## SECTION 8: HANDLING AND MAINTENANCE No change.

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FAA APPROVED  
R66 PILOT'S OPERATING HANDBOOK

HELISAS AUTOPILOT SUPPLEMENT

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

The 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:

January 20, 2015

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\* Manufacturer's data, not FAA approved.

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Manager, West Flight Test Section, AIR-716  
Federal Aviation Administration  
Los Angeles

DATE: 16 FEB 2022

## SECTION 1: GENERAL

### INTRODUCTION

This supplement contains the changes and additional data applicable when the HeliSAS autopilot is installed.

There are two versions of the HeliSAS autopilot. The earlier version (designated Version 51) has a BC (backcourse) button on the control panel. The later version (designated Version 52) replaces the BC button with a SPD (speed) button on the control panel.

The autopilot's primary Stability Augmentation System (SAS) mode maintains a steady helicopter attitude by applying corrective inputs to the cyclic. Additional modes providing heading hold, altitude hold, airspeed control (Version 52), and navigation functionality are also selectable. The autopilot does not provide any collective or pedal inputs. The system is designed as a "fly through" system meaning the pilot can override as desired for maneuvering without disengaging the system. Only a few pounds of force at the cyclic are required for override, and the system will not disconnect due to pilot cyclic inputs.

### **CAUTION**

The autopilot is intended to enhance safety by reducing pilot workload. It is not a substitute for adequate pilot skill nor does it relieve the pilot of the responsibility to monitor the flight controls and maintain adequate outside visual reference.

**SECTION 2: LIMITATIONS****FLIGHT AND MANEUVER LIMITATIONS**

Pilot's hand must be on cyclic grip under the following conditions:

During autopilot engagement or intentional disengagement

At altitudes less than 200 feet AGL

Minimum altitude for use of autopilot ALT mode is 200 feet AGL.

For practice instrument approaches, minimum altitude for use of autopilot VRT mode is 50 feet AGL.

**SECTION 3: EMERGENCY PROCEDURES****AUTOPILOT DISENGAGEMENT OR FAILURE**

The autopilot is designed to automatically disengage if the system detects a fault. Disengagement is normally indicated by four beeps in the headset. If the autopilot does not automatically disengage, failure may be recognized by erratic cyclic control motion, abnormal cyclic stick forces, or deviations in pitch or roll.

1. Continue flight using manual control. If autopilot has not disengaged, manually disengage using cyclic AP OFF button or control panel SAS button.
2. If SAS annunciator on control panel is steady white, re-engagement may be attempted at pilot's discretion.

***CAUTION***

Although unlikely, it is possible for certain faults to cause disengagement without the four-beep aural warning.

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

### AUTOPILOT DISENGAGEMENT OR FAILURE (cont'd)

#### ***CAUTION***

Due to the unstable nature of helicopters, autopilot disengagement requires immediate pilot attention. Always monitor helicopter attitude and flight controls, and be prepared to take manual control.

#### ***NOTE***

The system automatically switches off all modes except SAS mode at airspeeds below 44 KIAS or above 140 KIAS, accompanied by a single beep. This is by design and not a system failure. The high speed limit is not intended to provide  $V_{ne}$  protection. It is the pilot's responsibility to observe  $V_{ne}$  limits.

## SECTION 4: NORMAL PROCEDURES

### **GENERAL**

Autopilot controls and operating modes are described in Section 7, Systems Description.

#### ***NOTE***

Cyclic friction must be fully off for autopilot to work properly. Cyclic friction will degrade autopilot performance.

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

### STARTING ENGINE AND RUN-UP

After "Hydraulic system", add:

Autopilot . . . . . Check

Airspeed and altitude bugs . . . . Set (Version 52)

#### ***NOTE***

For autopilot check, wear headset and ensure cyclic friction is off. Engage SAS mode. Verify cyclic exhibits centering tendency and SAS annunciator on control panel turns green. Disengage. Verify 4 beeps in headset, cyclic reverts to normal hydraulic system feel, and SAS annunciator turns white.

### TAKEOFF PROCEDURE

Autopilot SAS mode may be engaged as desired on the ground or at any time during the takeoff procedure. Re-trim as necessary to eliminate undesirable cyclic forces.

### CRUISE

Add:

Engage autopilot modes as desired. In SAS mode, re-trim as necessary to eliminate undesirable cyclic forces.

#### ***CAUTION***

It is the pilot's responsibility to monitor flight controls, aircraft flightpath, traffic, and terrain even while the autopilot is engaged. The autopilot is designed to disengage in the event of a fault. Be prepared to take control if required.

## SECTION 5: PERFORMANCE

No change.

**SECTION 6: WEIGHT AND BALANCE** No change.

## **SECTION 7: SYSTEMS DESCRIPTION**

### **AUTOPILOT**

The HeliSAS autopilot system consists of two electric servomotors, a flight control computer, an autopilot control panel, and control buttons on the cyclic grip. One servomotor controls pitch and is installed in the control tunnel forward of the cyclic stick. The other servomotor controls roll and is installed under the pilot's seat. The servomotors are connected to the cyclic through electromagnetic clutches.

The flight control computer is installed on the forward panel under the pilot's seat, and the autopilot control panel is installed in the avionics stack.

The autopilot senses aircraft attitude using a combination of sensors in the flight control computer and an independent onboard attitude source such as the Attitude Heading Reference System (AHRS) for the Primary Flight Display (PFD). The computer then sends signals to the servomotors which are connected to the bottom of the cyclic in the control tunnel.

The primary autopilot mode is Stability Augmentation System (SAS) mode which maintains a steady helicopter attitude by applying corrective inputs to the cyclic. This is felt as a light cyclic centering force. Additional modes may be layered on top of SAS mode and are described below. The pilot can override as desired for maneuvering without disengaging the system. Only a few pounds of force at the cyclic are required for override, and the system will not disconnect due to pilot cyclic inputs.

The control panel has a row of buttons to control autopilot modes and annunciators to indicate mode status. A dark annunciator indicates that a mode is off, a white annunciator indicates that a mode is armed or on standby, and a green annunciator indicates that a mode is active.

**SECTION 7: SYSTEMS DESCRIPTION (cont'd)****AUTOPILOT (cont'd)**

When the avionics master is switched on, the autopilot performs a self-test and then enters SAS standby mode. All of the control panel indicators flash alternating white and green during the self-test. Four headset beeps occur at the beginning of the self-test as a check of the aural warning function. The SAS annunciator on the control panel turns steady white when the self-test is complete.

***NOTE***

Autopilot will not enter standby mode if attitude indicator is not functioning or indicated bank angle is greater than 6 degrees.

The autopilot SAS mode is engaged either by pressing the SAS button on the control panel or by pressing the TRIM button on the cyclic for more than 1.25 seconds. Additional modes are engaged by pressing the appropriate button on the control panel. The additional modes are disabled and will not engage at airspeeds below 44 KIAS or above 140 KIAS.

To disengage any mode, push the appropriate button on the control panel.

***NOTE***

Disengaging SAS mode will also disengage all other modes.

Modes may also be disengaged using the AP OFF button on the cyclic. If only SAS mode is engaged, push the AP OFF button once to disengage. If additional modes are engaged, push the AP OFF button once to disengage all modes except SAS and a second time to disengage SAS mode, or push and hold the AP OFF button to disengage all modes including SAS.

---

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

### AUTOPILOT (cont'd)

***NOTE***

SAS disengagement should always be accompanied by four beeps in the headset. If beeps do not occur, maintenance is required.

Safety monitors automatically disengage individual modes or the entire system if a fault is detected. Automatic disengagement of SAS mode (or the entire system) is indicated by four beeps in the headset. Automatic disengagement of any mode other than SAS is indicated by a single beep in the headset. There is no audio indication for intentional disengagement of modes other than SAS.

***NOTE***

The system also automatically reverts to SAS mode at airspeeds below 44 KIAS or above 140 KIAS, accompanied by a single beep. The high speed limit is not intended to provide  $V_{ne}$  protection. It is the pilot's responsibility to observe  $V_{ne}$  limits.

The TRIM button is used to re-set the target attitude (to re-trim) while in SAS mode. Use a small amount of force to override the autopilot and then push and release the TRIM button at the new desired condition. If the force to override is objectionable, the TRIM button may be held down during maneuvers. The system will re-trim to the attitude at which the TRIM button is released. For Version 52, stick forces felt during override will gradually wash out to near zero without use of TRIM button if override is maintained.

***NOTE***

The system will not re-trim to angles more than approximately 10° in pitch or roll.

**SECTION 7: SYSTEMS DESCRIPTION (cont'd)****AUTOPILOT (cont'd)*****NOTE***

When engaging SAS mode from standby, for angles of less than approximately 10° in pitch and roll, SAS holds the current angles. If either pitch or roll is larger than approximately 10°, the system assumes an unusual attitude and gently levels the helicopter.

The autopilot is protected by a dedicated circuit breaker on the avionics bus (autopilot is not powered with the avionics master switch off).

Heading Mode (HDG) – maintains the heading selected by the heading bug on the directional gyro or Horizontal Situation Indicator (HSI) display. Aircraft can be steered using the heading bug.

Altitude Mode (ALT) – maintains altitude at the time of engagement or of last TRIM button release. The target altitude is reset each time the TRIM button is pressed and released.

***NOTE***

The autopilot uses pitch attitude to maintain altitude or follow an approach glidepath. It does not have any control of power setting. The pilot must manage power with the collective to control speed and rate of climb or descent. Make small, smooth power changes to allow the system to adjust to new power settings.

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

### AUTOPILOT (cont'd)

Navigation Mode (NAV) – tracks the active GPS or VLOC course displayed on the Course Deviation Indicator (CDI). If no CDI is installed, NAV will only track the active GPS course displayed on the GPS.

NAV may be armed prior to intercepting the active course. NAV annunciator is white when NAV is armed and turns green at course intercept. If HDG is active when NAV is armed, the autopilot will fly the selected heading until course intercept. If HDG is not active, the autopilot will select a 45° intercept angle.

Vertical Navigation Mode (VRT) – tracks an ILS glideslope or GPS approach vertical guidance. Arm VRT (annunciator turns white when armed) prior to intercepting the glidepath. VRT annunciator will turn green at glidepath intercept.

#### ***NOTE***

Pushing the ALT button while VRT is armed or active will turn off VRT. VRT must be re-armed or re-engaged as desired.

#### ***NOTE***

Reducing power to approach setting just prior to glidepath intercept is recommended.

### Speed Mode (SPD) (Version 52 only)

Speed mode uses cyclic pitch to control airspeed. Exact behavior varies with configuration of airspeed and altitude bugs on the PFD as described below.

The altitude bug is displayed above the altitude tape and the airspeed bug is displayed above the airspeed tape. The appearance of all dashes or a blank field indicates a bug is not set.

**SECTION 7: SYSTEMS DESCRIPTION (cont'd)****AUTOPILOT (cont'd)****Speed Mode (SPD) (Version 52 only) (cont'd)**

If an airspeed bug is not set, selecting SPD holds the current airspeed. The target speed is reset each time the trim button is pressed and released.

If an airspeed bug is set, selecting SPD holds airspeed at the bug setting. Changing the bug will change the target airspeed.

If an altitude bug is set, selecting SPD will also arm ALT (ALT LED white) for altitude capture. The mode will switch from SPD to ALT if the selected altitude is crossed. There will be a brief period in capture mode with the ALT LED flashing white/green.

***NOTE***

Do not change the selected altitude during ALT capture (ALT LED flashing white/green). System may pitch up or down to chase bug and may not capture altitude.

***NOTE***

Different brands of PFD behave differently in terms of bug settings at power up and how bugs are manually set. Refer to PFD manufacturer's documents for proper use. Verify desired bug settings before engaging SPD mode.

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

### AUTOPILOT (cont'd)

- | Backcourse Mode (BC) (Version 51 only) – reverse CDI sensing for backcourse approaches. Course on HSI should be set so that tail of course pointer points toward runway (set to inbound front course).
- | Airspeed Protection (Version 52 only) – Minimizes the possibility of the ALT mode to fly the helicopter to an airspeed below 44 KIAS due to insufficient power, or the VRT mode to fly the helicopter to an airspeed above 140 KIAS due to excess power when flying a precision approach glideslope. When triggered, it causes the longitudinal mode to change from ALT (at low airspeed) or VRT (at high airspeed) to SAS mode with a commanded pitch attitude of 2 degrees nose down. Since the mode change is not commanded by the pilot, a single warning beep is annunciated.

### REMOVABLE FLIGHT CONTROLS

On later aircraft, disconnect the electrical connector for the left-hand trim button located near the quick release pin before removing the left cyclic grip. Reconnect the connector when installing the left cyclic grip.

## SECTION 8: HANDLING AND MAINTENANCE

No change.

## SECTION 10: SAFETY TIPS

The autopilot is intended to reduce pilot workload and enhance safety. It is important that pilots do not misuse this capability and allow their attention to be diverted. Pilots should continue monitoring the flight controls and helicopter attitude as well as looking for traffic and other obstacles. Autopilot disengagement requires immediate pilot attention. Pilots must always be prepared to take manual control.

The autopilot is not certified for flight in Instrument Meteorological Conditions (IMC). Adhering to appropriate VFR weather minimums is essential for safety.

If an inadvertent loss of outside visual reference occurs, the pilot must regain visual conditions as quickly as possible while avoiding abrupt, disorienting maneuvers. The following procedure is recommended:

1. If not already engaged, immediately engage autopilot SAS mode and allow autopilot to recover from unusual attitude if one has occurred.
2. Select a heading and altitude to ensure terrain and obstacle clearance. Turns and/or climbs may be required. Engage additional autopilot modes as desired for workload reduction.
3. While maintaining terrain and obstacle clearance, maneuver toward conditions of improved visibility.

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## AUXILIARY FUEL SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when the auxiliary fuel system 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

Los Angeles Aircraft Certification Office,  
Transport Airplane Directorate

DATE:

  
February 17, 2010

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\* Manufacturer's data, not FAA approved.

## REVISIONS

APPROVED BY:

Digitally signed by HIEN H TONG  
Date: 2019.08.15 11:15:18 -07'00'Manager, West Flight Test Section, AIR-716  
Federal Aviation Administration  
Los Angeles, CA

DATE: 15 AUG 2019

## **SECTION 1: GENERAL**

### **INTRODUCTION**

This supplement contains changes and additional data applicable when the auxiliary fuel system is installed. The system may be configured with either a large fuel tank with a 43.5 US gallon capacity or a small fuel tank with a 23.2 US gallon capacity.

## **SECTION 2: LIMITATIONS**

### **WEIGHT LIMITS**

Baggage Compartment with auxiliary fuel tank installed:

Maximum distributed load	50 lb/ft <sup>2</sup> (244 kg/m <sup>2</sup> )
Maximum total load	
with large tank installed	100 lb (45 kg)
with small tank installed	200 lb (90 kg)

### **FUEL LIMITATIONS**

#### **AUXILIARY FUEL CAPACITY**

Transferable to main tank:

Large auxiliary tank	43.5 US gallons (165 liters)
Small auxiliary tank	23.2 US gallons (88 liters)
Non-transferable:	0.2 US gallons (0.8 liters)

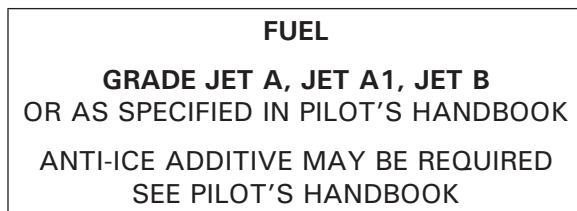
#### ***NOTE***

Fuel in auxiliary tank is not usable fuel for flight planning purposes until it is transferred to the main tank.

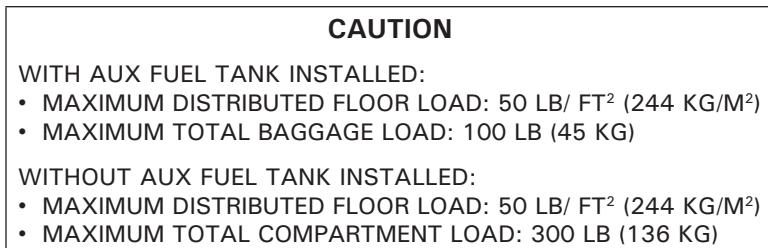
**SECTION 2: LIMITATIONS (cont'd)**

**PLACARDS**

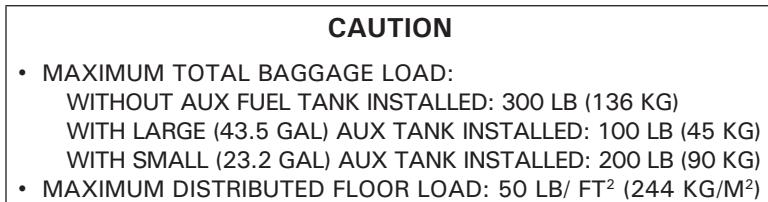
Near auxiliary fuel tank filler cap:



Inside main baggage compartment:



or



## SECTION 3: EMERGENCY PROCEDURES

### AMBER CAUTION INDICATORS

NO FLOW  
(on AUX FUEL  
panel)

When transfer pump is switched on, indicates fuel is not transferring from auxiliary tank to main tank. When pump is first switched on, it is normal for light to illuminate for approximately 5 seconds while system is priming. Otherwise, light indicates either auxiliary tank is empty or transfer pump has failed. Switch pump off to extinguish light.

#### *NOTE*

Light also illuminates when quantity button is pressed to verify circuit is functioning.

**SECTION 4: NORMAL PROCEDURES****DAILY OR PREFLIGHT CHECKS**

Add to item 1, Pilot's Station:

Verify aux fuel pump is off.

While battery switch is ON, press QUANTITY button to check aux fuel quantity and verify NO FLOW light illuminates.

Add to item 2, Fuselage Right Side:

Verify aux fuel tank is secure and no leaks

Verify aux fuel quantity and filler cap secure

Sample aux fuel, drain water and contaminants

Stow drain hose and latch baggage door

**BEFORE STARTING ENGINE**

Add:

Aux fuel pump . . . . . OFF

**AUX FUEL PUMP OPERATION**

After engine start, auxiliary fuel transfer pump may be turned on as desired. The aux fuel pump may be left on even when the main tank is full. Excess fuel is recirculated to the auxiliary tank. Switch aux fuel pump off when the auxiliary fuel tank is empty (indicated by the NO FLOW light).

***NOTE***

The fuel transfer system has no redundancy in case of pump failure. Therefore, fuel is not usable for flight planning purposes until it is transferred to the main tank.

**SHUTDOWN PROCEDURE**

Add:

Aux fuel pump . . . . . OFF

**SECTION 5: PERFORMANCE**

No change.

**SECTION 6: WEIGHT AND BALANCE****WEIGHT AND BALANCE RECORD**

Basic empty weight and CG with auxiliary fuel system installed is included in the Weight and Balance Summary provided with the helicopter.

**LOADING INSTRUCTIONS**

The following table may be used when calculating loaded helicopter weight and CG position.

Item	Weight (lb)	Longitudinal arm (in.)	Lateral arm (in.) (+ = right side)
Fuel, large auxiliary tank		101.0	+ 1.0
Remove large auxiliary tank	-30.0	101.0	+ 1.5
Remove large support tray	-3.0	101.0	-1.2
Fuel, small auxiliary tank		96.8	+ 2.9
Remove small auxiliary tank	-23.0	96.8	+ 3.5
Remove small support tray	-2.0	96.8	-0.4
Baggage in baggage compartment with large auxiliary tank installed		117.0	0.0
Baggage in baggage compartment with small auxiliary tank installed		113.0	0.0

***CAUTION***

- When large tank is full, auxiliary fuel system weighs over 320 lb (145 kg). Do not exceed helicopter weight limits.

