SECTION II

NORMAL PROCEDURES

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PREPARATION FOR FLIGHT.

FLIGHT RESTRICTIONS.

For limitations imposed on the helicopter, refer to Section V.

KNEELING.

The helicopter may be kneeled or unkneeled (normal) any time deemed necessary by the aircrew. Kneeling may be accomplished while engines are running, however, the helicopter should be in the unkneeled position during rotor engagement. The kneeling position can be utilized for convenience such as personnel door and aft ramp loading, slope landing, beaching, etc.

FLIGHT PLANNING.

The required fuel, airspeed, and power settings for takeoff, climb, cruising, hovering, and landing may be determined by reference to the performance data charts in Appendix.

NOTE

Airspeeds will be KIAS unless otherwise specified.

TAKEOFF AND LANDING DATA CARD.

Complete the takeoff and landing data card. Instructions for filling out the card are in the Appendix. The Takeoff And Landing Data Card (TOLD CARD), located in the Flight Crew Checklist, T.O. 1H-3(C)E-1CL-1, is designed as an aid in assuring safe and efficient mission planning. A TOLD card must be filled out for each flight. If conditions at the landing site are more favorable than for takeoff, use of the landing data is optional. The takeoff gross weight limitation can be determined for the applicable charts. Terrain conditions, surface conditions, and obstacles will dictate whether the in ground effect power and weight limitations or the out of ground effect power and weight limitations shall be used for planning the takeoff and landing gross weights and determining the type of takeoff to be made.

WEIGHT AND BALANCE.

The takeoff and anticipated landing gross weight will be obtained prior to each mission and determined to be within specified limitations. If a locally standardized weight and balance clearance, Form 365F, is not on file showing the helicopter to be within limits, a Form 365F will be completed. The load adjuster may be used to compute the Form 365F. For additional information refer to LOAD

ADJUSTER in section IV, WEIGHT LIMITATION, section V, Manual of Weight and Balance Data, T.O. 1-1B-40; Basic Weight Check List and Loading Data, T.O. 1H-3(C)E-5; Cargo Loading Manual, T.O. 1H-3(C)E-9, and USAF Aircraft Weight and Balance, T.O. 1-1B-50.

CHECKLIST.

The instructions contained in this flight manual should be complied with. However, every phase of operation shall also be presented in checklist form. When possible, the flight crew will perform each phase of action with a direct reference to a checklist. However, it would be impractical and unsafe to require the use of a checklist during actual landing, takeoff, taxiing near aircraft, buildings, or other hazards; or in certain emergency situations.

Checklist Responses.

When a checklist item is followed by a crew position designation, i.e., (P), (CP), (FM), etc., that crewmember takes the action, and if the action is in quotes, he reports that action to the person reading the checklist. When a checklist item requires a response by more than one crewmember, the crewmember will state the response and his crew position. Items of the checklist not applicable to the model, series, or configuration being operated may be omitted. If the action is not in quotes, he completes the action and remains silent. During accomplishment of the checklist, AS REQUIRED will not be used as a response; instead, the actual position or setting of the unit and/or item will be stated.

Thru-Flight Checklist.

The thru-flight checklist is to be accomplished only when the helicopter is assigned missions which require intermediate stops, including shutdown, by the same flight crew with no crew rest, and when no maintenance other than servicing is performed during these stops. Thru-flight checklist items are indicated by an asterisk. These items must be accomplished during an intermediate stop. The remaining items may be accomplished at the pilot's discretion. All items under ENGINE STARTING AND ROTOR ENGAGEMENT and subsequent checks should be accomplished as thru-flight checklist items.

Abbreviated Before Takeoff Checklist.

The abbreviated before takeoff checklist, identified by double asterisk items, may be used subsequent to the first takeoff of a flight providing the rotors are not shut down, and no major change in aircraft configuration or basic crew has been made. Examples when this checklist may be used are:

Passenger stops or after landings where speed selectors have been retarded.

TRAFFIC PATTERN CHECKLIST.

The Traffic Pattern Checklist is designed for use when multiple closed traffic patterns are to be performed to an authorized transition area. It may be used in lieu of the After Takeoff and Before Landing Checklists.

PREFLIGHT CHECK.

The pilot is responsible for insuring the preflight check is completed. He may delegate these tasks to other crewmembers.

NOTE

The pilot preflight inspection outlined in this section is predicated on maintenance personnel completing the Aircraft Schedule Inspection and Maintenance Requirements, T.O. 1H-3(C)E-6WC-1, for preflight. When operating from areas where maintenance personnel are not available to perform these requirements, the pilot will insure that the preflight inspection is accomplished in accordance with T.O. 1H-3(C)E-6WC-1.

INTERIOR INSPECTION.

1. Maintenance preflight inspection - CHECKED AND SIGNED OFF.
2. AVFUELS IDENTAPLATE - ABOARD.
3. Flight information publications - CHECKED.
4. Pilot's compartment - CHECKED.
   a. Landing gear lever - DOWN.
   b. First aid kit, fire extinguisher - CHECKED.
   c. Fuel dump switches (if installed) - OFF.

CAUTION

To preclude the possibility of fuel spillage, fuel dump switches must be OFF prior to energizing the electrical system.

5. Cargo compartment - CHECKED.
   a. Cargo, seats, miscellaneous equipment - CHECKED AND SECURED.

CAUTION

Interphone cords must be routed clear of window emergency release handles to preclude inadvertent jettison of windows.

b. First aid kits, fire extinguisher, emergency lights, crash axe - CHECKED.

c. Ramp cables - ATTACHED (WHEN LOADING COMPLETED).

