

**SECTION 4  
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
7. Nose
  - Verify pitot tube clear
  - Verify windshield clean and undamaged
  - Check yaw string

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

**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  
**Fuel cutoff** . . . . . **Pull OFF**  
**Throttle** . . . . . **Closed**  
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. Note hover torque.
4. Beep RPM as required to 100%.
5. Check gages in green, lower nose, and accelerate to climb speed following profile shown by height-velocity diagram in Section 5. Takeoff torque should not exceed 10% above hover torque.

***NOTE***

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

***NOTE***

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

## **CRUISE**

1. Beep RPM as required to 100%.
2. Set torque as desired with collective. Observe torque, MGT, and 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.

## **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.

**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 in green arc.
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 RPM 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<sub>1</sub> 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<sub>2</sub>/R needles split  
Wait one minute . . . . . Apply rotor brake  
Avionics, generator, battery, igniter switches . . . . . OFF

***CAUTION***

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

***CAUTION***

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

***NOTE***

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

***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.

## **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.

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## **AVOIDING HOT STARTS**

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

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.

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 measured gas temperature (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.

### **Before initiating a start:**

- Verify fuel cutoff is pulled completely off.
- Verify twist grip is completely closed (rotated toward pilot).
- Verify battery voltage is normal. If battery voltage is low (less than approximately 24.5 volts), use ground power and/or replace battery. Otherwise, the starter may not spin the compressor fast enough to provide the required airflow.

(OVER)

### During a start:

- DO NOT push the fuel cutoff on until  $N_1$  is smoothly rising through at least 15% (see flight manual for cold weather starts). If the starter is sluggish or will not achieve 15%, do not introduce fuel. Switch starter off using igniter (key) switch.
- If the engine is warm from a previous flight, DO NOT push fuel cutoff on until MGT is below  $150^{\circ}\text{C}$ . As the starter accelerates the engine to 15%  $N_1$  the MGT typically falls below  $150^{\circ}\text{C}$ . However, extra time may be required to allow the residual temperature to decrease.
- After pushing the 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  $900^{\circ}\text{C}$ . 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  $150^{\circ}\text{C}$ . Then, switch starter off using igniter (key) switch.
- Never push fuel cutoff back on if it has been pulled off. Finish aborting the start. Then, determine and correct the cause of the high temperature before attempting another start.