## SECTION 7: SYSTEMS DESCRIPTION

The auxiliary fuel system consists of a removable fuel tank located in the forward section of the baggage compartment, hoses connecting the auxiliary tank to the main fuel tank, and a small control panel on the instrument console.

The auxiliary fuel tank includes a crash-resistant bladder in an aluminum and fiberglass enclosure, an internal fuel transfer pump, a quantity sender, a filler port, and a sump drain. The filler port and sump drain are accessed by opening the baggage door. The tank mounts on a separate fiberglass tray which is also removable.

The pump transfers fuel to the main tank at approximately 40 gallons per hour (150 liters per hour). Venting is provided through a second hose connected to the main tank. If the main tank is full, any excess fuel transferred by the pump returns to the auxiliary tank through the vent hose.

A fuel flow sensor is located at the fitting where transferred auxiliary fuel enters the main tank (hose connection near the main tank filler port). The sensor illuminates the NO FLOW light on the control panel when the pump switch is on but the fuel transfer rate is less than ten gallons per hour.

The AUX FUEL control panel on the console includes a pump switch, a NO FLOW annunciator light, and a QUANTITY button. The pump switch engages the transfer pump. When the pump switch is on, the NO FLOW light indicates fuel is not transferring from auxiliary tank to the main tank, either because the auxiliary tank is empty or the pump has failed. It is normal for the light to illuminate for approximately five seconds when the pump is first switched on while the system is priming.

A time-delay circuit automatically switches the pump off if the NO FLOW light is illuminated for more than 15 seconds. The light will remain on even after the time delay has removed power from the pump. Turning the pump switch off will extinguish the light.

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

While the QUANTITY button is depressed, the fuel quantity gage indicates fuel quantity in the auxiliary tank instead of the main tank. The NO FLOW light also comes on while the QUANTITY button is depressed to provide a test of the circuit and to confirm that the auxiliary tank quantity is being displayed on the fuel gage.

The auxiliary fuel tank has two drains through the belly of the helicopter. Any fuel spilled at the filler port is collected by the surrounding scupper and drains through a hose into the outboard belly drain location. The tank support tray has a drain at the inboard drain location. Fuel leaking from the inboard drain indicates a possible leak in the fuel bladder.

A sump drain hose stowed vertically along the right side of the tank allows preflight fuel sampling from the low point of the tank. To sample fuel, extend hose away from the helicopter and push in on the valve. The valve may be locked open to allow draining of the tank.

Operationally, the fuel transfer pump may be switched on any time at the pilot's discretion. If the main tank is full, any excess fuel transferred from the auxiliary tank will return through the vent/return hose. Note that fuel in the auxiliary tank is not considered usable for flight planning purposes because the fuel transfer system has no redundancy in case of pump failure.

The auxiliary fuel tank may be removed to provide additional baggage space. The separate support tray may also be removed. A small container which may be clipped to the outboard side of the tank is provided for stowing installation hardware. Refer to the R66 Maintenance Manual for removal and installation procedures.

## SECTION 8: HANDLING AND MAINTENANCE

No change.

FAA APPROVED  
R66 PILOT'S OPERATING HANDBOOK

## LITHIUM-ION BATTERY SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when the lithium-ion main battery 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:

  
for Manager, Flight Test Branch ANM-160L  
Federal Aviation Administration  
Los Angeles Aircraft Certification Office,  
Transport Airplane Directorate

DATE:



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\* Manufacturer's data, not FAA approved.

REVISIONS  
APPROVED BY:

Nevada Ryan

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Manager, West Flight Test Section, AIR-716  
Federal Aviation Administration  
Los Angeles, CA

DATE: 23 DEC 2022

## SECTION 1: GENERAL

### INTRODUCTION

This supplement contains changes and additional data applicable when the lithium-ion main battery is installed.

## SECTION 2: LIMITATIONS

No change.

## SECTION 3: EMERGENCY PROCEDURES

### AMBER CAUTION INDICATORS

BATT FAULT      Indicates abnormal battery operation. Charging, discharging, or both may be disabled. Land as soon as practical. Generator will continue to supply power in flight.

#### *NOTE*

Battery's internal circuitry may disable charge/discharge functions due to over-temperature, over/under voltage, or excessive current draw. A flashing light means the fault may be recoverable (battery will reset itself) either when the condition improves or during a power cycle at the next landing. A steady light means battery maintenance or replacement will likely be necessary.

## SECTION 4: NORMAL PROCEDURES

### COLD WEATHER OPERATION

The lithium-ion battery has a built-in heater, so battery preheating is not required. When the battery switch is ON, the BATT HEATER light illuminates during the heating cycle and extinguishes when the battery is warm enough to attempt a start. The indicator light is disabled after engine start, but the heater will continue to cycle as required to maintain optimum battery temperature.

### STARTING ENGINE AND RUN-UP

After Battery switch ON, add:

Battery heater indicator light ..... Extinguished

#### *NOTE*

A battery without sufficient charge to start the engine will not have the normal indications of starter sluggishness associated with a lead-acid battery. Instead, the battery's monitoring circuit will suddenly interrupt power to the starter. If this occurs, immediately abort start by pulling fuel cutoff.

## SECTION 5: PERFORMANCE

No change.

## SECTION 6: WEIGHT AND BALANCE

No change.

## SECTION 7: SYSTEMS DESCRIPTION

### ELECTRICAL SYSTEM

A 17 amp-hour lithium-ion battery replaces the lead-acid main battery. The battery includes built-in circuitry that monitors temperature, voltage, and current draw and manages battery charge and discharge. The circuitry automatically disables charge and/or discharge if any electrical or thermal problems are detected. The battery uses lithium-iron-phosphate chemistry which is less susceptible to thermal runaway than some other lithium battery chemistries.

The metal battery case is designed to contain any heat or gases generated within the battery and is vented overboard on the left side of the aircraft. No venting should occur during normal operation.

Two annunciator panel segments, BATT FAULT and BATT HEATER, indicate battery status. Earlier aircraft have two indicator lights located to the left of the annunciator panel.

BATT FAULT illuminates if the battery has an over- or under-voltage condition, an over-temperature condition, or if current draw exceeds limits. A flashing light indicates a recoverable fault. The light may go out if the fault corrects itself (e.g. temperature decrease) or may go out as a result of a power cycle at the next landing. A steady light indicates battery maintenance or replacement may be required. The emergency procedure for a fault light (flashing or steady) is to land as soon as practical. The generator will continue to supply electrical power during the landing.

**SECTION 7: SYSTEMS DESCRIPTION (cont'd)****ELECTRICAL SYSTEM (cont'd)**

The battery incorporates an internal heater for cold weather operation. The heater attempts to maintain a battery temperature of at least 50°F (10°C). When the battery is switched ON, BATT HEATER illuminates while the heater is warming the battery and extinguishes when the battery is warm enough to attempt an engine start. On very cold days, the heating cycle may take 10 minutes or more. The heater light is disabled while the engine is running but the heater will continue to function as long as the battery switch is ON.

If a start is attempted with insufficient charge, the battery's safety monitors may interrupt power. In the event of a power interruption, a small backup power supply will allow the MGT and N<sub>1</sub> gages as well as the Engine Monitoring Unit to continue functioning. The backup power supply also provides power to the map light. The backup power supply consists of two 9-volt batteries installed in the compartment under the left front seat. The 9-volt batteries are non-rechargeable and should be replaced periodically as indicated in the R66 Maintenance Manual.

***NOTE***

The backup batteries will discharge if the battery switch is ON and the main battery is discharged or disconnected. Backup batteries should be replaced if battery switch was left ON without main battery power.

**SECTION 8: HANDLING AND MAINTENANCE**

Nominal charging voltage for the lithium-ion battery is 28.8 volts. Some lead-acid chargers may not provide enough voltage to fully charge the battery. Ensure charging equipment is compatible with lithium-ion batteries.

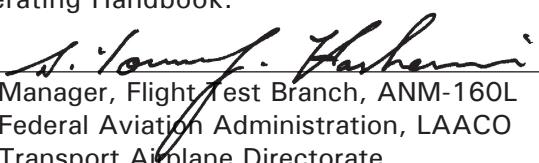
Refer to the R66 Maintenance Manual for additional handling and maintenance instructions.

FAA APPROVED  
R66 PILOT'S OPERATING HANDBOOKELECTRONIC NEWS GATHERING (E.N.G.) VERSION  
SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when Electronic News Gathering (E.N.G.) 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 DirectorateDATE: June 30, 2017

## LOG OF REVISIONS

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9-9.8*	30 Jun 17		

\* Manufacturer's data, not FAA approved.

**SECTION 1: GENERAL**

**INTRODUCTION**

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

The E.N.G. version is equipped with a nose-mounted, gyro-stabilized video camera, microwave transmitting equipment, and related video and audio components to allow on-scene video and audio recording as well as relay of video and audio to ground stations. A rear center equipment console replaces the center rear seat and houses various audio and video controls. Extended landing gear provides additional ground clearance for the nose camera and belly-mounted microwave antenna. Typical crew configuration includes a camera operator who controls the news equipment from the left rear seat. E.N.G. equipment is described in detail in section 7.

## SECTION 2: LIMITATIONS

### AIRSPEED LIMITS

#### NEVER-EXCEED AIRSPEED ( $V_{ne}$ )

All weights	120 KIAS
Autorotation	100 KIAS

For  $V_{ne}$  reductions with altitude and temperature, see placards on page 9-9.4.

### WEIGHT LIMITS

#### Baggage Compartment:

Maximum distributed floor load:	50 lb/ft <sup>2</sup> (244 kg/m <sup>2</sup> )
Maximum total baggage load:	250 lb (113 kg)

### FLIGHT AND MANEUVER LIMITATIONS

Rear seat main monitor must be stowed below 500 feet AGL.

Camera laptop controller must be stowed during taxi, takeoff, and landing.

### INSTRUMENT MARKINGS

#### AIRSPEED INDICATOR

Green arc	0 to 110 KIAS
Yellow arc	110 to 120 KIAS
Red cross hatch	100 KIAS
Red line	120 KIAS

## SECTION 2: LIMITATIONS (cont'd)

## 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										
2000			120							
4000	119							117	114	
6000	114					117	113	108		
8000	109	117		116	112	107	102	97		
10000	105	112	112	106	101	96	91	86		
12000	100	106	101	95	90					
14000	96	95	89							NO FLIGHT
16000	90									

NOTE: 65 KIAS MAXIMUM ABOVE 83% TORQUE

AUTOROTATION  $V_{ne}$  - KIAS

G654-14

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

On rear seat main monitor:

MONITOR MUST BE STOWED  
WHEN BELOW 500 FEET AGL

On laptop camera controller:

STOW DURING TAXI, TAKEOFF,  
AND LANDING

Inside right rear under-seat compartment:

NO STOWAGE

Inside main baggage compartment:

## CAUTION

- MAXIMUM DISTRIBUTED FLOOR LOAD: 50 LB/FT<sup>2</sup> (244 KG/M<sup>2</sup>)
- MAXIMUM TOTAL COMPARTMENT LOAD: 250 LB (113 KG)

### SECTION 3: EMERGENCY PROCEDURES

#### POWER FAILURE ABOVE 500 FEET AGL

Add:

If time permits, stow main rear seat monitor and laptop controller.

#### MAXIMUM GLIDE DISTANCE CONFIGURATION

With E.N.G. equipment installed, best glide ratio is about 4.8:1 or one nautical mile per 1300 feet AGL.

#### MINIMUM RATE OF DESCENT CONFIGURATION

With E.N.G. equipment installed, minimum rate of descent is about 1600 feet per minute. Glide ratio is about 3.8:1 or one nautical mile per 1600 feet AGL.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

Add to item 3, Tailcone, Empennage, and Tail Rotor:

    Verify security of camera on horizontal stabilizer

Add to item 4, Belly:

    Verify security of microwave antenna pod

Add to item 7, Nose:

    Verify security of camera and fairing

Add to item 8, Cabin area:

    Verify security or proper stowage of cameras, monitors, and control panels.

### ***CAUTION***

Talent lights and video monitors can be distracting for some pilots during dark, night conditions. Ensure proper crew coordination prior to switching on equipment, and set brightness levels to pilot preference.

### TAKEOFF PROCEDURE

Add:

    Stow rear seat main monitor and laptop camera controller.

### DESCENT, APPROACH, AND LANDING

Add:

    Stow rear seat main monitor and laptop camera controller.

## **SECTION 5: PERFORMANCE**

### **CLIMB PERFORMANCE, 2700 LB GROSS WEIGHT**

E.N.G. equipment may reduce climb rate by as much as 350 ft/min.

### **CLIMB PERFORMANCE, 2200 LB GROSS WEIGHT**

E.N.G. equipment may reduce climb rate by as much as 450 ft/min.

## 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 R66 is a four-place helicopter when E.N.G. equipment is installed.

Basic descriptions of news gathering equipment and systems are given below. More detailed information can be found in manufacturer's documents supplied with individual pieces of equipment.

### **ELECTRICAL SYSTEM**

An additional circuit breaker panel on the ledge just forward of the pilot's seat contains all circuit breakers for E.N.G. 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 E.N.G. equipment.

### ***NOTE***

E.N.G. circuit breaker panel will not be powered by news equipment master switch unless avionics switch is also on.

## 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 main baggage 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 in the recess at the aft end of the rear equipment console.

#### ***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 right rear seat. Power is supplied via a 5-amp circuit breaker in the main circuit breaker panel on the left hand side of the aircraft. Power to the audio system is not disconnected by the news equipment master switch.

The pilot's audio panel is located on the accessory bar in front of the pilot's seat. 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. With the toggle switch up, the ICS slider controls volume, and the VOX slider (adjacent to the left) controls voice-activation threshold. VOX slider full down is maximum threshold (keyed intercom). Pushing the ICS pushbutton (illuminating the green LED) provides hot mic regardless of VOX slider position.

The first detent of the pilot's trigger switch is the intercom key. The second detent transmits on the #1 VHF communications radio regardless of audio panel configuration. The audio panel transmit thumb button transmits on the panel-selected audio component.

A toggle switch to the left of the pilot's audio panel 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 the radio display can be used to verify transmission.)

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

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

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 copilot'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.

The left front seat audio panel also controls the audio configuration for the right rear seat.

The left rear seat audio panel is connected to the left rear seat headset jack. 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 and video recorder. 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 LCD monitors mounted to the left and right of the instrument console. 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 one large main LCD monitor mounted to the cross tube between the front seatbacks and either one or two smaller LCD monitors mounted near the longitudinal tube running above the rear center equipment console.

The large, main LCD monitor is mounted on a pivoting arm. The pivoting arm allows the monitor to be rotated between the stowed position inboard and operating position directly in front of the camera operator. A spring-loaded pin beneath the pivot locks the monitor in the stowed position. Pulling the pin releases the monitor for use. The Velcro tether attached to the monitor should be wrapped around the seat back cross tube to hold the monitor in the operating position. Detaching the tether will cause the monitor to return to the stowed position. Verify monitor locks in position after detaching tether.

***NOTE***

Monitor must be stowed below 500 ft AGL. If not stowed, the monitor is a potential source of head injury in an accident.

The main rear LCD monitor may be switched between three input signals. Input A displays nose camera, micro camera, or video recorder images as selected by the video switcher. Input B bypasses the video switcher and displays nose-camera images directly. The accessory input bypasses the video switcher and displays annotated nose-camera images.

One or two smaller auxiliary monitors are installed near the longitudinal tube above the rear equipment console and display TV broadcasts as selected by the TV tuner(s).

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

### VIDEO SWITCHER

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

### TV TUNER

The TV tuner is mounted in the rear equipment console and is used to select television broadcasts to be displayed on the monitors. A second tuner is optional.

### MICRO CAMERA SYSTEM

The micro camera system consists of three small cameras and their control units. The micro cameras are mounted at the tip of the horizontal stabilizer, on the windshield bow, and in the center of the cabin. The control units are located in the rear equipment console. The horizontal stabilizer camera is enclosed in a weatherproof case.

### VIDEO RECORDER

The video recorder is located on the cross tube between the front seatbacks and has a built-in monitor and controls.

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

**MICROWAVE SYSTEM**

The microwave transmitting system consists of a microwave transmitter, power amplifier, control panels, and a directional antenna pod.

The microwave transmitter is located in the main baggage compartment. The control panel for the transmitter is located in the rear equipment console.

The directional antenna pod is located beneath the aircraft belly at approximately the center of the cabin, and the power amplifier is mounted on top of it. The directional antenna pod contains a GPS tracking system which keeps the antenna aimed at a ground-based receive site. The antenna has its own control panel located in the rear equipment panel.

**FM TRANSCEIVERS**

FM transceiver #1 is mounted in the lower instrument panel, and FM transceivers #2 and #3 are mounted in the rear equipment console. All 3 transceivers are selectable from any of the three main audio control panels.

**AM/FM RECEIVERS**

An optional AM/FM receiver may be mounted in the rear equipment console. The receiver is selectable from any of the three main audio control panels.

**SCANNER**

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

## 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 left front seat occupant (typically a reporter) during broadcasts in low-light conditions. Beam elevation is adjustable via a friction mount. The aft talent light is mounted on top of the center-cabin camera and is used to illuminate rear seat areas as desired. The forward light is controlled by a toggle switch on the rear equipment console, and the aft light is controlled by a switch on the light itself.

### ***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 in the compartment under the right rear seat due to electronic equipment and wiring in that area.

### LANDING GEAR

Extended forward landing gear struts provide additional ground clearance for the camera and directional microwave pod. Ground clearance at the tail is reduced by approximately 8 inches with the helicopter parked.

## SECTION 8: HANDLING AND MAINTENANCE

For ground handling, a second set of wheel installation supports is provided forward on the landing gear skids. For ground handling using MT950 towcart, install wheels at forward supports and use cart at aft cross tube as indicated on cart instructions. For ground handling without towcart, wheels may be installed at all four support locations.

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FAA APPROVED  
R66 PILOT'S OPERATING HANDBOOK

## CARGO HOOK EQUIPMENT SUPPLEMENT

This supplement must be included in the FAA-approved Pilot's Operating Handbook when the factory-supplied cargo hook and associated 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:

*Acting**Hien Tong*  
Manager, West Flight Test Section, AIR-716  
Federal Aviation Administration  
Los Angeles, CA

DATE:

*July 6, 2018*

## LOG OF REVISIONS

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\* Manufacturer's data, not FAA approved.

REVISIONS  
APPROVED BY:

Nevada Ryan

Digitally signed by Nevada Ryan

Date: 2022.12.23 08:07:08 -06'00'

Manager, West Flight Test Section, AIR-716  
Federal Aviation Administration  
Los Angeles, CA

## **SECTION 1: GENERAL**

### **INTRODUCTION**

This supplement applies to:

- Belly-mounted cargo hook
- Electric and manual cargo release systems
- Left side cyclic control with hydraulic switch and left side collective control with start button
- Load-weigh system
- Provisions for remote control of equipment carried by cargo hook
- Forward door(s) with large bubble window
- Skid-mounted cargo mirror(s)

Limitations are found in Section 2 and equipment descriptions are found in Section 7 of this supplement.

All of the following combinations of hook-related equipment are approved flight configurations:

- Cargo hook installed or removed
- Left side cyclic with hydraulic switch and/or left side collective with start button installed or removed

#### ***NOTE***

Controls without switch/button may also be substituted. In this case, observe right seat solo flight limitation from basic handbook.

- One or both doors with large bubble window installed or removed
- One or both skid mirrors installed or removed

The cargo hook installation is not compatible with pop-out floats.