6. Cabin windows installation - CHECKED.

Ensure windows are securely installed and jettison handles are safetied.

7. Flare case jettison switches - OFF AND SAFETIED.

8. AN/ALE-20 flare set control panel - SET.

a. Flares per burst switch - AS REQUIRED.

b. Burst selector - AS REQUIRED.

c. Interval selector - AS REQUIRED.

d. Bursts remaining - AS REQUIRED.

e. Transfer switch - OFF.

f. Power switch - OFF.

g. Auto switch - OFF.

9. Aux servo compartment - CHECKED.
a. Aux servo free of leaks
b. Filter free of leaks and not in bypass, control rods for alignment and undamaged.

EXTERIOR INSPECTION.

The exterior inspection will normally be accomplished by the flight mechanic and is optional under the following circumstances:

a. A member of the flight crew performs the preflight in accordance with T.O. 1H-3(C)E-6WC-1.

b. There has been no crew change from the previous flight and no maintenance has been performed. Exterior inspection will be performed in accordance with figure 2-1.

1. Right front fuselage.
   a. Covers, plugs, tie-downs, and static wire - REMOVED.
   b. Pilot's window emergency release handle - SECURED.
   c. Cargo door and release mechanisms - SECURED.
   d. Access panels - SECURED. Closed and undamaged.
2. Upper right fuselage.
   a. Engine oil level - CHECKED. Oil cap secured.
   b. Engine inlet - CHECKED. Free of foreign matter and loose objects. Starter for security.
   c. Engine - CHECKED. Free of leaks and general security.
   d. Engine exhaust section - CHECKED. No evidence of cracks and FOD.
   e. Engine door - CHECKED. Locking mechanisms for wear, door for proper closing and security. Door closed.
   f. Main gear box - CHECKED. Free of leaks and damage.
   g. Emergency gear extension bottle - CHECKED. Pressure up, no leakage.
   h. Transmission deck - CHECKED. Free of leaks.
   i. Main rotor blades - CHECKED. Undamaged, pockets aligned and BIM/IBIS indicators seated.

WARNING

If a pressure indicator shows any red color, the helicopter shall not be flown until corrective maintenance has been performed. This may be an indication of blade damage that is a flight hazard.

   j. Main rotor head fairing - CHECKED. Undamaged and secure.
   k. Damper reservoir - CHECKED. Serviced to correct level.
   l. Main rotor head reservoirs - CHECKED. Serviced and free of leaks.
   m. Main rotor head assembly and control linkages - CHECKED. Properly aligned and undamaged.
   n. Utility hydraulic reservoir - CHECKED. Serviced and access door secured.
   o. Rotor brake hydraulic reservoir - CHECKED. Serviced and free of leaks.
   p. Hydraulic power packages and utility heater exchanger - CHECKED. Free of leaks, security, and not in bypass condition. Access door secured.
   q. Fire extinguishers - CHECKED. Correct pressure. Access doors closed.
   r. Main rotor head fairing access panels - SECURED. Closed and free of damage.
3. Upper transmission section and tail.
   a. Antennas - CHECKED. Secure, clean and undamaged.
   b. Stabilizer - CHECKED. Security and condition.
   c. Anti-collision light - CHECKED. Check for cracks and security.
   d. Tail rotor gear box - CHECKED. Gear box for proper servicing, leakage and security.

WARNING

To avoid personal injury while checking the tail rotor gear box, do not exert any external force on the tail rotor blades while working around the tail rotor star, as the negative force gradient spring may cause the blades to drive to the fully released (Star in) position.

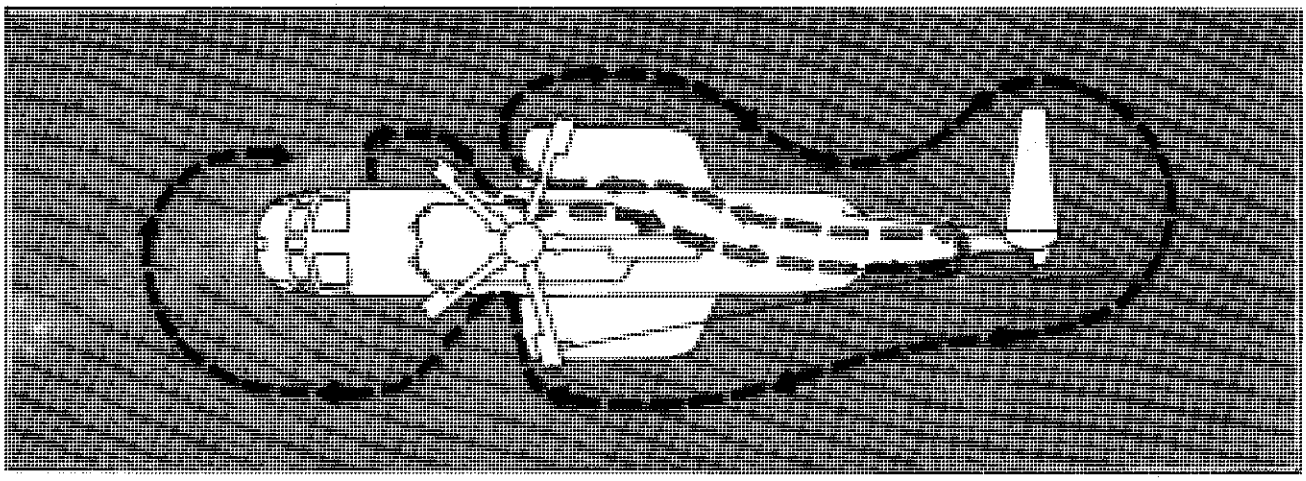


Figure 2-1. Exterior Inspection

e. Tail rotor hub - CHECKED.
Reservoir for servicing, linkage for alignment, wear and undamaged.

f. Tail rotor blades - CHECKED.
Undamaged, clean, and secured.

g. Access steps - CHECKED.
Proper operation and secured.

h. Transmission work platform - SECURED. Closed, locked and free of damage.

4. Right sponson.

a. Sponson and auxiliary tanks - CHECKED.
Tank safety pin installed, secure, free of leaks and damage, fuel quantity checked, filler cap secured. Check release lever and electrical solenoid plunger for proper position (see figure 1-29).

b. Main gear and tires - CHECKED.
Gear pin installed, free of leaks and damage.

c. Lower anti-collision lights - CHECKED.
For cracks and security.

d. Removable cabin windows - CHECKED.
Ensure window is properly installed.

5. Right rear fuselage.

a. Flare case - CHECKED.
Loaded, securely mounted, and safety pin installed.

WARNING

Stay clear of area below loaded flare cases.

b. Tail pylon - CHECKED.
Fairing for security and cracks.

6. Left rear fuselage.

a. Intermediate gear box - CHECKED.
Proper servicing, leaks and security.

b. Flare case - CHECKED.
Loaded, securely mounted, and safety pin installed.

c. Fire extinguisher discharge pins - CHECKED.
Ensure pins are not pushed out indicating a discharged fire extinguisher.

7. Left sponson.

a. Sponson and auxiliary tanks - CHECKED.
Tank safety pin installed, secure, free of leaks and damage, fuel quantity checked, filler cap secured. Check release lever and electrical solenoid plunger for proper position (see figure 1-29).

b. Main gear and tires - CHECKED.
Gear pin installed, free of leaks and damage.

c. Removable cabin windows - CHECKED.
Ensure windows are properly installed.

8. Upper left fuselage.

a. Engine oil level - CHECKED.
Oil cap secured.

b. Engine inlet - CHECKED.
Free of foreign matter and loose objects. Starter for security.

c. Engine - CHECKED.
Free of leaks and general security.

d. Engine exhaust section - CHECKED.
Evidence of cracks and FOD.

e. Engine door - CHECKED.
Latching mechanism for wear, door for

proper closing and security. Door closed.

f. Main gear box - CHECKED.
Free of leaks and damage, proper oil level.

g. Transmission deck - CHECKED.
Free of leaks.

h. Main rotor blades - CHECKED.
Undamaged, pockets aligned, and BIM/IBIS indicators seated.

i. Main rotor head fairing - CHECKED.
Undamaged and Secure.

j. Main rotor head reservoirs - CHECKED.
Serviced and free of leaks.

k. Main rotor head assembly and control linkages - CHECKED.
Properly aligned and undamaged.

l. Primary and auxiliary reservoirs - CHECKED.
Proper fluid level. Access panels closed.

m. Fire extinguisher - CHECKED.
Correct pressure, access door closed.

n. Main rotor head fairing access panels - SECURED. Closed and free of damage.

o. APU cowling - CHECKED.
Loose or missing fasteners, security.

p. Main transmission work platform - SECURED.
Closed and free of damage.

9. Left front fuselage.

a. Main fuel tank filler caps - SECURED.
Access panels closed.

b. Removable hatch - SECURED.

c. Antennas - CHECKED.
Secure, clean and undamaged.

d. Copilot's window emergency release handle - SECURED.

e. Covers, plugs and all tiedowns - REMOVED.

10. Front fuselage.

a. Nose gear and tires - CHECKED.
Free of leaks and secure.

b. Electronics compartment access door - SECURED.

c. Battery door - SECURED.
Closed, locked and free of damage.
Search light assembly for broken/cracked bulb.

d. Pilots - copilots and center windshields - CHECKED.
Clean and undamaged.

e. Refueling probe - CHECKED.
Secure and free of leaks.

BEFORE STARTING ENGINES.

The before starting engines procedures in this section are for normal engine starting and rotor engagement which require use of the APU. Should the APU be inoperative, engine starts may be accomplished by use of ac or dc external power or the battery. For starting procedures other than by use of the APU refer to Starting and Rotor Engagement Procedures With APU Inoperative in Section VII and/or Section IX.

*1. Passenger and crew briefing - "COMPLETED." (P)

Refer to Section VIII for Crew Briefing, Passenger Briefing, Predeparture Briefing, and Over-Water Briefing.

*2. Safety Belt, shoulder harness, seat, and rotor pedals - "FASTENED AND CHECKED." (CP, P)

a. Check that inertia reel lock will lock and unlock.

NOTE

When adjusting the shoulder harness, tighten the straps only enough to make a snug fit. Pulling the straps until they are tight against the stop may prevent the inertia reel lock mechanism from operating properly.

NOTE

Adjust tail rotor pedals with feet off pedals to avoid damage or breakage to the pedal adjustment cables.