## SECTION 2: LIMITATIONS

### AIRSPEED LIMITS

#### ADDITIONAL AIRSPEED LIMITS

100 KIAS maximum when one or both forward cabin doors with a large bubble window are installed.

80 KIAS maximum with any external load on hook.

#### ***CAUTION***

Maximum safe airspeed with external load depends upon load configuration. It is the operator's responsibility to establish a maximum airspeed for each specific load.

### POWERPLANT LIMITATIONS

During external load operations, maximum transient torque of 110% for up to 10 seconds is permitted for hover and hovering maneuvers.

#### ***NOTE***

Transient torque allowance is permitted only at airspeed below effective translational lift (approximately 15 to 20 knots) to account for pilot reaction to gusts or other momentary conditions while operating with heavy external loads.

### WEIGHT LIMITS

Maximum external load: 1200 lb (544 kg)

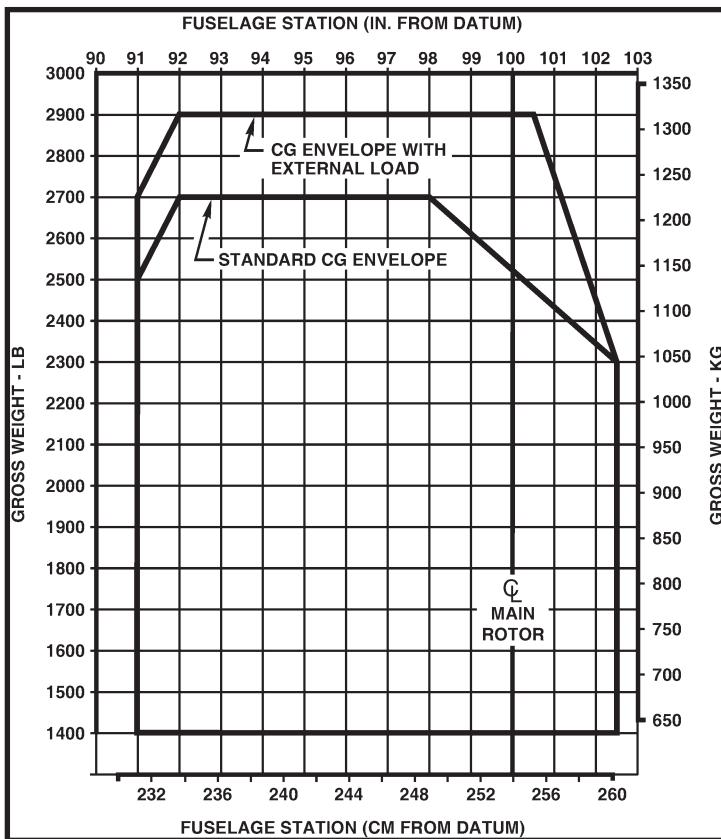
Maximum combined weight of helicopter and external load: 2900 lb (1315 kg)

(Weight above 2700 lb must be jettisonable external load. Maximum weight on landing gear is 2700 lb.)

## SECTION 2: LIMITATIONS (cont'd)

## CENTER OF GRAVITY LIMITS

See figure below for longitudinal CG limits for helicopter with external load. Lateral CG limits are unchanged. Weight above standard CG envelope must be jettisonable external load.



## LONGITUDINAL CENTER OF GRAVITY LIMITS

## SECTION 2: LIMITATIONS (cont'd)

### FLIGHT AND MANEUVER LIMITATIONS

Maximum operating density altitude 7000 feet for combined weight of helicopter and external load above 2700 lb.

Solo flight from left seat permitted provided left seat cyclic with hydraulic control switch is installed, left seat collective with engine start button is installed, and forward right seat belt is buckled.

Autorotations for any reason other than an actual emergency prohibited while carrying external load.

### KINDS OF OPERATION LIMITATIONS

Non-human external cargo only.

Night operations prohibited while carrying external load.

#### *NOTE*

External load equipment certification does not constitute operational approval. Operational approval for external loads must be granted by the local aviation authority.

Night operations prohibited with one or both doors with a large bubble window installed.

**SECTION 2: LIMITATIONS (cont'd)**

**PLACARDS**

Near hook on aircraft belly:

HOOK LOAD LIMIT 1200 LB (544 KG)

In clear view of pilot:

MAX SPEED WITH EXT LOAD 80 KIAS

NON-HUMAN EXTERNAL CARGO ONLY  
NIGHT OPERATIONS PROHIBITED WHILE  
CARRYING EXTERNAL LOAD

On door(s) with large bubble window:

WITH THIS DOOR INSTALLED:  
• MAXIMUM SPEED 100 KIAS  
• NIGHT FLIGHT PROHIBITED

**SECTION 2: LIMITATIONS (cont'd)**

**PLACARDS (cont'd)**

Near each cyclic release button:

HOOK RELEASE

Near each mechanical release knob:

HOOK RELEASE

The following placard is not required on left cyclic grip with hydraulic switch:

SOLO FROM RIGHT SEAT ONLY

## SECTION 3: EMERGENCY PROCEDURES

### POWER FAILURE – GENERAL

In case of power failure, release cargo using HOOK RELEASE after entering autorotation.

#### ***CAUTION***

Consider people and property on ground when releasing cargo.

### MAXIMUM GLIDE DISTANCE CONFIGURATION

With one or both doors with a large bubble window installed, best glide ratio is about 4.8:1 or one nautical mile per 1300 feet AGL.

### MINIMUM RATE OF DESCENT CONFIGURATION

With one or both doors with a large bubble window installed, minimum rate of descent is about 1450 feet per minute. Glide ratio is about 4.1:1 or one nautical mile per 1500 feet AGL.

### HOOK RELEASE BUTTON FAILURE

Pull manual release knob to release cargo.

## SECTION 4: NORMAL PROCEDURES

### RECOMMENDED AIRSPEEDS

Recommended airspeeds are not applicable with external load. Observe 80 KIAS external load speed limitation. Some loads may require lower speeds.

### DAILY OR PREFLIGHT CHECKS

Add to Item 4, Belly:

Verify hook secure, no damage to hook, wiring, or surrounding structure.

Swivel hook to travel extremes. Verify no binding of release cable or wiring.

Check release cable rigging through window in manual release cover. Lightly depress manual release lever and verify slack in cable.

#### ***CAUTION***

Verify no cargo lines pass over landing gear skid tubes or struts.

Add to Item 7, Nose:

Verify skid mirrors (if installed) secure, no damage.

Add to Item 8, Cabin Area:

Verify electrical plug at base of left-sided collective is inserted if collective is installed.

#### ***CAUTION***

If removing or inserting plug, ensure battery switch is OFF. Removing or inserting plug is equivalent to pressing start button.

Cycle hook release buttons and manual release controls to verify proper hook function.

Cycle external load control switches to verify proper function (if applicable).

Verify cargo instruments (load meter, MGT, Torque) are unobstructed and have no visible damage.

Zero load meter (as required).

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

**CARGO HOOK USE**

Prior to external load operations, verify ground crew has been properly instructed regarding electrical grounding and discharge of static electricity. Helicopter should be electrically grounded prior to attaching or removing external load in order to prevent static discharge arc.

Rig external load such that only one primary load ring is in contact with the cargo hook. Do not use multiple load rings, rope, or straps directly on the hook.

***CAUTION***

It is the responsibility of the operator to ensure safe rigging configuration for each load carried.

Prior to lifting an external load, ground crew should verify that the hook lock indicator on the side of the hook is in the fully locked position. (Lock indicator diamond must align with engraved lines on the manual release cover).

Apply collective smoothly when lifting load.

***CAUTION***

Size and shape of load as well as load rigging may affect flight characteristics. It is the responsibility of the operator to establish safe operational limits for each specific load.

The hook release button at the cyclic grip opens the cargo hook to release the external load. The manual release knob may also be used to release the load.

The external load control switch at the cyclic grip controls remote functions for equipment attached to the hook.

## SECTION 5: PERFORMANCE

### USE OF CHARTS

#### HOVER PERFORMANCE

Out-of-ground-effect (OGE) hover performance for gross weights above 2700 lb is provided on page 9-10.13. Hover performance is only presented up to 7000 feet density altitude since weight is limited to 2700 lb above this altitude. For weights below 2700 lb, use the chart on page 5-8 of the basic handbook.

Note that the hover performance shown on page 9-10.13 is achieved at the 100% engine torque limit for all but the lower left corner of the chart. The engine is able to produce 100% torque without exceeding MGT limits. (Engine anti-ice may be on below 10°C and is not needed above 10°C.) However, the engine will still be near MGT limits. A torque transient above 100% or use of cabin heat could result in an MGT exceedance. Increasing torque by 10% increases MGT by approximately 30°C, and using full cabin heat increases MGT by approximately 60°C. Pilots should maintain an adequate MGT margin to allow for torque transients. This may require operating at reduced weight and/or restricting heater use.

## SECTION 5: PERFORMANCE (cont'd)

### OGE HOVER CEILING VS GROSS WEIGHT

Use chart on page 9-10.13 for weights above 2700 lb.

### CLIMB PERFORMANCE

Due to drag variations with load type and rigging, climb performance charts may not be valid while carrying external load.

#### CLIMB PERFORMANCE, 2700 LB (1225 KG) GROSS WEIGHT

Climb rate may be reduced by up to 350 ft/min with one or both doors with a large bubble window installed.

#### CLIMB PERFORMANCE, 2200 LB (998 KG) GROSS WEIGHT

Climb rate may be reduced by up to 450 ft/min with one or both doors with a large bubble window installed.

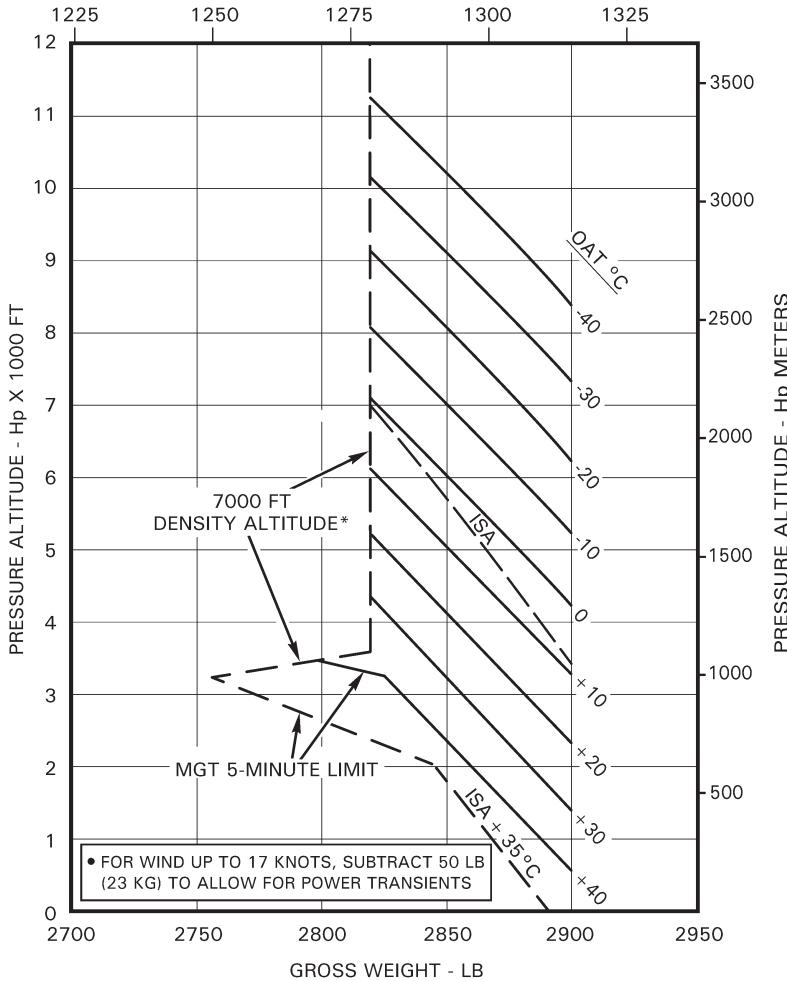
### HEIGHT-VELOCITY DIAGRAM

Due to drag and handling qualities variations with load type and rigging, the height-velocity diagram may not be valid while carrying external load.

## SECTION 5: PERFORMANCE (cont'd)

OUT OF GROUND EFFECT, ZERO WIND  
100% TORQUE EXCEPT AS NOTED  
ENGINE ANTI-ICE OFF OR ON BELOW 10°C  
CABIN HEAT OFF, 50 AMP GENERATOR LOAD

GROSS WEIGHT - KG



## OGE HOVER CEILING VS. GROSS WEIGHT

\*Gross weight limited to 2700 lb above 7000 feet density altitude.

## SECTION 6: WEIGHT AND BALANCE

The longitudinal arm of the cargo hook is 90.8 inches from the datum, and the lateral arm is -4.1 inches from the datum. These values may be used for weight and balance calculations when carrying external load. The weight and balance limits for the helicopter with external load are specified in Section 2 of this supplement.

### ***NOTE***

Doors with a large bubble window weigh more than standard doors. They should be individually weighed for weight and balance calculations. Their CG is the same as for standard doors.

**SECTION 7: SYSTEMS DESCRIPTION****GENERAL**

The cargo hook installation provides equipment for carrying external loads. External load operations in the United States require a valid Rotorcraft External-Load Operator Certificate in accordance with 14 CFR § 133.

The cargo hook installation consists of the following:

- Belly-mounted cargo hook.
- Electric cargo release buttons on left and right side cyclic control.
- Manual cargo release knobs for left and right front seats.
- Hydraulic switch and radio controls added to left-side cyclic (duplicates controls on right-side cyclic).
- Start button added to left-side collective (duplicates start button on right-side collective).
- A load weighing system.
- Additional MGT gage and torque meter for left seat pilot.
- Provisions for remote control of equipment carried as external load (such as remote hook on a long line).

Related equipment which may be installed with or without a cargo hook includes:

- Forward doors with a large bubble window (left, right or both).
- Skid-mounted mirrors to assist in viewing external loads (left, right, or both).

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

**CARGO HOOK**

A view of the cargo hook is shown on the following page. The hook is mounted to a hard point on the helicopter belly.

A hook lock indicator on the side of the hook's manual release cover provides verification that the hook is fully latched. The indicator diamond must be aligned with the engraved lines on the cover prior to lifting an external load.

A window in the manual release cover allows verification of proper rigging of the manual release cable. The cable should have a small amount of slack to ensure that cable tension does not cause an inadvertent hook release. Proper rigging should be verified during preflight by lightly depressing the manual release lever and observing a small gap between the cable's ball end and the release lever fork.

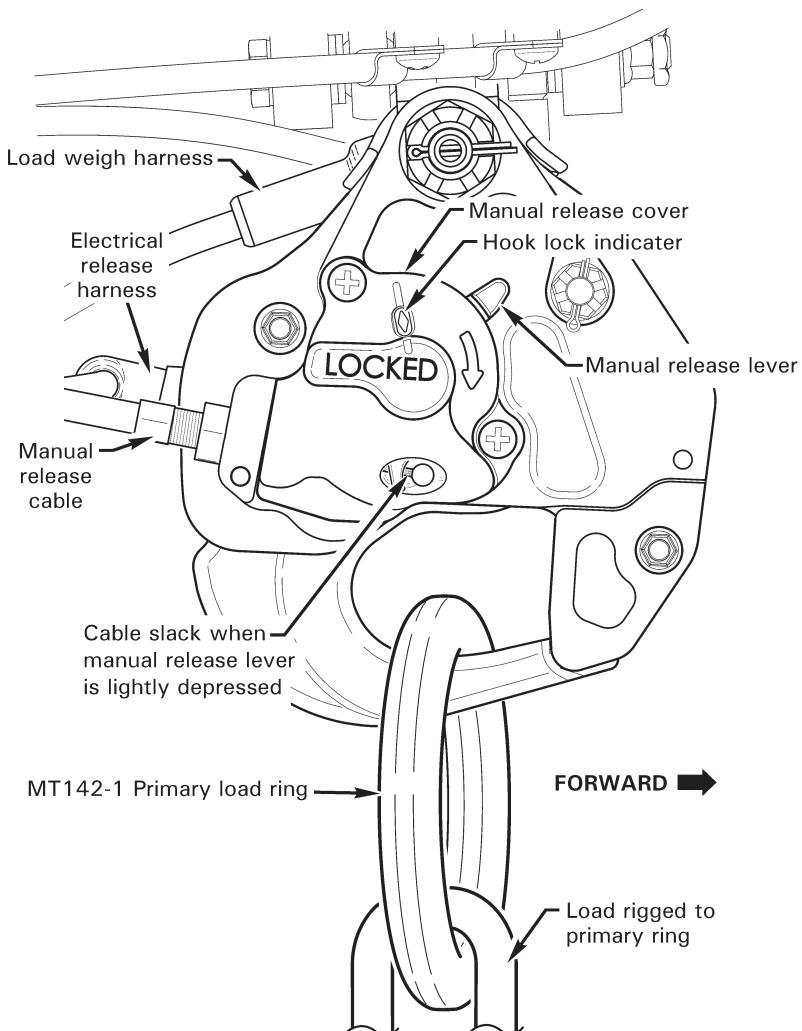
To ensure that the hook will release properly, the load should be rigged such that only a primary load ring (Robinson part no. MT142-1 or equivalent) is in contact with the hook.

Loads may be released from the hook by three methods. Primary release is by depressing the HOOK RELEASE button at the cyclic grip which energizes a solenoid that releases a latch and allows the hook to open. Manual release is by pulling the HOOK RELEASE knob located adjacent to the base of the collective. Pulling the knob pulls the inner wire of the manual release cable to open the hook latch. There is also a manual release lever on the side of the hook for use by ground crew.

All three release methods should be checked during preflight to confirm proper operation.

SECTION 7: SYSTEMS DESCRIPTION (cont'd)

CARGO HOOK (cont'd)



CARGO HOOK INSTALLATION

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

### FLIGHT CONTROLS

A HOOK RELEASE button is to the right of the hydraulic switch on each cyclic grip.

The left-side cyclic for the cargo hook includes a hydraulic switch and radio control buttons similar to the right-side cyclic.

A padded elbow rest is provided at the base of the left-side collective. This allows the left-side pilot to brace against the elbow rest for stability while leaning out to see external loads. The elbow rest is adjustable up and down via a friction knob on the front face of its support. It is also removable by completely unscrewing the knob.

#### *NOTE*

When the left side cyclic for the cargo hook is installed, both hydraulic switches must be ON to enable the system.

### REMOVABLE FLIGHT CONTROLS

There is an additional electrical plug where the left-side grip mates with the cyclic cross tube and an additional electrical plug at the base of the left-side collective.

#### *CAUTION*

Ensure battery switch is OFF when removing or inserting electrical plug at the base of the collective. Removing or inserting plug makes electrical contact equivalent to momentarily pressing start button.

### ENGINE CONTROLS

The left-side collective incorporates an engine start button.

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

### ELECTRICAL SYSTEM

The cargo hook electric releases are powered by the HOOK RELEASE circuit breaker. The load cell is also powered by the HOOK RELEASE breaker.

The controls for external equipment are powered by the EXT LOAD circuit breaker.

The left-side (door sill mounted) torque meter and MGT indicator receive power from the main (panel-mounted) torque meter.

### INSTRUMENT PANEL

A second torque meter and MGT indicator are provided near the left door sill. These allow the pilot to monitor power limits while leaning out to see external loads. A toggle switch in the door sill controls an instrument light for these gages.

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

### SEATS, BELTS, AND BAGGAGE

Anchor points in the cabin ceiling above the door posts are provided for attaching a safety tether or harness for operations which involve leaning outside the cabin. Robinson offers a part no. MT184-1 harness for pilot use during cargo hook operations.

#### *NOTE*

The MT184-1 harness is considered a pilot accessory and has no FAA approval.

### EXTERNAL LOAD CONTROL

External load functions are controlled by the EXT LOAD CONTROL momentary toggle switch located below and to the left of the radio control buttons on each cyclic grip.

The EXT LOAD CONTROL switch is a 3-position switch. The center, spring-loaded position is neutral. Momentary toggle up and momentary toggle down provide switched 28-volt power to external equipment. An electrical receptacle on the aircraft belly is provided for interface with external equipment and includes a decal showing pin assignments. A Robinson part no. MT143-1 wire harness is available for connecting to the receptacle. Control functions will vary with the type of equipment being used.

#### *CAUTION*

If using an external long line, release of load from end of line may cause substantial line recoil depending on characteristics of the line.

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

### LOAD WEIGH SYSTEM

The load weigh system consists of a load cell incorporated in the hook attaching hardware and a display installed near the left door sill.

The display shows load on the hook in tens of pounds (e.g. 90 indicates 900 lb.). An on-off toggle switch is adjacent to the display, and the display is internally lit.

#### ***NOTE***

The load weigh system is for reference only. Correct weight and balance is the responsibility of the pilot in command based on actual weighing or on reliable weight data for cargo to be carried.

### DOORS WITH LARGE BUBBLE WINDOW

Doors with a large bubble window are designed such that pilots may lean their head into the bubble in order to look straight down at an external load. The left door contains a second, lower window that allows the pilot to look back inside at the torque meter, MGT indicator, and load cell display. Each door contains an electric fan to aid with defogging. The fan is controlled by a toggle switch on the fan housing. The doors can be removed and installed in the same manner as standard doors with the addition of an electrical plug for the fans.

### SKID MIRRORS

Mirrors may be installed near the forward end of one or both landing gear skid tubes. The mirrors are intended to assist the pilot in viewing external loads. The mirrors are mounted on friction ball joints and may be adjusted to optimal angles prior to takeoff.

**SECTION 8: HANDLING AND MAINTENANCE**

**CARGO HOOK**

The R66 Maintenance Manual provides removal, installation, and servicing instructions for the cargo hook.

**CABIN DOORS**

The doors with a large bubble window may be removed and installed by maintenance personnel or pilots. Use the same procedure as for standard doors, except disconnect the fan power wire prior to door removal and reconnect it upon installation.

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## OPTIONAL AVIONICS SUPPLEMENT

This supplement must be included in the FAA-approved Robinson R66 Pilot's Operating Handbook when certain factory-supplied optional avionics 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 R66 Pilot's Operating Handbook.

APPROVED BY: Hin Tong

*Acting* Manager, West Flight Test Section, AIR-716  
Federal Aviation Administration  
Los Angeles, CA

DATE: April 18, 2018

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\* Manufacturer's data, not FAA approved.

## SECTION 1: GENERAL

### INTRODUCTION

This supplement provides additional information for certain avionics options. A set of manufacturers' instructions for all installed avionics is provided with each new helicopter.

The following equipment is addressed in this supplement:

- Aspen Avionics EFD 1000H PFD and EFD 500H MFD
- Garmin G500H avionics system with non-touch screen display (GDU 620)
- Garmin G500H avionics system with touch screen display (GDU 1060 TXi or GDU 700L TXi)

### ***NOTE***

For all Robinson Primary Flight Display (PFD)/ Multi Function Display (MFD) installations, the airspeed indicator, altimeter, compass, tachometer, and engine instruments are retained. Pilots should use the traditional instruments as primary unless fully familiar with the installed avionics.

<b>SECTION 2: LIMITATIONS</b>	No change.
<b>SECTION 3: EMERGENCY PROCEDURES</b>	No change.
<b>SECTION 4: NORMAL PROCEDURES</b>	No change.
<b>SECTION 5: PERFORMANCE</b>	No change.
<b>SECTION 6: WEIGHT AND BALANCE</b>	No change.
<b>SECTION 7: SYSTEMS DESCRIPTION</b>	See below.
<b>SECTION 8: HANDLING AND MAINTENANCE</b>	

No change.

## SECTION 7: SYSTEMS DESCRIPTION

### ASPEN EFD 1000H PFD AND EFD 500H MFD

The Aspen Electronic Flight Display (EFD) 1000H is a Primary Flight Display (PFD) optimized for helicopter use. It is available in a "Pilot" (basic) version or "Pro" (with more advanced navigation features) version.

The Aspen EFD 500H is a Multifunction Display (MFD) optimized for helicopter use.

Robinson configurations are either a single EFD 1000H PFD or a dual installation with one EFD 1000H PFD and one EFD 500H MFD. A typical dual-installation instrument panel is illustrated on the following page.

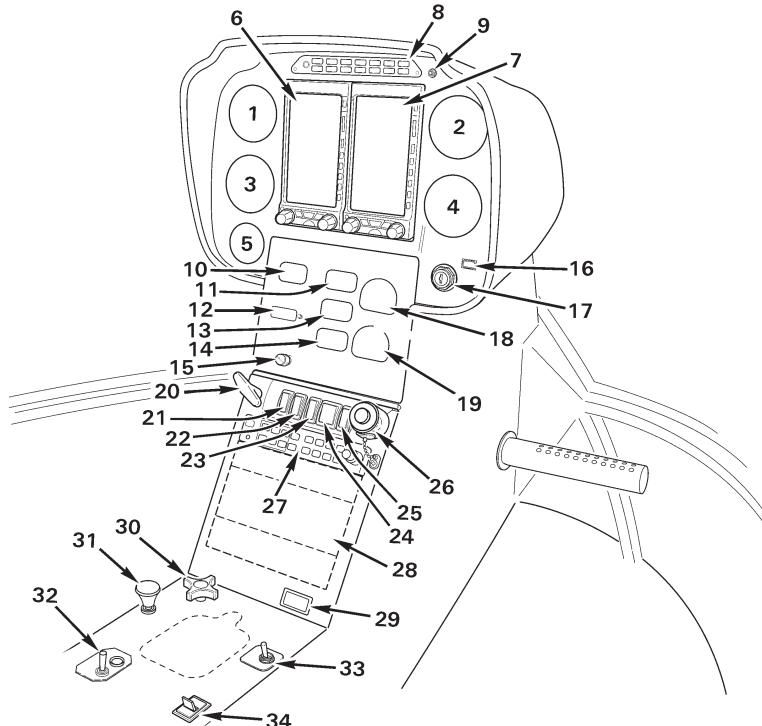
The manufacturer's documents for the EFD 1000H and EFD 500H are:

Title	Document No.
<i>Aspen Avionics Evolution Flight Display EFD 1000H PFD Pilot's Guide</i>	091-00012-001
<i>Aspen Avionics Evolution Flight Display EFD 1000H/500H MFD Pilot's Guide</i>	091-00013-001

#### ***NOTE***

A Robinson part no. D327-4 light filter may be used to reduce reflections in the windshield at night. The light filter is installed by clipping it to the front of the display. Filter use is at pilot discretion.

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



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

**OPTIONAL INSTRUMENT PANEL WITH  
ASPEN EFD 1000H PFD and EFD 500H MFD**  
(Exact panel configuration may vary with optional  
equipment and date of helicopter manufacture.)

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

**GARMIN G500H SYSTEM WITH GDU 620 (NON-TOUCH SCREEN) DISPLAY**

The Garmin GDU 620 display is a split screen PFD/MFD designed for use with Garmin's G500H helicopter avionics system.

A typical Robinson Installation is illustrated on the following page.

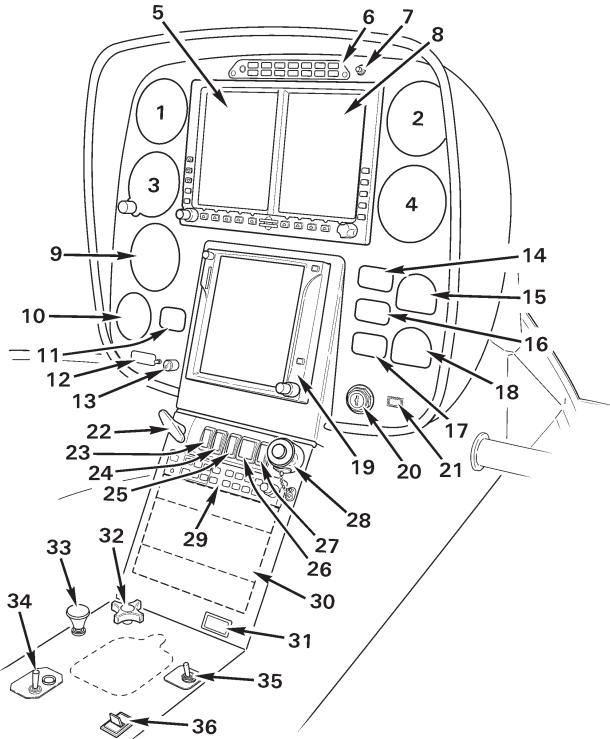
The manufacturer's document for the G500H system with GDU 620 display is:

Title	Document No.
<i>Garmin G500H Pilot's Guide</i>	190-01150-02

***NOTE***

A Robinson part no. D327-1 light filter may be used to reduce reflections in the windshield at night. The light filter is installed by clipping it to the front of the display. Filter use is at pilot discretion.

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



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

**OPTIONAL INSTRUMENT PANEL WITH  
GARMIN G500H SYSTEM WITH GDU 620 DISPLAY**

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

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

**GARMIN G500H SYSTEM WITH GDU 1060 TXi OR  
GDU 700L TXi TOUCH SCREEN DISPLAY**

The Garmin GDU 1060 TXi is a 10.6 inch diagonal split screen PFD/MFD designed for use with Garmin's G500H Helicopter Avionics System.

The Garmin GDU 700L TXi is a 7 inch diagonal PFD/MFD designed for use with Garmin's G500H helicopter avionics system.

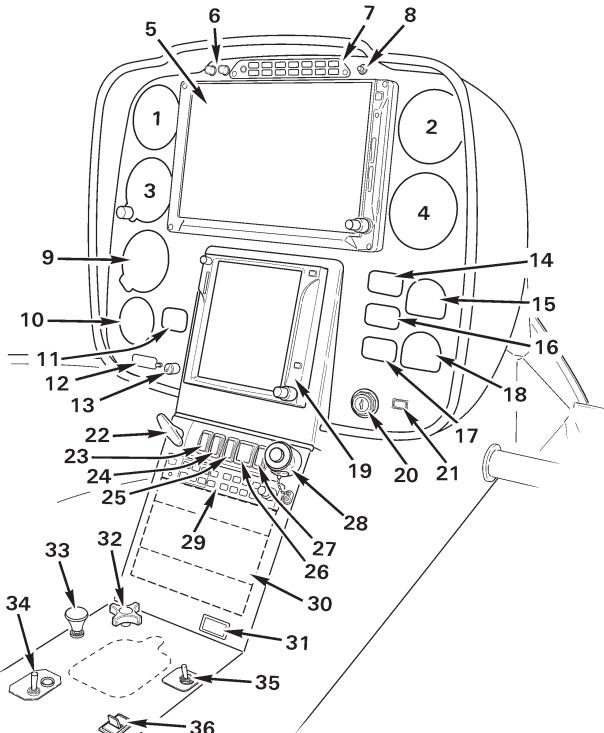
Both displays use a touch screen for pilot interface, with primary functions duplicated via knobs and buttons.

Robinson installations for each of the displays are illustrated on the following pages.

The manufacturer's document for the G500H system with GDU 1060 TXi or GDU 700L TXi display is:

Title	Document No.
<i>Garmin G500(H)/G600/G700 TXi Pilot's Guide</i>	190-01717-11

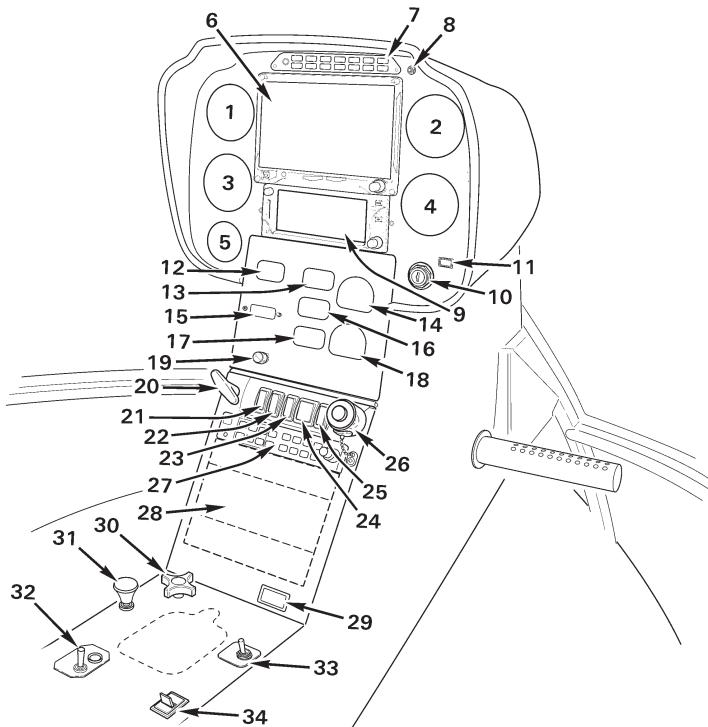
## SECTION 7: SYSTEMS DESCRIPTION (cont'd)



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

**OPTIONAL INSTRUMENT PANEL WITH  
GARMIN G500H SYSTEM WITH GDU 1060 TXi DISPLAY**  
(Exact panel configuration may vary with optional  
equipment and date of helicopter manufacture.)

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



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

**OPTIONAL INSTRUMENT PANEL WITH  
GARMIN G500H SYSTEM WITH GDU 700L TXi DISPLAY**  
(Exact panel configuration may vary with optional  
equipment and date of helicopter manufacture.)

**FAA APPROVED  
R66 PILOT'S OPERATING HANDBOOK  
PRESSURE FUELING SUPPLEMENT**

This supplement must be included in the FAA-approved Pilot's Operating Handbook when the pressure-fueling system 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.

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\*Manufacturer's data, not FAA-approved.

**LOG OF REVISIONS**

REV NO	FAA APPROVAL	SUMMARY DESCRIPTION
IR	Nevada Ryan, Manager, AIR-716 30 NOV 2022	Initial release
1		Changed 40 gal to 25 gal
	STEVEN THOMAS NASSAU	Digitally signed by STEVEN THOMAS NASSAU Date: 2025.06.12 11:52:19 -07'00' FTP, AIR 713 12 Jun 25
	Manager, Flight Test & Human Factors Branch, AIR-710 Federal Aviation Administration	Date

**SECTION 1: GENERAL**

**INTRODUCTION**

This supplement contains changes and additional data applicable when the pressure-fueling system is installed. The pressure-fueling port is compatible with an Emco Wheaton J71 coupler.

## SECTION 2: LIMITATIONS

### PLACARDS

Near pressure-fueling port:

**FUEL: GRADE JET A, JET A-1, JET B  
OR AS SPECIFIED IN PILOT'S HANDBOOK**

**MAX PRESSURE: 50 PSI (3.5 BAR)**

**NO DEFUELING**

## SECTION 3: EMERGENCY PROCEDURES

### RED WARNING INDICATORS

**TANK PRESSURE** (on pressure-fueling panel) Indicates high pressure in fuel tank. Shut-off valve will latch closed preventing further fueling. Have maintenance personnel inspect system before flight.

### AMBER CAUTION INDICATORS

**VALVE OPEN** (on pressure-fueling panel) Indicates shut-off valves are open, allowing fuel flow from fueling port to fuel tank.

### AUDIO ALERTS

"FUEL HOSE" sounds if collective is raised off down stop with a fuel hose connected to the fueling port.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

Add to item 1, Pilot's Station:

Test tank pressure warning circuit.

Verify pressure fueling power switch is OFF.

***NOTE***

For tank pressure warning circuit test, turn pressure fueling power switch ON and press one test button. Verify red light illuminates and stays on. Turn pressure fueling power switch OFF and verify light turns off. Repeat for 2nd test button.

Add to item 2, Fuselage Right Side:

Verify fueling port cap (if installed) is secure.

***NOTE***

The cap is provided for protection from contamination in dirty environments or for long term non-use. Installation of the cap is not required for flight.

**SECTION 4: NORMAL PROCEDURES (cont'd)****PRESSURE FUELING**

To accept fuel at the pressure-fueling port: With collective full down, switch power ON at the pressure-fueling control panel and select desired quantity (full or 25 gallons) using the quantity switch. The VALVE OPEN light indicates that the shut-off valves are open, allowing fuel flow from the fueling port to the fuel tank. A shut-off valve will automatically close to stop fuel flow when fuel quantity reaches the selected level. To fuel to other quantities, switch pressure-fueling power OFF at the desired fuel level.

***NOTE***

The selectable fuel quantities are determined by float switches inside the fuel tank. Fueling on a non-level surface will affect actual fuel load.

**TAKEOFF PROCEDURE**

Verify fuel hose is disconnected before takeoff.

**SECTION 5: PERFORMANCE**

No change.

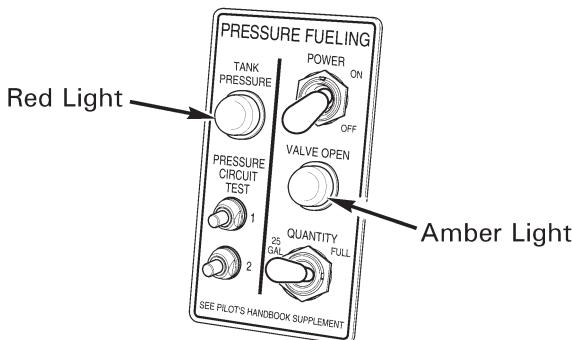
**SECTION 6: WEIGHT AND BALANCE**

No change.

**SECTION 7: SYSTEMS DESCRIPTION**

The pressure-fueling system consists of a fueling port on the right side of the fuselage, two shut-off valves in series just downstream of the port, a hose from the valves to an inlet at the top of the fuel tank, fuel tank level and pressure sensors, and a control panel on the instrument panel. The fueling port is compatible with an Emco Wheaton J71 dry-break coupler (recommended Emco Wheaton part no. J71C-AVN1-E004, which fits a fuel hose with a one-inch male NPT-threaded fitting).

Two shut-off valves are used to provide redundant protection against overfueling. Both valves must be open to allow fuel to flow. Each valve is connected to an independent float switch in the fuel tank to close the valve when the tank is full as well as an independent pressure switch to close the valve if fuel tank overpressure is detected. One of the valves is also connected to a second float switch to shut off at 25 gallons (95 liters).

**TYPICAL CONTROL PANEL**

The pressure-fueling control panel includes a power switch, a quantity selector switch, a VALVE OPEN light, and a TANK PRESSURE warning light with two test buttons for testing the overpressure warning circuits. The power switch enables refueling by providing power to open the two shut-off valves.

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

The fuel cap should be installed during pressure fueling to prevent overflow. Fueling may be accomplished with or without engine running. If the helicopter is running, the collective must be on the down stop for the valves to operate. The VALVE OPEN light illuminates when both shut-off valves are open, indicating the system is ready to accept fuel. The TANK PRESSURE light illuminates when excessive pressure is detected in the fuel tank. Excessive pressure will latch a shut-off valve closed until power to the system is cycled.

The pressure-fueling system feeds fuel to the top of the main fuel tank. The system cannot be used for defueling and it will not add fuel to the optional auxiliary tank in the baggage compartment. Maximum allowable pressure for ground equipment connected to the fueling port is 50 psi (3.5 bar), which provides approximately 50 gallons per minute (190 liters per minute) fuel flow. Approximate flow rates at lower pressures are 30 gpm at 20 psi, 20 gpm at 10 psi, or 100 lpm at 1 bar.