3. Window emergency release - "CHECKED." (CP, P)

4. Pilot's console - "SET." (P)

a. J-4 compass selector switch - MAG.

b. AFCS channel monitor panel.
Channel disengage switches - ON.
Hardover switches - CENTERED.
Gyro select switch - LEFT.

c. Public address and loudhailer systems - OFF.

d. Battery bus circuit breakers - SET.

e. Ramp control switches - AS REQUIRED.

5. Nose wheel - "AS REQUIRED." (P)

CAUTION

The nose wheel lock handle must be unlocked for ground taxi (except rearward taxi), towing, takeoff and landing to prevent shearing the nose gear lock pin. During slope operations, the nose wheel lock handle should be locked to prevent the nose gear turning; however, caution must be used to avoid sideward motion as the helicopter settles to the ground.

6. Cockpit console - "SET." (CP, P)

a. Radios - OFF.

NOTE

If external power is used to start APU, UHF and/or VHF radios may be turned on at this time. All other radios and navigation equipment should be OFF.

b. Interphone panel - SET.

c. Alternate gear and external fuel tank release handles - DOWN AND SAFETIED.

d. APU master switch - OFF.

e. APU fuel shut-off switch - NORMAL.

f. APU fire extinguisher switch - OFF.

g. Ramp control switches - OFF.

h. Landing, search and floodlight switches - OFF.

i. External auxiliary fuel panel

(1) Jettison switches OFF and safetied.

(2) Pressurization switches OFF.

*7. Hoist and servo switches - "SET." (CP, P)

a. Servo switches - CENTERED.

b. Hoist master switch - OFF.

*8. Circuit breakers - "SET." (CP, P)

*9. Overhead switch panel - "SET." (P)

a. Engine anti-ice switches - OFF.

b. Windshield anti-ice switch - OFF.

c. Windshield washer motor switch - OFF.

d. Anchor lights - OFF.

e. Fuselage lights - OFF.

f. Anti-collision light switches - As REQUIRED.

g. Position lights - AS REQUIRED.

h. Emergency exit lights - RESET/NORMAL.

i. Loading lights switch - OFF.

j. Rescue light - OFF.

k. Windshield wiper control knob - OFF.

l. Pitot heater switch - OFF.

m. Heater switch - OFF.

n. Vent fan switch - NORM.

o. Cockpit lights - AS REQUIRED.

p. Nose gear switch - AS REQUIRED.

q. Cargo/hoist switch - OFF.

r. Cargo hook switch - SAFE.

s. Stick trim switch - ON.

t. Inverter switch - ON.

u. Transformer rectifier switches - ON.

v. External power switch - OFF (ON if used).

NOTE

With AC or DC external power source connected and energized, turning on the external power switch should illuminate the external power on advisory light and energize the appropriate AC or DC circuits. Not all AC APUs are equipped to provide a 28 volt DC input. When using this type APU, it is necessary to activate the battery switch momentarily to provide DC current for energizing the AC external power relay.

w. Battery switch - ON (OFF if external power is used).

x. Generator switches - ON.

y. Crew alarm bell - CHECKED.

z. T- handles - IN.

aa. Fire extinguisher switch - OFF.

ab. Hoist cable shear switch - OFF AND SAFETIED.

ac. Ignition switches - OFF

10. Engine controls - "CHECKED." (P)

a. Speed selectors - Check for freedom of movement, ground idle detent, full range, and shutoff.

b. Emergency fuel control levers - Check closed position stops, freedom of movement, full range, and closed (behind stops).

CAUTION

Failure to have emergency fuel control levers closed prior to start will result in a hot start.

*11. Rotor brake - "LOCK-OFF, BRAKE-ON." (P)

Minimum rotor brake pressure is 320 psi.

12. Pressure refuel panel - "SET." (P)

a. Master power switch - OFF.

b. Probe selector switch - STOW.

c. Panel lamp test switch - PRESS TO TEST.

d. Main tank selector switches - SELECT (FWD AND AFT).

e. External auxiliary fuel tank selector switches - OFF.

f. Probe light rheostat - OFF.

g. Fuel dump switches - OFF.

*13. Fuel management system - "SET." (CP)

a. Fuel shut-off valve switches - CLOSE.

b. Fuel crossfeed valve switch - CLOSE.

c. Boost pump switches - AS REQUIRED (NO. 1 AFT BOOST PUMP SWITCH - ON).

NOTE

This pump assures fuel to the APU after the prime pump drops out, provided the ac essential bus is energized.

d. Fuel quantity indicators - CHECKED. Depress test switches and hold until pointers drop to below zero. After a drop to below zero has been noted, release test switches; pointers should return to their original reading.

WARNING

When the test switches are depressed and held and a pointer does not drop to zero, but stops at a higher fuel indication, or the movement of a pointer is not smooth, a malfunction is indicated.
When test switches are released below zero, a slight hesitation in the fuel quantity indicator will occur below the zero point; however, the pointer should return smoothly to the original fuel quantity indicated prior to test.

*14. Caution - Advisory lights - "CHECKED." (P) Check that appropriate caution lights are on as noted below:

CAUTION PANEL.

a. With battery switch ON, 9 lights (if ramp and cargo door closed):

Nos 1 and 2 generators.
Nos 1 and 2 transformer-rectifier (TR's).
Transmission oil pressure.
Primary servo pressure.
Auxiliary servo pressure.
Blade pressure.
Rotor brake on.

b. With DC external power connected, the same 9 lights on the caution panel will be illuminated.

c. With AC external power connected the two TR lights will not be illuminated.

NOTE

If the IBIS, BLADE PRESS caution light does not illuminate when the battery is ON, the IBIS circuit electrical continuity is defective. The helicopter may be cleared for flight when the IBIS circuit is defective, if the IBIS indicators are checked and indicate normal and the IBIS circuit is deactivated by pulling the IBIS circuit breakers. Under these conditions, the helicopter speed and flight duration will be limited to a maximum of 110 KIAS and 6 hours.

NOTE

If any other lights are on at this time, the cause or condition should be noted or corrected before proceeding further.

d. Check that all lights go on when press-to-test button is pressed.

e. Reset master caution light as necessary.

NOTE

Cross-check caution or advisory system and other cockpit indications as other systems are operated. This will help the pilot avoid reliance on a malfunctioning warning system and help prevent situations which can lead to incidents or equipment failure.

*15. Intercom - "CHECKED." (ALL)

*16. Fire warning system - "CHECKED." (P, CP)

a. All engine and APU warning lights illuminated.

b. Audible signal and cutout switches checked.
Check pilot and copilot cutout switches.

*17. APU - "CLEAR." (FM), "STARTING." (CP or P)

If APU is inoperative, refer to Engine Starting and Rotor Engagement Procedure With APU Inoperative in Section VII and/or IX.

a. APU caution lights - PRESS-TO-TEST.

b. APU master switch - RUN (High exhaust temperature light - ON, Overspeed light - ON).

c. APU master switch - START (Hold until approximately 40% speed).

d. All APU caution lights - OFF.

NOTE

A primary pump failure would be indicated by continuous illumination of the PRI PUMP caution light during start. This condition should be corrected before departing for a destination where AC ground power equipment is not available.

e. APU ON advisory light - ON.

NOTE

Lite-off should occur by 36% speed. Clutch engagement should occur at 76-80% speed at which time the accelerations will slow down for about 3 seconds, then rapidly speed up to 100% with a maximum momentary overshoot of 110%. Should engagement occur above 80% speed, the actual engagement speed will be entered in the Form 781. Total time for starts should be 9 to 12 seconds. Below -29°C total starting time should be a maximum of 18 seconds.

f. APU tachometer - 98 to 100%.

CAUTION

APU start should be aborted by moving the master switch to OFF position if any of the following occurs:

(1) APU tachometer hangs up between 76-80% for more than 4 seconds (6 seconds when below -29°C). Overheating of clutch may result.

(2) No tachometer indication. This may signify a lack of overspeed protection or sensing of 90% which could result in ignition remaining energized and burning out.

(3) Low oil pressure caution light ON, high exhaust temperature caution light ON, or overspeed caution light ON. These indications should be accompanied by automatic shutdown.

NOTE

For APU emergency shutdown procedures, refer to FIRE IN APU in section III.

*18. Caution and advisory lights - "CHECKED". (P)

When the APU is running, 8 caution lights (generators, transformer - rectifiers, primary and auxiliary servo pressure, blade pressure and transmission oil pressure) should go off.

*19. Transmission and hydraulic indicators - "CHECKED." (P)

All indicators within normal range.

20. External power - "AS REQUIRED." (P, FM)

a. Battery switch - ON.

b. External power switch - OFF.

c. External power - DISCONNECTED.

If APU is inoperative, refer to Starting and Rotor Engagement Procedures With APU Inoperative in Section VII and/or IX.

21. Cargo sling releases - "CHECKED AS REQUIRED." (CP, P, FM)

If sling operations are planned, check for proper rigging and operation of all release mechanisms.

WARNING

Operation of the cargo emergency release should be smooth with no binding and the pedal should return to the full up position. If the pedal does not return to the full up position, a positive latching of the hook is not assured.

22. Rescue hoist - "CHECKED AS REQUIRED." (FM)

*23. Ramp - "AS REQUIRED; CABLE ATTACHED." (FM)

CAUTION

To prevent possible damage to the ramp, do not extend nose gear or engage the rotors if the ramp is below the horizontal position.

*24. Lights - "CHECKED" (FM) "SET" (P)

NOTE

Flight Mechanic will visually check exterior lighting. Cockpit and loading lights should be checked as mission requires. Do not set strobe lights until takeoff. Set position lights to flash when operated without anti-collision lights.

*25. Comm/Nav/Radios/Altimeter - "SET" (CP,P).

a. Radios on and set to desired frequencies.

b. IFF - STANDBY.

c. Set altimeter to field elevation.

CAUTION

Do not turn on the doppler navigation equipment until after the engines are started as damage to the doppler power supply may result from the changes in electrical power when the engine starter is engaged and when the starter drops out. To avoid damage to the power supply within the doppler, both ac and dc current must remain stable and uninterrupted whenever the doppler switch is not OFF.

26. Chip detector and ramp caution lights - "CHECKED." (P)
Press to test.

*27. Landing gear and warning light - "CHECKED." (P)

28. Turn rate switches - "NORMAL." (CP, P)

29. Voltmeter selector - "CHECKED." (CP)

NOTE

All positions shall read 28 $\pm$ 1 vdc.

*30. J-4 compass - "SLAVED AND ALIGNED." (P) "ALIGNED." (CP)

*31. Electronic altimeter - "ON." (CP, P)

32. Flight Controls and Cyclic trim - "CHECKED" (P, FM)

a. Cyclic stick, collective pitch lever, and tail rotor pedals - CHECKED. Check for proper response and freedom of movement through full travel. Have flight mechanic check tail rotor response when rudder pedals are moved.