The fueling port and recommended Emco Wheaton coupler are both dry-break fittings, allowing the external fueling equipment to be connected or disconnected without fuel spillage regardless of whether the shut-off valves are open or closed. A cap is provided which may be installed on the fueling port when the system is not in use.

An optical sensor near the fueling port will detect a fuel hose if the hose is connected to the port. If the collective is raised off the down stop while a hose is connected, a "fuel hose" audio alert will repeat in the headsets. The alert is muted 15 seconds after the collective is raised to prevent a distraction in case of a false alert.

**CAUTION**

The audio alert is only an aid. Do not rely on audio alert to verify hose is disconnected. Pilots must visually confirm fuel hose is disconnected and area is clear before takeoff.

**SECTION 8: HANDLING AND MAINTENANCE**

No change.

FAA APPROVED  
R66 PILOT'S OPERATING HANDBOOK

NVG COMPATIBILITY SUPPLEMENT

This supplement must be included in the FAA-Approved Pilot's Operating Handbook for helicopters configured as Night Vision Goggle (NVG) compatible.

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: **Nevada Jo Ryan** Digitally signed by Nevada Jo Ryan  
Date: 2022.09.30 08:02:58 -07'00'  
Manager, West Flight Test Section, AIR-716  
Federal Aviation Administration  
Los Angeles, CA

DATE: 30 SEP 2022

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\* Manufacturer's data, not FAA approved.

**SECTION 1: GENERAL**

**INTRODUCTION**

This supplement contains the changes and additional data applicable for Night Vision Goggle (NVG) compatibility.

NVG compatibility is only valid for aircraft configured exactly as delivered from the factory and subject to the limitations in this supplement. Any modification, including mission-specific equipment, involving a light emitting or reflecting device requires reassessment of the cockpit to ensure NVG compatibility.

## SECTION 2: LIMITATIONS

### NVG COMPATIBILITY

The following NVGs are compatible with the installed lighting:

ITT AN/AVS-9 (F4949F-YG) Generation 3 Pinnacle with Class B filter. These goggles have TSO-C164 certification.

Litton/L3 AN/AVS-9 (M949) Gen III Night Vision with Class B filter. These goggles have TSO-C164 certification.

### FLIGHT AND MANEUVER LIMITATIONS

During single-pilot NVG operations into and out of unimproved sites, an additional NVG-trained crewmember must use NVGs to assist in obstacle identification and clearance.

A functioning radar altimeter is required for operations using NVGs.

Use of non-NVG-compatible carry-on or personal equipment in the cockpit is prohibited during NVG operations.

### KINDS OF OPERATION LIMITATIONS

The NVG-compatible configuration does not approve flight operations with night vision goggles. The operator must coordinate with the appropriate FAA Flight Standards District Office (or equivalent authority in countries other than the US) to obtain operational authorization.

### PLACARDS

In clear view of pilot:

THIS AIRCRAFT CERTIFIED AS NVG COMPATIBLE  
ANY MODIFICATION REQUIRES RECERTIFICATION  
SEE PILOT HANDBOOK SUPPLEMENT

## SECTION 3: EMERGENCY PROCEDURES

### NIGHT VISION LIGHTING FAILURE

If any portion of the cockpit or exterior lighting fails or develops characteristics which degrade operation with NVGs, transition to unaided flight.

### NIGHT VISION GOGGLE FAILURE

If the NVGs fail or perform abnormally, transition to unaided flight.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

Add to Item 1, Pilot's Station

Verify any non-NVG-compatible carry-on or personal equipment is switched off and stowed.

Verify NVG settings, adjustment, and focus.

Verify interior and exterior lighting function and lighting levels with and without NVGs.

### TAKEOFF PROCEDURE, CRUISE, DESCENT, APPROACH, AND LANDING

NVG-aided or un-aided flight is at pilot's discretion. Lighting controls are the same as for the basic aircraft.

## SECTION 5: PERFORMANCE

No change.

## SECTION 6: WEIGHT AND BALANCE

No change.

## SECTION 7: SYSTEMS DESCRIPTION

### NIGHT VISION GOGGLE COMPATIBILITY

Night vision goggle compatibility consists of the helicopter interior and exterior configuration, instruments, and avionics compatible for use with Night Vision Goggles (NVGs). The primary concern is cockpit lighting, but overall geometry for reflections and external lighting has also been shown to be compatible. NVG compatibility has been demonstrated for dual tube ITT AN/AVS-9 (F4949F-YG) and Litton/L3 AN/AVS-9 (M949) Generation 3 goggles with Class B filter. The goggles are TSO-C164 certified, self-powered, and do not interface with any helicopter systems.

The NVG-compatible configuration has also been tested for unaided flight to ensure that all lighting levels and colors remain appropriate.

All installed lighting is compatible with both aided and unaided flight. There is no need to switch lighting sources. Compatibility was achieved through the installation of instruments, avionics, and lighting specifically designed to be NVG compatible. No modification should be made to these items without specialized knowledge and a re-test for compatibility.

The goggles themselves are not supplied as part of the factory installation. Use of the specified goggles is the responsibility of the operator.

Pilot certification for NVG operations is the responsibility of the operator.

## SECTION 8: HANDLING AND MAINTENANCE

Any modifications to lighting, instruments, or avionics must be retested and certified for NVG compatibility.

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FAA APPROVED  
R66 PILOT'S OPERATING HANDBOOK

LASER ILLUMINATOR SUPPLEMENT

This supplement must be included in the FAA-Approved Pilot's Operating Handbook when provisions for a laser illuminator 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: Nevada Jo Ryan Digitally signed by Nevada Jo Ryan  
Date: 2022.09.30 08:02:09 -07'00'  
Manager, West Flight Test Section, AIR-716  
Federal Aviation Administration  
Los Angeles, CA

DATE: 30 SEP 2022

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\* Manufacturer's data, not FAA approved.

**SECTION 1: GENERAL**

**INTRODUCTION**

This supplement contains the changes and additional data applicable when provisions for a laser illuminator are installed.

The laser illuminator is included inside certain gimbal-mounted cameras on police-version helicopters and provides the ability to illuminate a target on the ground with a light that is outside the visible spectrum. The camera operator is able to illuminate a point of interest on the ground with a spot that is only visible with the aid of night vision equipment. This is primarily to allow the camera operator to identify the target of interest to ground personnel and the pilot to facilitate maintaining the helicopter's position relative to the target.

The laser illuminator is not FAA approved for civil aircraft operations and is disabled upon delivery from the factory. Provisions are provided to allow public-use operation. Title 49 U.S.C. § 40102(a)(41) provides the definition of "public aircraft" and § 40125 provides the qualifications for public aircraft status. These statutory provisions provide the legal basis for operation of public aircraft in the United States.

## SECTION 2: LIMITATIONS

### FLIGHT AND MANEUVER LIMITATIONS

The laser illuminator is not FAA approved for civil aircraft operations and is disabled upon delivery from the factory.

#### ***CAUTION***

The FAA has not assessed all potential hazards associated with the laser and has not validated the manufacturer's laser safety or hazard assessments.

### PLACARDS

On laser arming control panel:

LASER OPERATION  
NOT FAA APPROVED

## SECTION 3: EMERGENCY PROCEDURES

No change.

## SECTION 4: NORMAL PROCEDURES

### DAILY OR PREFLIGHT CHECKS

For FAA civil aircraft operations, verify laser illuminator is disabled. As a visual indication to the pilot, the laser arming control panel is located on the left side of the main instrument console. When the laser illuminator is properly disabled, the laser arming control panel should be removed from the aircraft.

## SECTION 5: PERFORMANCE

No change.

**SECTION 6: WEIGHT AND BALANCE**

No change.

**SECTION 7: SYSTEMS DESCRIPTION**

**LASER ILLUMINATOR**

The laser illuminator is not FAA approved for civil aircraft operations and is disabled upon delivery from the factory. Provisions are provided to allow public-use operation.

The laser illuminator is a Class 3B laser making the direct beam hazardous to the skin and an immediate eye hazard when viewed directly at close range.

The laser illuminator has Food and Drug Administration (FDA) approval (Accession No. RH18A0084). 21 CFR 1040 requires specific purpose laser products such as the laser illuminator to meet certain Accessible Emission Limits (AELs) or obtain a variance for exceeding the established limits. The laser illuminator has been issued variance number FDA 2018 V 1069.

It is the responsibility of the public use operator to comply with the variance limitations.

**SECTION 8: HANDLING AND MAINTENANCE**

The laser illuminator must be disabled for all FAA civil aircraft operations. Instructions for properly disabling the laser illuminator are contained in the R66 Maintenance Manual.

**FAA APPROVED**  
**R66 PILOT'S OPERATING HANDBOOK**  
**GARMIN GFC 600H**

This supplement must be included in the FAA-approved Pilot's Operating Handbook when the Garmin GFC 600H Helicopter Flight Control System 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.

**LOG OF REVISIONS**

REV NO	FAA APPROVAL	SUMMARY DESCRIPTION
IR	STEVEN THOMAS NASSAU 14 May 2025	Initial release
		Configuration Version Update
1	STEVEN THOMAS NASSAU  Digitally signed by STEVEN THOMAS NASSAU Date: 2025.07.29 14:22:54 -0700'	29 JUL 25 Manager, Flight Test & Human Factors Branch, AIR-710 Federal Aviation Administration

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\* Manufacturer's data, not FAA approved

**SECTION 1: GENERAL****INTRODUCTION**

This supplement contains the changes and additional data applicable when the Garmin GFC 600H Helicopter Flight Control System (FCS) is installed.

**APPLICABILITY**

The following or later software versions must be installed for the Pilot's Operating Handbook (POH) revision to be applicable to the installation:

Configuration	Version
Standard R66	415802
Pop-out Float Equipped R66	415803

***NOTE***

This section is not intended to be a comprehensive list of approved software. It is intended to provide a means to determine if this Pilot Operating Handbook Supplement revision is applicable to the software that is installed in the rotorcraft. Do not use this Pilot Operating Handbook Supplement revision if the installation has a software version less than that shown above.

**GARMIN GFC 600H**

The GFC 600H maintains a pilot-selected rotorcraft attitude by providing inputs to the cyclic and (optional) pedals. In hover and taxi, the system provides hover position hold and ground-speed hold. In cruise flight, the system provides upper level modes including holding selected airspeed, vertical speed, altitude, heading, and tracking GPS or VHF lateral and vertical navigation signals.

**SECTION 1: GENERAL (cont'd)**

**GARMIN GFC 600H (cont'd)**

Additionally, the GFC 600H provides safety enhancing functions including single button engagement to a safe flight attitude (Level mode), tactile feedback to the pilot when certain attitude, airspeed, or G limits are exceeded (Limit Cueing), and protection from inadvertent exceedance of  $V_{NE}$ .

FCS modes are selected using controls on the GMC 605H Mode Controller, cyclic grip, and under the pilot's collective. System status and operating modes are shown on the GMC 605H Mode Controller and GDU 1060/700 TXi display.

Refer to the Garmin GFC 600H Pilot's Guide, Garmin Document number 190-02602-00, for a detailed description of the system and its components.

***CAUTION***

The FCS system is intended to enhance safety by reducing pilot workload. It is not a substitute for adequate pilot skill nor does it relieve the pilot of the responsibility to monitor the flight controls and maintain adequate outside visual reference.

## SECTION 2: LIMITATIONS

### FLIGHT AND MANEUVER LIMITATIONS

Pilot's hand must be on the cyclic grip and feet on the tail rotor pedals (if optional yaw control system is installed) under any of the following conditions:

During FCS engagement or intentional disengagement

When HOV/GSPD modes are engaged

At altitudes less than 300 feet AGL

When AHRS DGRD message is displayed on the GMC 605H

Use of all upper level modes except APR are limited to altitudes above 300 feet AGL.

For practice instrument approaches, minimum altitude for use of APR mode is 50 feet AGL.

Flight is prohibited if "PFT" is indicated on the GMC 605H.

### KINDS OF OPERATION LIMITATIONS

Installation of FCS does not change the kinds of operations approved. Installation of the FCS does not approve IFR operations.

### EXTERNAL LOAD

For External Load Operation including flight with any combination of large bubble doors, FCS must pass PFT and be DISENGAGED.

## SECTION 2: LIMITATIONS (cont'd)

### POP-OUT FLOATS

For operations with pop-out floats inflated, FCS must pass PFT and be DISENGAGED.

### COUPLED STEEP APPROACHES

GFC 600H coupled approaches in GS or GP mode with glidepath angles greater than 6 degrees are prohibited.

### PLACARDS

In clear view of the pilot:

CYCLIC LIMIT CUEING PROVIDES RESISTANCE TO INPUTS AT CERTAIN AIRSPEEDS AND ATTITUDES. PRESS AND HOLD FCS OFF TO DISABLE. SEE POH SUPPLEMENT.

### SECTION 3: EMERGENCY PROCEDURES

The following emergency procedures incorporate changes to existing procedures in the R66 Pilot's Operating Handbook. The name of each procedure corresponds to the procedure in the basic Pilot's Operating Handbook.

#### ***NOTE***

If time does not permit disengagement of FCS, pressing and holding FTR will relieve control forces.

### POWER FAILURE ABOVE 500 FEET AGL

1. Power Failure Above 500 Feet AGL Procedure – Apply

#### ***NOTE***

FCS may be used in attitude mode during autorotative glide if desired. FCS may provide undesirable feedback during cyclic flare and landing. If time permits, disengage FCS prior to cyclic flare, or press and hold FTR to relieve forces.

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

1. Power Failure Between 8 Feet and 500 Feet AGL Procedure – Apply

#### ***NOTE***

FCS may be used in attitude mode during autorotative glide if desired. FCS may provide undesirable feedback during cyclic flare and landing. If time permits, disengage FCS prior to cyclic flare, or press and hold FTR to relieve forces.

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

#### POWER FAILURE BELOW 8 FEET AGL

1. Power Failure Below 8 Feet AGL Procedure – Apply
2. FCS – If time permits, disengage.

#### LOSS OF TAIL ROTOR THRUST IN FORWARD FLIGHT

1. Loss of Tail Rotor Thrust in Forward Flight Procedure – Apply
2. FCS – If time permits, disengage.

#### LOSS OF TAIL ROTOR THRUST IN HOVER

1. Loss of Tail Rotor Thrust in Hover Procedure – Apply
2. FCS – If time permits, disengage.

#### HEADSET AUDIO FAILURE

1. Headset Audio Failure Procedure – Apply
2. Disengage FCS. Pilot will not hear FCS aural annunciations with a failed headset.

#### ENGINE FIRE IN FLIGHT

1. Engine Fire in Flight Procedure – Apply
2. FCS – If time permits, disengage.

#### ELECTRICAL FIRE

1. FCS – Disengage
2. Electrical Fire Procedure – Apply

#### HYDRAULIC SYSTEM FAILURE

1. FCS – Disengage
2. Hydraulic System Failure Procedure – Apply

#### *NOTE*

FCS does not have sufficient authority to overcome cyclic control forces of a hydraulics system failure.

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

The following emergency procedures are new procedures not in the basic R66 Pilot's Operating Handbook.

**FCS MALFUNCTION**

If the helicopter deviates unexpectedly from the planned flight path or if control forces or motion are abnormal:

1. Cyclic and pedals – Hold firmly.
2. Maintain manual control of rotorcraft attitude.
3. Cyclic FCS OFF – Press and hold.
4. Verify FCS is disconnected.
5. If FCS still engaged, GMC 605H FCS key – Press and hold.
6. Verify FCS is disconnected.
7. If FCS is still engaged, AUTOPILOT FCS Circuit Breaker – Pull.
8. Verify FCS is disconnected.
9. If FCS cannot be disengaged, land as soon as practical.

***NOTE***

AUTOPILOT FCS circuit breaker is marked with a red collar for easy identification. If power to the FCS servos is lost or turned off via circuit breaker, then cyclic control forces will be slightly higher than normal.

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

### FCS FAILURE / ABNORMAL DISCONNECT

FCS failure is indicated by a red LED next to the FCS key on the GMC 605H Mode Controller, aural tone, "FCS FAIL" displayed on GMC 605H, or "FCS" displayed on the Primary Flight Display (PFD) in red.

1. Cyclic and pedals – Hold firmly.
2. Maintain manual control of rotorcraft attitude.
3. Cyclic FCS OFF – Press and release.

#### **NOTE**

If no failure indications (red LED) are present on the GMC 605H Mode Controller, then the pilot may attempt to re-engage the FCS by pressing and releasing the GMC 605H FCS key.

#### **NOTE**

If after failure of the FCS the GFS 83 servos are still functional, they will retain the cyclic in its position at the time of the failure. As soon as the pilot moves the cyclic out of the detent the forces will be removed.

### CYCLIC CONTROL JAM

If cyclic forces are excessive or cyclic appears to be jammed:

1. Cyclic – Grip firmly.
2. Cyclic FCS OFF – Press and hold.
3. If controls still appear to be jammed, apply load to cyclic as required to break shear fuse.
4. Land as soon as practical.

#### **CAUTION**

Minimize slow airspeed maneuvering. If winds are in excess of 15 KTS, land into the wind.

#### **NOTE**

After breaking a shear fuse, control forces will be higher than normal.

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

#### YAW AXIS FAILURE (IF INSTALLED)

If aural "YAW FAIL" annunciates and "YAW FAIL" displayed on GMC 605H and PFD:

1. Maintain manual control of yaw axis through manual inputs.
2. Set pitch and roll FCS modes as desired.

#### TAIL ROTOR PEDAL CONTROL JAM

If tail rotor pedal forces are excessive or pedals appear to be jammed:

1. Tail rotor pedals – Place feet firmly on pedals.
2. YAW ENABLE/DISABLE switch – Disable.
3. If pedals still appear to be jammed, disengage FCS.
4. If pedals still appear to be jammed, perform emergency procedure for "Loss of Tail Rotor Thrust in Forward Flight" or "Loss of Tail Rotor Thrust in Hover" as applicable.

#### PFD FAILURE

Modes which utilize data from the PFD will be affected. ALTS and APR will be unavailable. NAV mode will be limited to GPS courses only. ALT will revert to PALT mode. If VS is engaged when PFD is restored, FCS VS will change to last stored VS bug value and begin to seek that reference.

#### GTN NAVIGATOR FAILURE

Navigation modes which utilize GPS or navigation radio will be unavailable. HOV, GSPD, and Low Altitude Protection will be unavailable.

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

### GMA AUDIO PANEL FAILURE

If flying from the left pilot's seat, disengage FCS.

#### ***CAUTION***

FCS aural annunciations will be provided to the right side pilot only.

### LOSS OF ATTITUDE DATA

1. Cyclic and pedals – Hold firmly.
2. Maintain manual control of rotorcraft attitude.

#### ***NOTE***

FCS will disconnect.

### FCS PREFLIGHT TEST INCOMPLETE

Indicated by "PFT" display on GMC 605H and PFD.

The FCS system has not completed the automatic preflight test. If the preflight test does not complete as indicated by continued display of "PFT", takeoff is prohibited.

#### ***CAUTION***

Failure to complete the preflight test may indicate an error with the FCS which could result in unsafe operation.

**SECTION 3: EMERGENCY PROCEDURES (cont'd)****FCS PREFLIGHT TEST FAIL**

Indicated by red LED illuminated next to FCS key, "PFT FAIL" displayed on GMC 605H, "PFT" displayed in red on PFD, or aural "FCS TEST FAILED" message.

The FCS system failed the automatic preflight test. The FCS, (optional) yaw axis system, and Limit Cueing will not be operational.