(1) Full left pedal - tail rotor "STAR-IN" (FM)

(2) Full right pedal - tail rotor "STAR-OUT" (FM)

NOTE

FM will verify tail rotor star assembly is in when pilot says left pedal in, and tail rotor star assembly is out when pilot says right pedal in. If inadvertent release of the parking brake occurs during this check, they should be reset prior to continuing the checklist.

b. When cyclic stick is displaced and released, it should return to original position

c. Cyclic trim release button - CHECKED. With cyclic trim release button depressed, displace cyclic stick. When button is released, cyclic stick should remain in position set.

d. Cyclic trim switch - CHECKED. Move cyclic stick in each direction by use of trim switch.

e. Collective friction - AS REQUIRED. Friction may be checked at the pilot's discretion and after maintenance has been performed. Check that with full increase friction it is still possible to move the collective with normal arm force. Readjust collective friction to preclude collective bounce.

33. Primary servo - "OFF." (CP) "CHECKED, INTERLOCK CHECKED." (P)

NOTE

This check should be accomplished using the co-pilot's servo switch and the pilot's controls.

a. Check all flight controls for proper operation on auxiliary servos. Primary pressure should show zero and PRI PRESS caution light should come on. There should be no jump in the flight controls.

b. The pilot should check the servo interlock by placing his servo switch in the AUX OFF position and observing that there is no drop in the auxiliary servo hydraulic pressure and no caution light indication. As soon as this is ascertained, the pilot centers his servo switch.

34. Auxiliary servo - "OFF." (CP) "CHECKED, INTERLOCK CHECKED." (P)

NOTE

This check should be accomplished using the co-pilot's servo switch and the pilot's controls.

a. Check all flight controls for operation on primary servos. Auxiliary pressure should show zero and AUX PRESS caution light should come on.

NOTE

When turning auxiliary servo off, note that stick jump does not exceed 1/8 inch in cyclic and 1/16 inch in the tail rotor pedals and collective pitch to insure proper rigging of auxiliary servo pilot valve. Collective should be at least 4 inches from minimum during this check and tail rotor pedals in the neutral position.

b. The pilot should check the servo interlock by placing the servo switch in the PRI OFF position and observing that there is no drop in the primary servo hydraulic pressure and no caution light indication. As soon as this is ascertained, the pilot centers the servo switch.

35. Servo switches — "CENTERED." (CP)
"PRI, AUX CENTERED." (P)

Pilot checks his servo switch in PRI and AUX position. Observe that caution lights illuminate and pressures drop as appropriate and that pressures are normal and caution lights are off with both servo switches centered.

36. Parking brakes - "RESET" (P)

*37. "Before Starting Engines checklist completed." (CP)

ENGINE STARTING AND ROTOR ENGAGEMENT.

Prior to engine start and rotor engagement, a designated crewmember or ground personnel should be positioned in front of the helicopter to preclude personnel from inadvertently trespassing into danger areas. Refer to figure 2-2.

1. Ignition switches - "NORMAL" (CP)
2. Fuel management system - "CHECKED AND SET." (CP)

a. Fuel low pressure caution lights - CHECKED.
Press to test.

b. Fuel shut-off valves - OPEN.

c. Fuel crossfeed valve - CHECKED AND CLOSED.
Open the crossfeed valve. The No. 1 engine fuel flow should increase momentarily. Crossfeed valve closed.

NOTE

Check fuel shutoff and crossfeed valve status lights for proper indication when switches are actuated. Lights should illuminate briefly as valve moves.

d. Boost pumps - CHECKED AND ON.

(1) Turn on the FWD NO. 1 boost pump. The boost pump failure warning light should flicker then go off and the engine fuel flow should increase momentarily. Turn off the boost pump.

(2) Continue check of boost pumps. Failure warning light on momentarily, then off. Turn off the boost pump.