**FCS UNPOWERED OR FAILED**

If the GFC 600H system is unpowered or is failed, the system will apply forces to the cyclic control similar to a small amount of cyclic control friction. These forces are provided to reduce movement of the cyclic in the event of a failure of the FCS while the pilot's hands are not on the controls. The amount of force provided is proportional to the rate at which the cyclic is moved.

**SERVO OUT OF DETENT**

Out of detent servos are indicated by "P", "R", or "Y" shown in inverse video in the FCS status field on the GMC 605H and PFD. If the controls stay out of detent for more than 30 seconds then a "P DETENT", "R DETENT", or "Y DETENT" message will be displayed on the GMC 605H. A servo out of detent indication when the pilot is not moving the flight controls may indicate excessive control system friction. Verify the cyclic friction is fully loose. If the condition persists, disengage the FCS and manually fly the rotorcraft. Land as soon as practical.

***NOTE***

Limit Cueing will cause a servo out of detent indication when it is active.

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

### LOSS OF HEADING DATA

Indicated by "HDG FAIL" displayed on PFD.

If heading fails, the FCS will revert to using GPS track in place of magnetic heading data. A "TRK MODE" message will be displayed as a message on the GMC 605H. The ground track reference will be displayed in a cyan box on the PFD and can be adjusted using the HDG knob. GPS NAV and APR modes will still be available. VOR, VAPP and LOC/GS modes will not be available. Yaw control system performance in hovering flight will be reduced resulting in the rotorcraft not returning to the reference heading after being displaced.

### AHRS DEGRADED

Indicated by "AHRS DGRD" displayed on GMC 605H.

The GMC 605H ARHS is not receiving one or more data parameters (GPS, Air Data, or Magnetometer). The FCS will function normally, but an FCS disconnect is more likely to occur due to loss of AHRS data. Pilot's hand should be kept on the cyclic and feet on pedals while this message is displayed.

### LOSS OF ACTIVE NAVIGATION DATA

Indicated by "GPS", "VOR", "LOC/GS", "GPS/GP" or "VAPP" flashes for 10 seconds on GMC 605H accompanied by a flashing amber FCS LED and automatic mode change aural annunciation.

If a navigation signal is lost while the FCS is tracking it, the FCS will hold the last roll reference and default to Lateral Attitude Hold mode (ATT). For loss of GS or GP, the vertical mode will revert to Pitch Attitude Hold mode (ATT) and hold the pitch attitude present when the mode reverted. Reengagement of Navigation mode may be attempted if desired.

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

#### LOW ALTITUDE

Indicated by "LOW ALT" displayed on GMC 605H and PFD, and aural "LOW ALTITUDE" annunciation.

1. Verify rotorcraft flight path relative to terrain.
2. Climb and maintain safe altitude. Assume manual control if necessary.

#### ***CAUTION***

Do not intentionally use Low Altitude Protection to arrest a descent or maintain clearance from terrain.

#### ***NOTE***

FCS will automatically change vertical mode to VS and remain in VS until the pilot initiates a mode change. The upper vertical mode may not be changed until the rotorcraft climbs above 300 feet GPS height above terrain. All upper modes may be disengaged or the FCS may be disengaged entirely at any altitude.

## SECTION 4: NORMAL PROCEDURES

The following normal procedures incorporate changes to existing procedures in the R66 Pilot's Operating Handbook. The name of each procedure corresponds to the procedure in the basic Pilot's Operating Handbook.

### GENERAL

***NOTE***

Cyclic friction must be fully off for FCS to work properly. Cyclic friction will degrade FCS performance.

***NOTE***

When engaged, the FCS provides force feedback on the cyclic and pedals (if optional yaw control system is engaged).

### BEFORE STARTING ENGINE

After "Fuel valve" add:

***NOTE***

With left cyclic removed and the cyclic balance spring not wound, the right cyclic may contact the pilot's leg when pilot's hand is off the cyclic. Performance of the FCS may be degraded. To prevent contact between the pilot's leg and the cyclic, wind up balance spring per procedure in Section 7 REMOVABLE FLIGHT CONTROLS in the main POH when left cyclic is removed.

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

### STARTING ENGINE AND RUN-UP

After "Avionics switch, headsets" add:

FCS . . . . . Press NAV key or cyclic FTR  
FCS LED Lights . . . . . Verify amber then red  
PFT . . . . . Verify passed

After "Hydraulic system" add:

FCS Check . . . . . Perform

### DOORS-OFF OPERATION

Add:

FCS use is allowed with any combination of small bubble or standard doors installed or removed.

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

The following normal procedures are new procedures not in the basic R66 Pilot's Operating Handbook.

### PREFLIGHT TEST (PFT)

After power is applied to the GFC 600H system a splash screen will be displayed on the GMC 605H Mode Controller. During the PFT the servos will move the controls a small amount for approximately 1 second. Press the NAV key (display shows CONT with an arrow pointing to the correct key) or the cyclic FTR button to complete the PFT. LED lights on the GMC 605H Mode Controller will cycle through a test sequence, amber lights will illuminate for one second, followed by red lights for one second, then extinguish. Aural "FCS TEST OK" or "FCS TEST FAILED" annunciates when the preflight test is completed. If the GFC 600H passes the preflight test, the display on the GMC 605H will be blank and all LED fault lights will extinguish.

If the GFC 600H fails the PFT, "PFT FAIL" is displayed in the GMC message window, "PFT" is displayed in red on the PFD, and the FCS LED illuminates red. Do not take off if "PFT" is indicated on the GMC 605H.

### **CAUTION**

Failure to complete the preflight test may indicate an error with the FCS which could result in unsafe operation.

**SECTION 4: NORMAL PROCEDURES (cont'd)****FCS CHECK**

Perform at each pilot's station that has controls installed.  
Verify pilot wears headset and cyclic friction is off.

1. Engage FCS and engage YAW (if installed).
2. Make small cyclic and pedal control inputs 2 or 3 times in each axis and verify no abnormal forces are present.
3. Disengage the system.
4. Verify disconnect tone is heard.
5. Make small cyclic and pedal control inputs 2 or 3 times in each axis.
6. Verify FCS detent forces are removed.

**ENGAGE FCS**

The FCS may be engaged using any one of the following methods:

FTR button . . . . . Press and hold  
GMC 605H FCS key . . . . . Press  
LVL button . . . . . Press

Observe GMC and PFD for normal indications and ensure FCS is holding desired reference attitude before releasing flight controls.

**ENGAGE FCS UPPER LEVEL MODES**

Upper level FCS modes (HDG, NAV, APR, ALT, VS, IAS) may be activated by pressing the associated key on the GMC 605H Mode Controller when the FCS is engaged and indicated airspeed is greater than 45 knots. Observe GMC and PFD for normal indications and ensure FCS is holding desired reference attitude before releasing flight controls.

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

### DISENGAGE FCS UPPER LEVEL MODES

To disengage all upper level modes simultaneously:

Cyclic FCS OFF button . . . Press and release

To disengage modes individually:

GMC 605H Mode key

(for active mode) . . . . . Press and release

### DISENGAGE FCS

The FCS may be disengaged using any one of the following methods:

If no upper level modes are engaged,

Cyclic FCS OFF button . . . Press and release twice or hold for at least one second

If upper level modes are engaged,

Cyclic FCS OFF button . . . Press and release twice or hold for at least one second

GMC 605H FCS key . . . . Press

### ENGAGE/DISENGAGE FCS YAW

While YAW ENABLE/DISABLE switch is ENABLED, the yaw control system will engage/disengage with pitch and roll when the FCS is engaged/disengaged.

### MAX SPEED

Max Speed Protection may be exited by lowering the collective, resetting the pitch reference, or changing the mode such that the current pitch reference will result in an airspeed below the stabilized airspeed for Max Speed Protection.

### LOW SPEED

Low Speed Protection may be exited by raising the collective, resetting the pitch reference such that an indicated airspeed of 45 knots can be maintained, or disengaging FCS upper modes.

## SECTION 5: PERFORMANCE

No change.

## SECTION 6: WEIGHT AND BALANCE

No change.

## SECTION 7: SYSTEM DESCRIPTION

### SYSTEM COMPONENTS

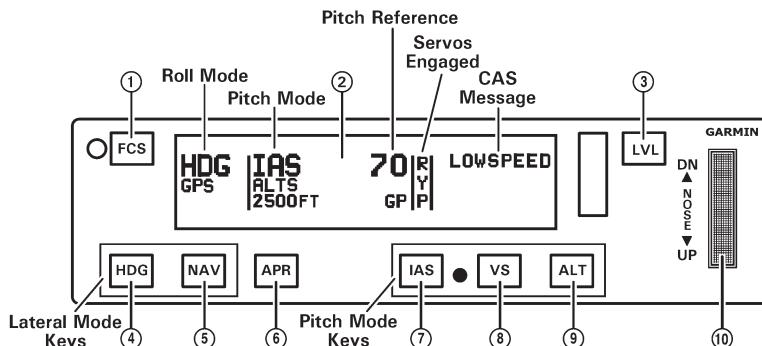
The GFC 600H system consists of a GMC 605H Mode Controller, GFS 83 electromechanical servos for the pitch, roll, and (optional) yaw axes, a GSU 75 ADAHRS, and cyclic and (optional) yaw controls. Power to the FCS is provided through the AUTOPILOT FCS circuit breaker and avionics master switch.

### GMC 605H MODE CONTROLLER

The GMC 605H Mode Controller, located in the center console, is one means for the pilot to interface with the GFC 600H system. The GMC 605H display shows active modes, references, and system messages. Bezel keys provide a means to engage/disengage the FCS system and individual modes.

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

## GMC 605H MODE CONTROLLER (cont'd)



1. FCS Engages/disengages the Flight Control System.
2. LCD Displays FCS modes, references, and annunciations.
3. LVL Key engages the FCS in Level mode (or selects Level mode if FCS is already engaged).
4. HDG Key selects/deselects Heading Select mode.
5. NAV Key selects/deselects Navigation mode. Cancels GS mode if LOC mode is either active or armed. Cancels GP mode if GPS mode is either active or armed.
6. APR Key selects/deselects Approach mode.
7. IAS Key selects/deselects Indicated Airspeed mode.
8. VS Key selects/deselects Vertical Speed mode.
9. ALT Key selects/deselects Altitude Hold mode.
10. NOSE UP/DN Adjusts the vertical mode reference in Vertical Speed, Indicated Airspeed, and Altitude Hold modes.

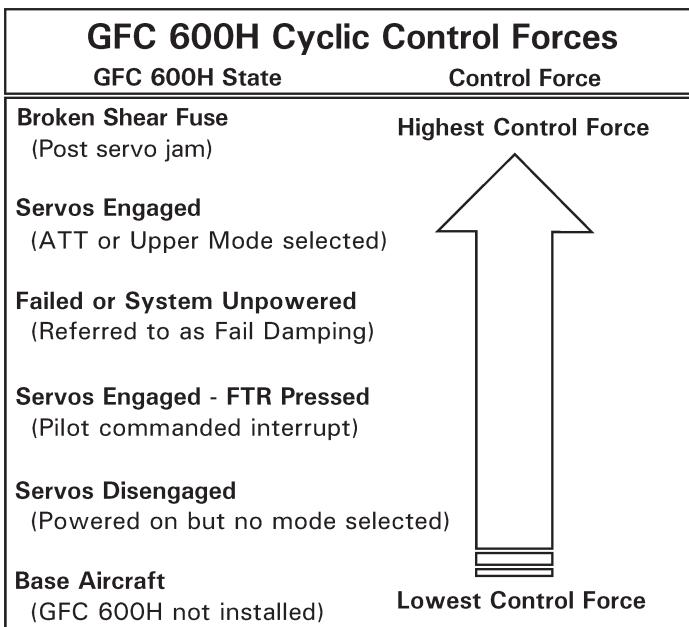
**SECTION 7: SYSTEM DESCRIPTION (cont'd)****GFS 83 SERVO**

The GFS 83 is an electromechanical “smart” servo which actuates the flight controls and also performs many FCS processing functions. The GFS 83 servo is installed in parallel with the primary flight controls, resulting in cyclic and tail rotor pedal movements directly proportional to movement of the servo. The servos are installed in the pitch, roll and (optional) yaw axes. The GFS 83 provides fly through capabilities, meaning that the pilot can override the system at any time by pushing through any control forces which may be present. Upon releasing the controls, the system will return to its commanded references.

GFS 83 direct drive servos are installed in the pitch and roll axes. These servos provide a fail passive damping feature which reduces attitude deviation in the event of a servo disconnect while the pilot’s hand are not on the controls. In the event of a mechanical jam in a servo, the pilot must apply sufficient force to the affected rotorcraft flight control to break the shear fuse at the output shaft of the servo, removing the servo from the control system and allowing free movement of the flight control. Some residual friction will be felt in the control axis after breaking the shear fuse.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****GFS 83 SERVO (cont'd)**

The figure below illustrates the forces the GFS 83 servos provide to the helicopter's cyclic control system. In all cases, the pilot can overpower the system sufficiently to control the helicopter.



Optionally, a GFS 83 mechanically clutched servo is installed in the tail rotor control system. This servo contains a mechanical clutch to engage the motor drive to the servo output.

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

### ATTITUDE AND AIR DATA SENSORS

The GFC 600H system consists of a minimum of two attitude sources and one air data source. A Garmin GSU 75H ADAHRS provides the primary attitude data and air data. The GMC 605H Mode Controller provides the second AHRS which is used as a monitor for the system.

### GPS

A Garmin GPS position source provides GPS navigation data for upper modes and aiding to AHRS. GPS data is required for Ground Speed Hold (GSPD), Hover Position Hold (HOV), and Low Altitude Protection mode.

### COLLECTIVE POSITION SENSOR

A position sensor provides collective position to the GFC 600H to improve system performance and aid in determining if the helicopter is on the ground.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****CYCLIC AND PANEL MOUNTED CONTROLS**

Control	Common Name	Location	Color
FTR	Force Trim Release	Cyclic	White

**Purpose:**

Servos Disengaged:

Press and hold will engage FCS in all axes.

Any Engaged Mode:

Press and hold will reduce the control forces for the duration of time that the switch is depressed. After 1 second the system will annunciate "FTR" as indication that an extended press is active.

HOV or GSPD Mode:

Press and hold reduces control forces. Upon release system synchronizes forward and lateral ground speed references and (if enabled) yaw heading reference to current values.

ATT Mode:

Press and hold reduces control forces. Upon release system synchronizes the pitch and roll attitude reference to current values.

CPLD Upper Modes:

Upon release system synchronizes the pitch and roll reference (VS, ALT/ PALT, IAS, HDG) to the current value as applicable.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****CYCLIC AND PANEL MOUNTED CONTROLS (cont'd)**

Control	Common Name	Location	Color
FCS OFF	FCS DISC	Cyclic	RED

**Purpose:**

Momentary Press:

If upper level mode is engaged:

Disengages all upper modes. Servos remain engaged in ATT mode.

If in ATT mode:

Momentary press disengages the pitch, roll, and (optional) yaw servos.

Double momentary press OR press and hold for 1 second:

Disengages the pitch, roll, and (optional) yaw servos.

Press and hold for 5 seconds:

Toggles Limit Cueing ON/OFF.

Control	Common Name	Location	Color
TRIM ADJUST	TRIM ADJUST	Cyclic	Black

**Purpose:**

Single Press:

Increments the FCS references.

Press and Hold:

Slews the FCS references.

HOV or GSPD Mode:

Increments the forward or lateral ground speeds.

ATT Mode:

Increments the reference pitch and roll attitude.

CPLD Upper Modes:

Changes the reference altitude, vertical speed, indicated airspeed, or heading as applicable.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****CYCLIC AND PANEL MOUNTED CONTROLS (cont'd)**

Control	Common Name	Location	Color
LVL	Level Mode	Cyclic	Blue

**Purpose:**

Momentary Press:

Engages the pitch, roll, and, if enabled, optional yaw axis system in LVL mode.

Control	Common Name	Location	Color
YAW ENABLE/ DISABLE	Yaw ON/OFF	Panel adjacent pilot's side collective	White (two- position switch)

**Purpose:**

Enables and disables the yaw axis system. When enabled, yaw axis system will be engaged and disengaged with FCS. Enabling or disabling yaw with the FCS already engaged allows independent engagement/disengagement of yaw.

Control	Common Name	Location	Color
YAW TRIM	Yaw Trim	Panel adjacent pilot's side collective	Black (rocker switch)

**Purpose:**

In forward flight:

If yaw is enabled, adjusts the lateral trim reference of the yaw control system.

In low speed flight, HOV, or GSPD:

No function.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****ENGAGEMENT LIMITS**

The FCS may be engaged within the range of 30° pitch up or down and 70° roll left or right. If the pitch or roll engagement limits are exceeded while the FCS is engaged, the FCS will disconnect. The FCS command limits are 10° pitch up to 10° pitch down and 30° roll left and right. Engaging the FCS or attempting to trim the FCS outside of its command limits, but within its engagement limits, will cause the FCS to return the helicopter to the nearest command limit.

**MODES OF OPERATION**

The default FCS mode is Attitude Hold mode (ATT) which holds the attitude reference at the time of engagement or as modified by the pilot. If in a hover or hover taxi, HOV or GSPD mode will automatically engage. GSPD allows the forward and horizontal reference to be set to a GPS ground speed. In HOV, the ground speed reference is set to zero to help aid in holding a steady hover.

If the (optional) yaw control system is installed and enabled, the yaw system will engage with FCS pitch and roll. In hover or hover taxi, the yaw system seeks to hold a reference heading. A green bug on the PFD HSI indicates the current yaw heading reference. The yaw control system holds lateral trim in forward flight.

Engagement of the FCS is indicated by a green LED next to the FCS key and the characters "P" and "R" being displayed on the GMC 605H and PFD. "Y" is shown when the (optional) yaw control system is engaged.

Upper level modes may be coupled at airspeeds above 45 knots. The tables below describe the available vertical and lateral modes that may be engaged in the FCS.

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

## MODES OF OPERATION (cont'd)

Vertical Mode	Control	Annunciation	Reference Range	Reference Change Increment
Altitude Hold	ALT key	ALT xxxxx		10 ft
		PALT xxxxx		
Glidepath	APR key	GP		
		GS		
Ground Speed Hold	(See description above)	GSPD	0 to 15 kts forward or aft.	1 kt
Hover Hold	(See description above)	HOV		
IAS Hold	IAS key	IAS xxx	45 to 120 kts or 5 kts below $V_{NE}$ .	1 kt
Level (LVL)	LVL key or Cyclic LVL button	LVL	Within $\pm 30^\circ$ pitch engagement limit.	
Low Altitude		LOW ALT	Engages at 200 feet GPS height above terrain if in VS, ALT/PALT, or IAS.	

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

## MODES OF OPERATION (cont'd)

Vertical Mode	Control	Annunciation	Reference Range	Reference Change Increment
Low Speed		LOW SPD	Engages at 45 knots if in VS, ALT/PALT, or GP/GS. Does not engage in IAS mode.	
Max Speed		MAX SPD	In ATT mode: Engages when airspeed reaches 125 knots or 5 knots below $V_{NE}$ [1]. In VS, ALT/PALT, or GP/GS mode: Engages when airspeed reaches 123 knots or 3 knots below $V_{NE}$ [1].	
Pitch Attitude Hold (ATT)	(default)	ATT	10° nose up to 10° nose down.	0.5°
Pitch Limit Cue			High pitch limit cue engages above 15° nose up and/or 1.9 G. Low pitch limit cue engages below 16° nose down and/or 0.4 G.	