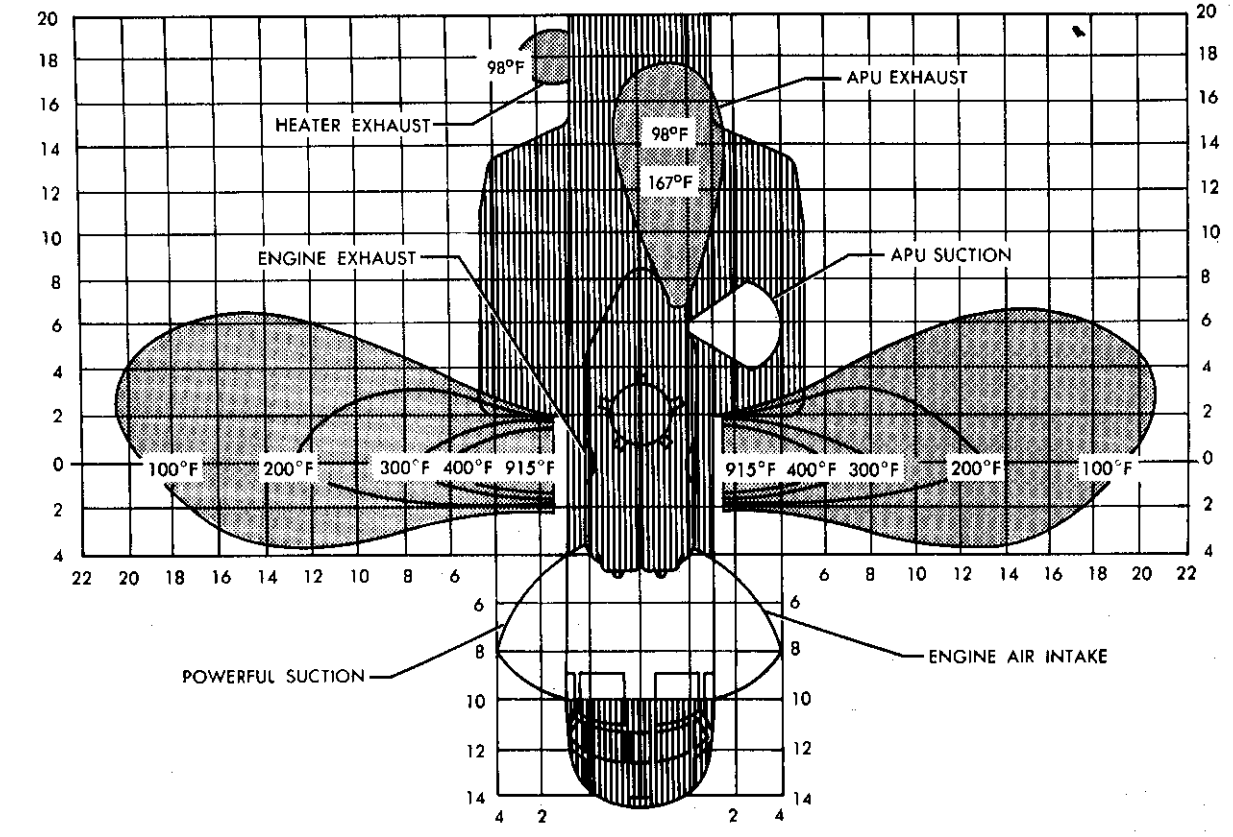
(3) One boost pump on in each tank.

NOTE

If fuel system maintenance has been performed, leave boost pumps on for approximately one minute after start to purge trapped air from fuel lines.

NOTE

Continuous use of one boost pump per tank is recommended to prevent inadvertent operation without boost pumps when their use is required. Refer to EQUIPMENT LIMITATIONS in Section V when the use of boost pumps are required. A recommended procedure for the operation of boost pumps is that the outside switches (No. 1 FWD and No. 2 AFT) be operated on odd dates and the inside switches on even dates. This procedure will equalize boost pump usage and will assure at least one boost pump is on if one generator should fail. If the fuel system is not primed, it may be required to turn the boost pumps ON for 20 to 30 seconds to prime before starting. An exception to the normal boost pump procedures (i.e., one per tank) may be made when two pumps are operative in one fuel tank and the mission can be completed using only fuel from that tank.



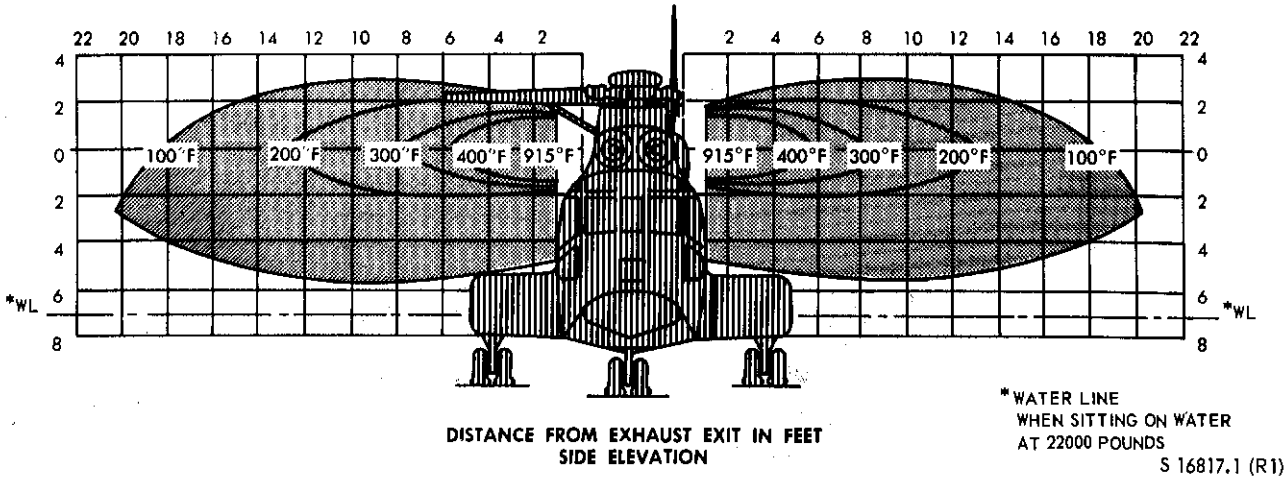


Figure 2-2. Danger Areas (Sheet 1 of 2)