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****MODES OF OPERATION (cont'd)**

Vertical Mode	Control	Annunciation	Reference Range	Reference Change Increment
Selected Altitude Capture	[2]	ALTS	[2]	[2]
$V_{NE}$ Limit Cue			Engages at 125 kts or 3 knots below $V_{NE}$ [1].	
Vertical Speed	VS key	VS xxxx	+1000 to -1500 fpm	100 fpm

[1]  $V_{NE}$  calculated based on current ambient conditions.

[2] ALTS arms automatically when VS or IAS is active and a valid value is set in the PFD altitude bug.

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

## MODES OF OPERATION (cont'd)

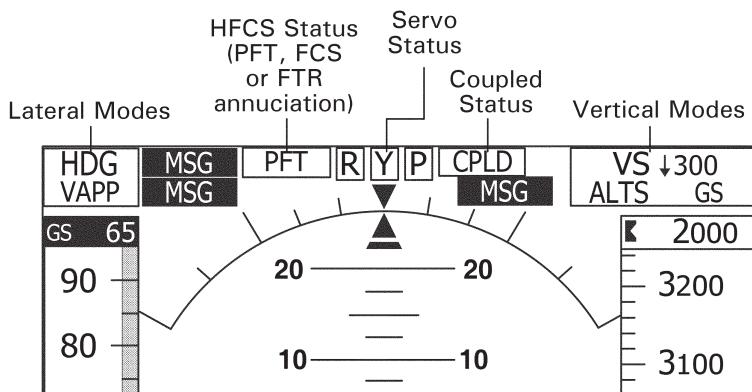
Lateral Mode	Control	Annunciation	Maximum Roll Command Limit
Roll Attitude Hold (ATT)	(default)	ATT	30° roll left and right.
Hover Hold	(See description above)	HOV	
Ground Speed Hold	(See description above)	GSPD	0 to 15 kts left or right.
Heading Select	HDG key	HDG	The lesser of 25° or standard rate. [1]
Level (LVL)	LVL key or Cyclic LVL button	LVL	70° roll engagement limit.
GPS Navigation	NAV key	GPS	30° [1]
VOR Navigation		VOR	25° [1]
LOC Navigation		LOC	25° [1]
GPS Approach	APR key	GPS	25° [1]
VOR Approach		VAPP	25° [1]
ILS/LOC Approach		LOC	25° [1]
Roll Limit Cue			Engages at 31° roll left or right.

[1] Roll command limited to 15° in upper level modes above 10,000 feet.

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

## FCS STATUS ANNUNCIATIONS ON GARMIN PFD

The GFC 600H interfaces with the Garmin PFD. FCS mode annunciations will be provided along the top of the PFD. The current FCS reference for VS, IAS, ALTS, and HDG will be shown on the PFD and may be controlled via the PFD in addition to the GMC 605H Mode Controller and cyclic mounted switches.



Alert Message (displayed on the PFD)	Alerting Criteria
MAXSPD	Max Speed Protection is active.
LOWSPD	Low Speed Protection is active.
FCS (red)	FCS is failed – The FCS is inoperative.
YAW FAIL	System is unable to provide yaw axis control.
PFT (white)	PFT is in progress.
PFT FAIL (red)	PFT has failed.
LOWALT	Low Altitude Protection is active.
FTR (white)	FTR button is being held.

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

## GMC 605H MESSAGES

Message	Description
< > KEY	The specified key on the GMC 605H is stuck in the active state.
ADC DATA	Air Data inputs to the GMC 605H have failed. Functions dependent on air data (IAS, VS, and ALT/PALT modes; Max Speed and Low Speed Protection; overspeed aural annunciation) will not function and FCS performance may be degraded. Yaw axis system will not function.
AHRS DGRD	AHRS is not receiving aiding data from one or more parameters.
FCS SWTCH	FCS OFF switch has been active for more than 30 seconds.
COLL FAIL or COLL POS	Collective position sensor has failed. Yaw axis system performance during collective changes will be degraded. ALT/PALT, VS, IAS, GS, and GP performance during collective changes will be degraded.
CYC FTR	FTR switch has been active for more than 60 seconds.
DSABLD KEY	Key is disabled because associated function is not supported in the installation.
FCS FAIL	FCS has failed.
FTR	Force Trim Release is being held.
GPS DATA	GPS aiding is unavailable. HOV, GSPD, LOW ALT will be unavailable.
HDG FAIL	System does not have valid heading. Functions that use heading data will be degraded or unavailable.

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

## GMC 605H MESSAGES

Message	Description
LMTQ FAIL	The Limit Cueing function has failed. The pilot should not expect tactile feedback for pitch/roll attitude, G loading, and $V_{NE}$ exceedances. Max Speed and Low Speed Protection remain operational.
LMTQ OFF	Limit Cueing is off. The pilot should not expect tactile feedback for pitch/roll attitude, G loading, and $V_{NE}$ exceedances. Max Speed and Low Speed Protection remain operational.
LOWSPEED	Low Speed Protection is active.
LOW ALT	Low Altitude Protection is active.
LVL SWTCH	Cyclic LVL button has been active for more than 30 seconds.
MANIFEST	Incorrect manifest versions. Maintenance is required.
MAXSPEED	Max Speed Protection is active.
ON GROUND	System senses helicopter is on the ground and will not provide any control inputs.
P DETENT	Cyclic has been out of detent in pitch axis for more than 30 seconds.
PFT	Preflight test is in progress.
PFT FAIL	Preflight test has failed. The FCS is inoperative. Red FCS LED illuminates steady.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****GMC 605H MESSAGES (cont'd)**

Message	Description
R DETENT	Cyclic has been out of detent in roll axis for more than 30 seconds.
ROLL BEEP	TRIM ADJUST in roll has been active for more than 30 seconds.
PIT BEEP	TRIM ADJUST in pitch has been active for more than 30 seconds.
TRK MODE	Heading data is unavailable, FCS has reverted from heading to GPS track mode.
Y DETENT	Tail rotor pedals have been out of detent in yaw axis for more than 30 seconds.
YAW BEEP	Yaw TRIM switch has been active for more than 30 seconds.
YAW FAIL	System is unable to provide yaw axis control.

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

## FCS VISUAL ANNUNCIATIONS

Normal Mode Annunciations			
FCS Status	FCS LED	GMC 605H	GDU
FCS Engaged	Steady Green	"R" & "P" illuminated. "ATT" displayed.	"R" & "P" displayed in green. "ATT" displayed in green.
FCS Coupled	Steady Green	"R" & "P" illuminated. Lateral and vertical modes displayed.	Lateral and vertical modes, and "R" & "P" displayed in green. "CPLD" displayed in green.
Yaw axis engaged		"Y" illuminated.	"Y" displayed in green.

Normal Disconnect Annunciations			
FCS Status	FCS LED	GMC 605H	GDU
FCS Disconnect	Flashing amber for 10 seconds, then extinguished.	No annunciation.	"R" & "P" & "Y" (if enabled) flashing in yellow inverse video.
Yaw axis disengaged		No annunciation.	"Y" flashing in yellow inverse video.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****FCS VISUAL ANNUNCIATIONS (cont'd)**

<b>Abnormal Disconnect</b>			
<b>FCS Status</b>	<b>FCS LED</b>	<b>GMC 605H</b>	<b>GDU</b>
FCS Fail	Continuous flashing red until acknowledged, then steady red.	No annunciation.	Continuous FCS flashing red and white inverse video.

<b>System Failure</b>			
<b>FCS Status</b>	<b>FCS LED</b>	<b>GMC 605H</b>	<b>GDU</b>
FCS Fail	Continuous flashing red until acknowledged, then steady red.	FCS FAIL message displayed.	FCS displayed in red.
Yaw axis failure		YAW FAIL message displayed.	YAW message displayed in black on yellow.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****FCS AURAL ANNUNCIATIONS**

<b>FCS System Annunciation</b>	
<b>Aural Annunciation</b>	<b>Description</b>
Automatic mode change: Aural "DING-DING"	Indicates a pitch or roll upper mode change. No tone played for normal transition into or out of HOV or GSPD modes.
"FCS TEST OK"	PFT has passed.
"FCS TEST FAILED"	PFT has failed.
"DECOPLED"	All upper modes have been disengaged and pitch and roll are now in attitude hold.
FCS Engagement: Single tone aural "DING"	Played whenever FCS is engaged.
FCS Disconnect: Two-tone aural "BEE-BOOP"	Played whenever the FCS is disconnected automatically or by pilot action.
"LEVELING"	Level mode has been engaged.
"LIMIT CUE DISABLED"	Limit Cueing has been disabled.
"LIMIT CUE ENABLED"	Limit Cueing has been enabled.
"LOW ALTITUDE"	Low Altitude Protection is active.
"MAX SPEED"	Max Speed Protection is active.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****FCS AURAL ANNUNCIATIONS (cont'd)**

Aural Annunciation	Description
"OVERSPEED"	$V_{NE}$ has been exceeded.
"YAW FAIL"	Yaw axis system has failed and disconnected.
"LOW SPEED"	Low Speed Protection is active.

**LEVEL MODE DESCRIPTION**

Level mode provides a method to establish a safe flight attitude with a single button press. Level mode reference depends on the current default mode of the FCS at the time the LVL button is pressed. In hover or hover taxi, the following Level mode references will be set:

Lateral ground speed reference will be set to zero.

The forward speed will be set to the forward speed of the helicopter when Level mode was activated. The helicopter will remain in low speed or hover flight.

If (optional) yaw control system is enabled and a heading reference was set when Level mode was activated, the system will continue to seek that heading reference. If no heading reference was set when Level mode was activated, the heading present upon activation will become the heading reference. If yaw control system is disabled, yaw will not engage when Level mode is selected.

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****LEVEL MODE DESCRIPTION (cont'd)**

In forward flight, the following Level mode references will be set:

Roll angle reference will be set to zero.

The pitch angle reference will be set to 2 degrees nose down. This attitude will generally keep the helicopter in forward flight.

If (optional) yaw control system is enabled, yaw system will engage and seek lateral trim. If yaw system is disabled, yaw system will not engage when Level mode is selected.

***CAUTION***

Airspeed may decay when Level mode is engaged. Ensure sufficient power is applied when Level mode is activated to maintain altitude.

**MAX SPEED PROTECTION**

Max Speed Protection prevents the FCS from trimming to references that result in a stabilized airspeed above 120 knots or a small offset below  $V_{NE}$ , whichever is less. In attitude hold mode, Max Speed Protection becomes active at 125 knots or 3 knots below  $V_{NE}$ . A gentle pitch up force will be applied to the cyclic to seek a stabilized airspeed of 120 knots or 3 knots below  $V_{NE}$ . Visual annunciation "MAXSPD" will be provided on the GMC 605H and the PFD. Max Speed Protection will remain active until the current reference attitude would result in an airspeed of less than 120 knots or 3 knots below  $V_{NE}$ . With any vertical upper level mode engaged, Max Speed Protection will become active at 123 knots or 3 knots below  $V_{NE}$ . IAS will become the active mode with a reference of 120 knots or 6 knots below  $V_{NE}$ . Visual annunciation "MAXSPD" will be provided on the GMC 605H and the PFD, and aural annunciation "MAX SPEED" will be provided. Max Speed Protection will remain active until airspeed drops below 118 knots or 8 knots below  $V_{NE}$ .

**SECTION 7: SYSTEM DESCRIPTION (cont'd)****LOW SPEED PROTECTION**

Low Speed Protection prevents inadvertent deceleration below 45 knots while VS, ALT/PALT, or GS/GP is the active vertical mode. When a coupled FCS vertical mode is selected and the airspeed or airspeed trend drops below 45 knots, IAS will become the active vertical mode with a reference of 45 knots. Visual annunciation "LOWSPD" will be provided on the GMC 605H and the PFD, and aural annunciation "LOW SPEED" will be provided. Low Speed Protection will remain active until airspeed increases above 45 knots. If airspeed continues to decay below 35 knots, the FCS will transition to attitude hold mode and an automatic mode change tone will be provided.

**LOW ALTITUDE PROTECTION**

Low Altitude Protection prevents inadvertent descent below 200 feet GPS height above terrain (HAT) while VS, IAS, or ALT/PALT is the active vertical mode. When conditions for Low Altitude Protection are met, VS becomes the active vertical mode with a reference of 0 fpm or the current vertical speed if a positive vertical speed was present at activation. Visual annunciation "LOW ALT" will be provided on the GMC 605H and the PFD, and aural annunciation "LOW ALTITUDE" will be provided. Low Altitude Protection will remain active until the helicopter climbs above 300 feet GPS HAT. Once Low Altitude Protection is active, the vertical mode will remain VS with the current reference until the mode or reference is changed by the pilot. If the conditions for Max Speed Protection or Low Speed Protection are met concurrently with Low Altitude Protection, the speed protection mode will take priority, however visual annunciations and aural annunciations for both protection modes will be provided.

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

### LIMIT CUEING

Limit Cueing provides resistance to cyclic inputs when pitch, roll, airspeed, or G limits associated with safe flight are exceeded. The amount of resistance provided is proportional to the deviation beyond threshold values. If the FCS is disengaged when the threshold(s) is exceeded, the servo(s) in the affected axis (axes) will automatically engage and provide resistance until the parameter(s) exceeded is below its threshold. The affected servo will give an out of detent indication when Limit Cueing is active. Limit Cueing may be disabled/re-enabled by pressing and holding the cyclic FCS OFF button for more than 5 seconds. Limit Cueing defaults on at each power cycle of the GMC 605H.

### LIGHTING

GMC 605H Mode Controller lighting is controlled by integrated photocells which sense the ambient cockpit light level.

## SECTION 8: HANDLING AND MAINTENANCE

No change.

**SECTION 10**  
**SAFETY TIPS AND NOTICES**

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## **SECTION 10**

### **SAFETY TIPS AND NOTICES**

#### **GENERAL**

This section provides suggestions for the pilot to 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 (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 starting the engine and leave on after shut down until the rotors stop turning. The strobe light is located near the tail rotor and provides a warning to ground personnel.
5. Operation of all external lights even during daylight is recommended to promote collision avoidance. Strobe, position, and landing lights are long-life and suitable for continuous use.
6. Never carry any external load except when using an approved hook, and never attach anything to the outside of the helicopter. Also, be sure no loose articles are in the cabin, particularly when flying with any doors removed. Even a small, lightweight object can damage the tail rotor in flight.
7. Avoid abrupt control inputs or accelerated maneuvers, particularly at high speed. These produce high fatigue loads and, over time, could lead to failure of a critical component.

**SAFETY TIPS (cont'd)**

8. A change in the sound or vibration of the helicopter may indicate an impending failure of a critical component. If unusual sound or vibration begins in flight, make a safe landing and have aircraft thoroughly inspected before flight is resumed. Hover helicopter close to the ground to verify problem is resolved, and then have aircraft reinspected before resuming free flight.
9. Take steps to ensure ground personnel or onlookers remain well clear of tail rotor and exhaust. Main rotor blades can also be dangerous, especially if personnel are upslope from helicopter.
10. Never allow rotor RPM to become dangerously low. Most hard landings will be survivable as long as the rotor is not allowed to stall.
11. Never make takeoffs or landings downwind, especially at high altitude. The resulting loss of translational lift can cause the aircraft to settle into the ground or obstacles.
12. A vertical descent or steep approach, particularly downwind, can cause the rotor to fly into its own downwash, a condition known as vortex ring state. In this condition, even maximum engine power may not be enough to stop the descent, resulting in a hard ground impact. Vortex ring state can be avoided by always reducing rate of descent before reducing airspeed. (See Safety Notice SN-22.)
13. 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 or sideward, 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)**

14. Although the engine is equipped with an RPM governor, RPM control will not be exact for large or rapid power changes. If entering autorotation with a rapid collective input, close throttle before lowering collective to avoid an overspeed.
15. Engine may take several seconds to spool up from low to high power. Power should be applied early during power-recovery autorotations and other power-critical maneuvers
16. Do not attempt an engine start while distracted. Hot starts may result from improper positioning of twist grip or fuel cutoff or from low battery power. Continuously monitor MGT and be prepared to pull fuel cutoff OFF at any time during a start until reaching idle RPM.
17. Do not use collective pitch to slow the rotor during shut-down. Collective pitch produces lift on the blades which can disengage the droop stop friction and allow the blades to strike the tailcone. Also, do not slow or stop the rotors by grabbing the tail rotor. Stopping the tail rotor by hand can damage the tail rotor drive.
18. Do not land in tall dry grass. The exhaust is very hot; a grass fire may be ignited.
19. Always check area for wires or other obstructions before practicing autorotations.

## **PILOT KNOWLEDGE AND PROFICIENCY**

Pilot knowledge and proficiency is essential to safe helicopter operation. In addition to being appropriately licensed and complying with regulatory recurrency requirements such as 14 CFR §61.56 and §61.57, all pilots should seek to keep their knowledge base current and proficiency at a high level.

Periodic study and recurrent training is needed to maintain proficiency. Emphasis on the areas below is recommended. These areas should also be covered during transition training for each specific make and model that a pilot flies.

All Robinson dealers are staffed with approved instructors, and the factory can provide up-to-date information on instructors in your area.

## **RECOMMENDED REVIEW AND PROFICIENCY TOPICS:**

### ***NOTE***

The FAA Helicopter Practical Test Standards, FAA Helicopter Flying Handbook, and commercially available helicopter training syllabi can provide detailed lessons and standards in many of the areas listed.

- All Safety Tips and Safety Notices (SNs) in the Pilot's Operating Handbook
- Limitations and Emergency Procedures
- Precision hovering, hovering turns, hover taxi (*Ref SNs 9 and 42*)
  - Safe liftoff and set down with no tendency to drift
  - Crosswind and tailwind position and directional (yaw) control
- Vortex Ring State (*Ref SNs 22 and 34*)
  - Conditions conducive
  - Recovery procedures (Vuichard and traditional)
- Loss of outside visual reference (*Ref SNs 18, 19, and 26*)
  - Seriousness of this condition
  - Traps (night flight with clouds, gradually worsening conditions, etc.)
  - Featureless terrain or glassy water

**PILOT KNOWLEDGE AND PROFICIENCY (cont'd)**

- Flight planning (*Ref SNs 15, 26, and 43*)
  - Thorough preflight inspection
  - Fuel
  - Weather
  - Performance (hot/high/loading)
- Distractions (*Ref SNs 16, 34, 36, and 41*)
  - Failure to keep eyes outside scanning for wires, other obstacles, and traffic
  - High workload missions such as photo flights
  - Passengers
  - Avionics
  - Cell phones
- Low-G and mast bumping (*Ref SNs 11, 29, and 32*)
  - Avoidance
    - Reduce airspeed in turbulence
    - Monitor airspeed when lightly loaded
    - Ensure passenger controls are removed
  - Recognition and recovery

**CAUTION**

Never practice/demonstrate low-G in flight.

Low-G training should be knowledge based only.

- Low RPM considerations (*Ref SNs 10, 24, and 29*)
  - Recognition and recovery
- Power failures (*Ref SNs 10, 24, and 29*)
  - Instinctive autorotation entry
  - Continuously consider emergency landing sites throughout every flight
- Practice autorotations (*Ref SN 38*)
  - Proven, safe methods

**CAUTION**

In-flight practice of Low RPM, power failures, and autorotations should only be conducted under the supervision of an instructor.

- Confined area operations (Ref SN 22)
  - High and low reconnaissance
  - Assessing wind
  - Power margins

**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 Notices are available on the RHC website: [www.robinsonheli.com](http://www.robinsonheli.com).

<b>SAFETY NOTICE</b>	<b>TITLE</b>
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 Hold Controls When Boarding Passengers Never Land in Tall Dry Grass
SN-18	Loss of Visibility Can Be Fatal Overconfidence Prevails in Accidents
SN-19	Flying Low Over Water is Very Hazardous
SN-20	Beware of Demonstration or Initial Training Flights
SN-22	Vortex Ring State Avoidance, Recognition, and Recovery
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 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	Drive Belt Slack
SN-34	Aerial Survey and 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	Post-Crash Fires
SN-41	Pilot Distractions
SN-42	Unanticipated Yaw
SN-43	Use Extra Caution During Post-Maintenance Flights
SN-44	Carrying Passengers

## **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 cutoff 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 1982

Revised: Feb 1989; Jun 1994

### 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 1982

Revised: Nov 2000; Jul 2025

### **LOW-G PUSHOVERS – EXTREMELY DANGEROUS**

Pushing the cyclic forward following a pull-up or rapid climb, or under some conditions even from level flight, may produce a low-G (weightless) flight condition. During a low-G condition the thrust from the rotor disc is reduced and the ability to generate the moments necessary for attitude control is reduced. Helicopters have low rotational inertia about the roll axis and any imbalance in aerodynamic forces will lead to an accelerating roll. The severity of the roll increases significantly with increasing airspeed and when lightly loaded, and is strongly influenced by the type of horizontal stabilizer fitted to the helicopter:

- Helicopters equipped with the asymmetric horizontal stabilizer (earlier version, mounted adjacent to the tail rotor gearbox) may experience a rapid right roll under low-G conditions.
- Helicopters equipped with the symmetric horizontal stabilizer (later version, mounted under tailcone forward of tail rotor) may experience a less severe roll to the right OR left.

With reduced thrust from the rotor, the decreased control effectiveness can result in the pilot making large control inputs to counteract rolling motion; low-G mast bumping can occur as a result of these improper control inputs. Severe in-flight low-G 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 any roll. To reload the rotor, immediately apply a gentle aft cyclic, but avoid any large cyclic inputs.

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 or condition which could result in a low-G condition. Low-G mast bumping accidents are almost always fatal.

Pushovers are not the only cause of low-G conditions. A pilot's improper response to turbulence may also introduce a dangerous loss of loading on the rotor. See SN-32 for more information.

**NEVER PERFORM A LOW-G PUSHOVER!!**

## **Safety Notice SN-13**

Issued: Jan 1983

Revised: Jun 1994

### **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, & SN-28

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## **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.

## **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: July 1986 Revised: June 1994; October 2016, January 2024

### **VORTEX RING STATE AVOIDANCE, RECOGNITION, AND RECOVERY**

A vertical descent or steep approach, particularly downwind, can cause the rotor to fly into its own downwash. At certain descent rates, large vortices develop as the downwash is recirculated through the rotor disk. This condition is known as vortex ring state (VRS). Once VRS exists, adding power (raising collective) can unexpectedly increase descent rate due to the increase in downwash recirculating through the rotor. Recovery can only be accomplished by moving the rotor disk out of its own downwash.

To avoid VRS, reduce rate of descent before reducing 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.

Signs that VRS is developing include increased vibration levels, decreased control authority ("mushy controls"), and a rapid increase in sink rate. Pilots should always be aware of wind conditions and plan descents to avoid VRS. Pilots should be particularly alert to the possibility of VRS during OGE hover operations or steep approaches.

A recovery should be initiated as soon as VRS is suspected. Early recognition and immediate recovery by moving the rotor out of its downwash is essential. Large control inputs are not necessary and should be avoided. After recovery, increasing collective and/or airspeed will help to avoid re-entering VRS.

## **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.

## Safety Notice SN-24

Issued: Sep 86 Rev: Jun 94

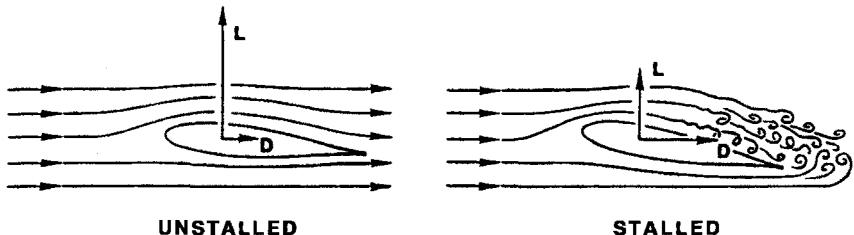
### LOW RPM ROTOR STALL CAN BE FATAL

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 1986 Rev: Jul 2012

### **CARBURETOR ICE**

Avoidable accidents have been attributed to engine stoppage due to carburetor ice. When used properly, the carburetor heat and carb heat assist systems on the R22 and R44 will prevent carburetor ice.

Pressure drops and fuel evaporation inside the carburetor cause significant cooling. Therefore, carburetor ice can occur at OATs as high as 30°C (86°F). Even in generally dry air, local conditions such as a nearby body of water can be conducive to carburetor ice. **When in doubt, assume conditions are conducive to carburetor ice and apply carb heat as required.**

For the R22 and R44, carburetor heat may be necessary during takeoff. Unlike airplanes which take off at full throttle, helicopters take off using power as required, making them vulnerable to carburetor ice. Also use full carb heat during run-up to preheat the induction system.

On aircraft equipped with the carb heat assist system, the control knob should be left unlatched unless it is obvious that conditions are not conducive to carburetor ice.

Carburetor heat reduces engine power output for a given manifold pressure. Approximately 1.5 in. Hg additional MAP is required to generate maximum continuous power (MCP) or takeoff power (TOP) with full heat applied. The additional MAP with carb heat does not overstress the engine or helicopter because power limits are still being observed. Since the engine is derated, it will produce TOP at lower altitudes even with full heat. However, avoid using more heat than required at high altitudes as the engine may reach full throttle at less than MCP or TOP.

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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 1988    Rev: Jul 2012

### **LISTEN FOR IMPENDING BEARING FAILURE**

An impending ball or roller bearing failure is usually preceded by a noticeable increase in noise. The noise will typically start several hours before the bearing actually fails or before there is any increase in bearing temperature. To detect pending failure of a drive system bearing, the pilot should uncover one ear and listen to the sound of the drive system during start-up and 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 to indicate impending bearing failure. A failing bearing may not run hot enough to black out the Telatemps until it actually starts to disintegrate. This may occur only seconds before complete failure.

### **CLUTCH LIGHT WARNING**

It is normal for the clutch light to come on occasionally in flight for a short time (approximately 3 to 6 seconds) to re-tension the drive belts. If the clutch light flickers or does not go out within 10 seconds, it can indicate a belt or bearing failure. If abnormal clutch light indication occurs, pull clutch circuit breaker and reduce power. Select a safe landing site and make a precautionary landing to check drive system. If additional symptoms of drive system failure (smell of hot rubber, noise, or vibration) are present, land immediately. If tachometer needle split occurs, enter autorotation.

After landing, shut down and check the drive belts to insure that the belts are in their grooves and not damaged. Check the upper and lower actuator bearings for seal damage. Also check the Telatemp indicator readings. If drive system problems are found, 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 1994

Rev: Apr 2009

### **LOOSE OBJECTS CAN BE FATAL**

Fatal accidents have occurred due to loose objects flying out of the cabin and striking the tail rotor. Any object striking the tail rotor can cause failure of a tail rotor blade. Loss of or damage to a tail rotor blade may cause a severe out-of-balance condition which can separate the tail rotor gearbox or entire tail assembly from the tailcone, resulting in a catastrophic accident. Accidents have also been caused by fuel caps, birds, and other objects striking the tail rotor. Before each flight perform the following:

- 1) Walk completely around the aircraft checking fuel cap security and tail rotor condition. Ensure no loose objects or debris in helicopter vicinity. Verify cotter rings or pins are installed in all door hinge pins.
- 2) Stow or secure all loose objects in the cabin. Even with doors on, items such as charts can be sucked out of a vent door.
- 3) Instruct passengers regarding the dangers of objects striking the tail rotor. Warn them never to throw anything from the helicopter or place items near vent doors where they could get sucked out.
- 4) Firmly latch all doors.
- 5) Never fly with a left door removed. (Remove only the right door for ventilation.)

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## **Safety Notice SN-31**

Issued: Dec 1996

### **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 1998

Revised: Jun 2020; Jul 2025

### HIGH WINDS OR TURBULENCE

Flying in high winds or turbulence should be avoided. A pilot's improper application of control inputs in response to turbulence or high winds can lead to a loss of control and/or create a dangerous low-G condition. The pilot must be aware of conditions that can be associated with turbulence, including convective activity, strong surface winds over terrain of varying elevation, mountain waves, and strong inversions. Avoid flying over terrain where turbulence will likely be severe. If moderate or greater turbulence is expected or encountered, the following procedures are recommended:

- Reduce power and use a slower-than-normal cruise speed (60–70 knots). Low-G mast bumping is significantly less likely at lower airspeeds.
- Tighten seat belt and rest right forearm on right leg to minimize unintentional control inputs. Some pilots may choose to apply a small amount of cyclic friction to further minimize unintentional inputs.
- Disengage autopilot upper modes such as ALT, VS, IAS, HDG, and NAV.
- Do not overcontrol. Allow aircraft to move with the turbulence, then restore aircraft attitude with smooth, gentle control inputs. Momentary airspeed, heading, altitude, and RPM excursions are to be expected.
- If a low-G condition is encountered, reload the rotor with a gentle aft movement of the cyclic prior to correcting any roll deviations.
- If appropriate, adjust course to avoid terrain likely to cause turbulence, such as the downwind side of hills, ridges, or tall buildings.

The helicopter is more susceptible to turbulence at light weight. Reduce speed and use caution when flying solo or lightly loaded.

Do not fly if extreme conditions are anticipated.

Refer to SN-11 for more information about low-G conditions.

## **Safety Notice SN-33**

Issued: Mar 1998

Revised: Jul 2013; Jul 2021

### **DRIVE BELT SLACK**

Pilots must ensure R22 and R44 drive belts do not have excessive slack during engine start. Belts that are too loose may jump out of their sheave grooves while being tensioned, but the pilot has no way of observing this. Therefore, the following checklist items are very important.

1. Per preflight checklist, with clutch disengaged, deflect belts inboard just above fan scroll on aircraft right side. Verify a maximum of 1.5 inches (4 cm) deflection. If belts deflect further, have belt tension actuator adjusted prior to flight.
2. Per run-up checklist, verify rotor turns within 5 seconds after engaging clutch switch. If time is longer, shut down and have belt tension actuator adjusted prior to flight.

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## **Safety Notice SN-34**

Issued: Mar 99 Rev: Apr 2009

### **AERIAL SURVEY AND PHOTO FLIGHTS – VERY HIGH RISK**

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

Often, to please the observer or photographer, an inexperienced pilot will slow the helicopter to less than 30 KIAS and then attempt to maneuver for the best viewing 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.

Aerial survey and 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 observer or photographer and only fly the aircraft at speeds, altitudes, and wind angles that are safe and allow good escape routes.

Also see Safety Notice SN-24.

## Safety Notice SN-35

Issued: Apr 1999      Revised: Feb 2016

### FLYING NEAR BROADCAST TOWERS

High-power radio broadcast towers (typically 50 kW or greater) may generate Electromagnetic Interference (EMI) with helicopter electrical systems and electronic equipment. Early indications of a high-power radio field can be considerable radio squelch break or static in the intercom system. More severe effects may include random illumination of warning lights or erratic engine governor and tachometer operation. In the worst cases, the governor may attempt to fully open or close the throttle. If the pilot is not ready to counteract a governor malfunction, a low-RPM condition or overspeed may occur.

Radio field strength decreases rapidly as distance from a transmitting antenna increases. To minimize the probability of encountering EMI, do not fly within  $\frac{1}{2}$  mile of high-power broadcast towers.

If EMI is inadvertently encountered:

- Do not become distracted trying to adjust the radio or audio system.
- Keep one hand on the throttle twist grip and feel for normal operation. If operation is abnormal, tighten grip to override governor and control throttle manually. If desired, governor may be switched off until helicopter is clear of the EMI area.
- Monitor tachometer, engine instruments, and warning lights carefully. Use caution not to overreact to a false instrument or warning light indication.
- Following a flight where EMI was encountered, have electrical system and installed electronic equipment assessed by qualified maintenance personnel.

The location and height of radio broadcast towers are marked on aeronautical charts. However, transmitter power and frequency are not. While all broadcast towers should be circumnavigated at a safe distance, those in the HF/Short Wave band have the highest likelihood of causing EMI. A list of such towers for the United States can be found on the Robinson Helicopter Company website at [www.robinsonheli.com/sn35antennas](http://www.robinsonheli.com/sn35antennas). The list was compiled from a Federal Communications Commission (FCC) database of HF/Shortwave stations. Appropriate agencies in other countries may be able to provide similar databases.

## **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.

## **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: Jul 2019

### **PRACTICE AUTOROTATIONS CAUSE MANY TRAINING ACCIDENTS**

Practice autorotations continue to be the number one cause of helicopter training accidents. Many of these accidents occur because the instructor fails to take decisive action.

Instructors should always perform the following "100 Foot Decision Check":

- 1) Rotor RPM approximately 100%
- 2) Stabilized airspeed between 60 and 70 KIAS
- 3) Stabilized rate of descent, usually less than 1500 ft/min.
- 4) Turns (if any) completed

Prior to descending below 100 feet AGL, the instructor must make the decision to take the flight controls and make an immediate power recovery if any of the above parameters is not correct. Do not attempt to salvage the situation by coaching the student or trying to correct below 100 feet AGL. At density altitudes above 4000 feet, increase the decision check to 200 feet AGL or higher.

If the decision to continue is made, the instructor should announce "100 Foot Check complete, continue".

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.

The purpose of the practice autorotation is to teach control and maneuvering during the glide, proper use of the flare, and the power recovery (or landing). While simulated power failure/forced landing practice may involve more abrupt power reduction, practice autorotation entries should be accomplished smoothly and slowly in accordance with the Robinson Flight Training Guide.

## **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 severed 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: July 2006 Rev: May 2013

### **POST-CRASH FIRES**

There have been a number of cases where helicopter or light plane occupants were severely burned by fire following an accident. Fire-retardant Nomex flight apparel reduces the likelihood of severe burns. Military, law-enforcement, medical, and other organizations often require Nomex apparel for every flight. Pilots should consider the benefits of fire-retardant clothing and brief or equip all occupants accordingly.

## Safety Notice SN-41

Issued: May 2013

Revised: Jul 2021; Jul 2025

### PILOT DISTRACTIONS

Pilot distractions have caused or contributed to numerous fatal accidents. Examples of distractions include the use of mobile phones and portable electronic devices, unexpected events, consuming food or beverage, and attending to passengers.

Distractions may be visual, physical, or mental as each of these divert the pilot's attention from the primary duty of flying the helicopter. Numerous studies have shown that distractions while driving a motor vehicle are the equivalent of driving while impaired, leading to laws prohibiting this behavior. Operation of an aircraft while distracted is similarly affected and equally dangerous.

It is your responsibility as the pilot to maintain focus on the operation of the helicopter by not engaging in activities that unnecessarily distract from this responsibility.

Use of an autopilot never frees a pilot from the responsibility to closely monitor and control the aircraft. Do not fall prey to complacency while the autopilot is engaged or regard its use as an opportunity to engage in non-essential activities.

The following guidelines will help ensure your safety and the safety of your passengers:

- Keep your hands available to assume control of the aircraft at all times.
- Postpone lower priority activities until it is safe to do so or until after landing.
- Always maintain your visual scan outside the aircraft and of the flight instruments.
- Maintain situational awareness and mental engagement with the operation of the helicopter.
- Any avionics programming that takes more than a few seconds should be done while on the ground.
- If a door opens in flight, always land before attempting to close it.
- When hovering, keep both hands on the controls. If tuning a radio or other task is required, first land and reduce collective pitch.

## **Safety Notice SN-42**

Issued: May 2013

Revised: Jul 2019

### **UNANTICIPATED YAW**

A pilot's failure to apply proper pedal inputs in response to strong or gusty winds during hover or low-speed flight may result in an unanticipated yaw. Some pilots mistakenly attribute this yaw to loss of tail rotor effectiveness (LTE), implying that the tail rotor stalled or was unable to provide adequate thrust. Tail rotors on Robinson helicopters are designed to have more authority than many other helicopters and are unlikely to experience LTE.

To avoid unanticipated yaw, pilots should be aware of conditions (a left crosswind, for example) that may require large or rapid pedal inputs. Practicing slow, steady-rate hovering pedal turns will help maintain proficiency in controlling yaw. Hover training with a qualified instructor in varying wind conditions may also be helpful.

Note that thrust of any tail rotor decreases significantly as RPM decreases. Low RPM combined with high torque, as occurs when over-pitching, may result in an uncontrollable right yaw (see also Safety Notice SN-34).

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## **Safety Notice SN-43**

Issued: Jan 2015

### **USE EXTRA CAUTION DURING POST-MAINTENANCE FLIGHTS**

A number of fatal accidents have occurred during flights immediately following maintenance. In several cases, the cause was incorrect or incomplete reassembly of the helicopter, and the error would have been detectable during a careful preflight inspection.

Even the best maintenance personnel can become distracted and make a mistake. Pilots should conduct an especially thorough preflight inspection after maintenance has been performed. If possible, speak to the technicians who performed the work, find out exactly what was done, and pay special attention to those areas. Professional maintenance personnel will appreciate the pilot's commitment to safety and will welcome an additional check of their work.

Any work done on the flight control system deserves special attention because a flight control disconnect is almost always catastrophic. During track and balance work, always climb up to the rotor head for a close inspection of the pitch link and control tube fasteners after each adjustment. Never rush or skip preflight steps.

## Safety Notice SN-44

Issued: February 2017   Revised: June 2017

### CARRYING PASSENGERS

Carrying passengers is an additional responsibility for the pilot in command. Passengers have placed their trust entirely in the hands of the pilot and should be advised of risks associated with the flight. Risks include pilot experience level, aircraft capability, and operational considerations such as flight over water or night flight. Carrying a passenger in and of itself increases risk because passengers add workload and distractions.

#### Passenger Briefings

Always conduct a passenger safety briefing before allowing a passenger on board. Passenger safety briefings should include:

- Risks: A discussion of the risks associated with the flight. Ensure passengers know that you will be happy to cancel or discontinue a flight if anyone is uncomfortable.
- Entry and exit: Have passengers demonstrate proper operation of seatbelts and doors. Brief safe emergency entry and exit paths (away from tail rotor and within pilot's view). Do not board or disembark passengers with rotors turning unless procedures (such as ground escorts) are established before the flight.
- Aircraft controls: Always remove passenger-side controls. Ensure passengers secure any personal items brought on board. Caution passengers against inadvertently bumping the cyclic center post. Ensure passengers know how to operate headsets and intercom system.
- Expectations for the flight: Adhering to fixed schedules or flying over landmarks may not be possible due to weather, airspace, or performance limitations. If passengers are aware of these limitations prior to the flight, there will be less pressure for the pilot to attempt a task beyond his comfort or experience level.
- High workload times: Passengers should always tell the pilot about safety-related items such as traffic but should refrain from unnecessary conversation during takeoff, landing, and radio communications.

## **Safety Notice SN-44 (continued)**

### **Newly-Rated Pilots**

Accident data shows that new pilots carrying passengers have high accident rates. The workload and distractions added by passengers are magnified for new pilots who may still be getting used to the aircraft and operating environment. Newly-rated helicopter pilots:

- Should not carry passengers until accumulating 100 total hours helicopter experience including 20 hours pilot in command in type after receiving their helicopter rating.
- Should only fly in daylight with good VFR conditions and low winds.
- For the first several passenger-carrying flights, should limit flight to a local, familiar area.

### **Related Safety Notices**

- SN-30 (doors-off flight with passengers is not recommended unless they have significant helicopter familiarity).
- SN-34 (photo missions have risks well beyond regular passenger carrying flights and require specific training and experience).