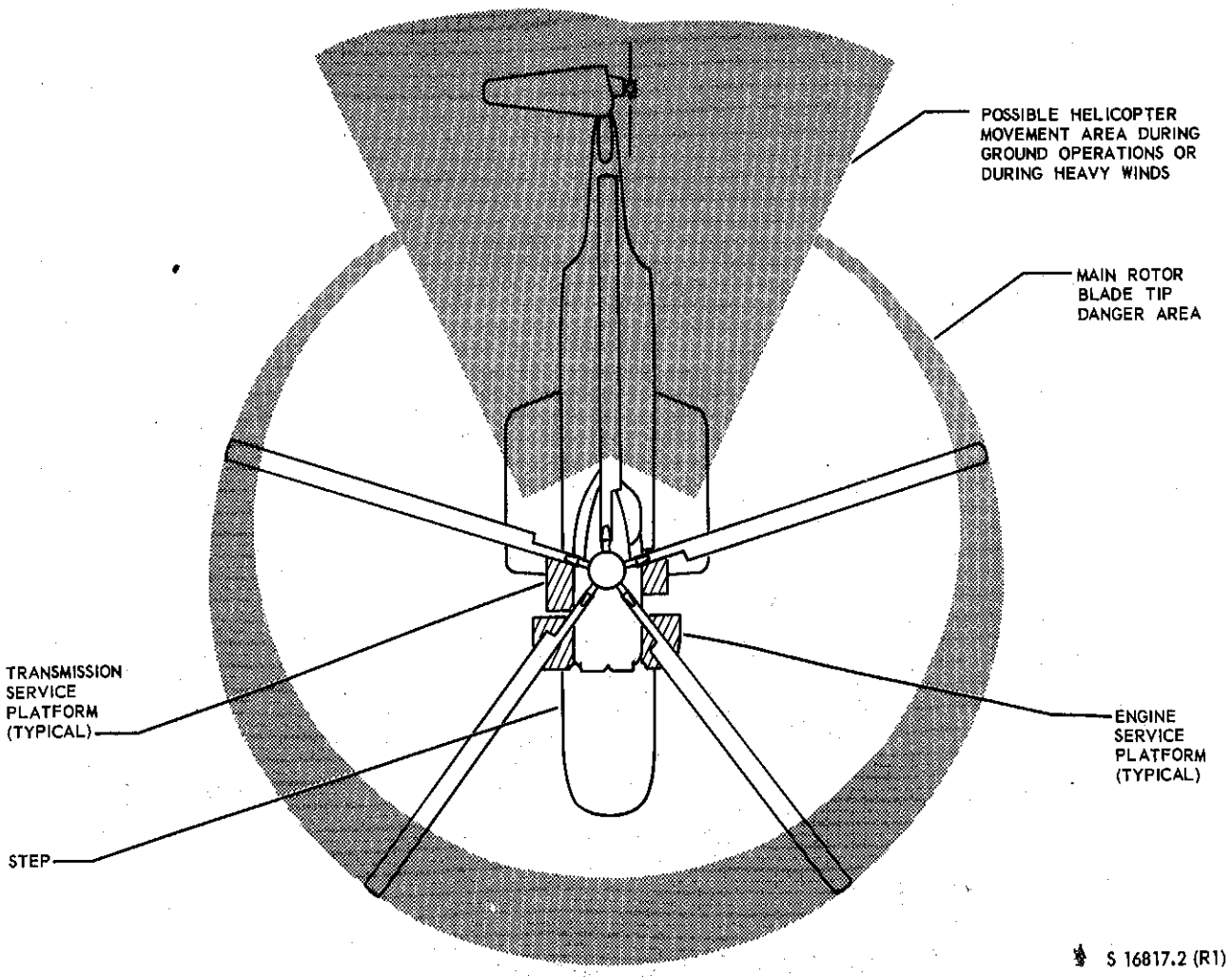


Figure 2-2. Danger Areas (Sheet 2 of 2)

CAUTION

If the gas generator (N_g) does not accelerate, monitor the power turbine inlet temperature (T_5). Determine the cause of the hot start before attempting restart. Normally, only one restart should be attempted. If T_5 rises abnormally and/or reaches 840°C, abort the start and be alert for an engine fire. If temperature remains low, abort the start or use starting procedures described in USE OF EMERGENCY FUEL CONTROL LEVER TO ASSIST STARTING in Section III.

c. Loadmeters - OBSERVE FOR STARTER DROPOUT.

Starter dropout should occur between 45 and 53% N_g.

CAUTION

If normal starter dropout indications are not observed, pull down on the speed selector to abort starter operation, while leaving the speed selector in the ground idle position. If starter does not disengage, pull the affected starter circuit breaker to prevent starter damage that will result at idle or higher N_g.

d. Engine instruments - CHECK. After engine temperature and pressure have stabilized:

(1) Check for approximately 56 $\pm$3% N_g. (15°C OAT).

NOTE

Idle speeds are affected by ambient temperatures and can vary from 50 + 3% N_g at -40°C OAT to 59 $\pm$ 3% N_g at 50°C.

(2) T_5 at approximately 300 to 525°C.

(3) At ground idle, fuel flow is approximately 165 pounds per hour.

(4) Engine oil pressure should be at approximately 8 to 20 psi.

CAUTION

If a minimum of 8 psi engine oil pressure is not indicated, shut engine down.

4. No. 2 engine - "CLEAR." (FM), "STARTING." (CP or P)

The procedure for starting the No. 2 engine is the same as for the No. 1 engine.

5. External auxiliary fuel tanks - "CHECKED." (CP, FM)

Pressurize each tank and check that fuel is transferring with no leakage. To ensure fuel transfer from the auxiliary fuel tanks proceed as follows:

a. Main tank selector switches - ON.

b. Turn one pressurization switch - ON.

c. Monitor refueling panel to ensure main tank flow lights are illuminated.

d. Turn pressurization switch - OFF.

e. Repeat procedure utilizing opposite pressurization switch.

6. Pins and chocks - "REMOVED" (FM)

NOTE

The FM may remove pins and chocks during the external auxiliary fuel tanks inspection (step 5).

WARNING

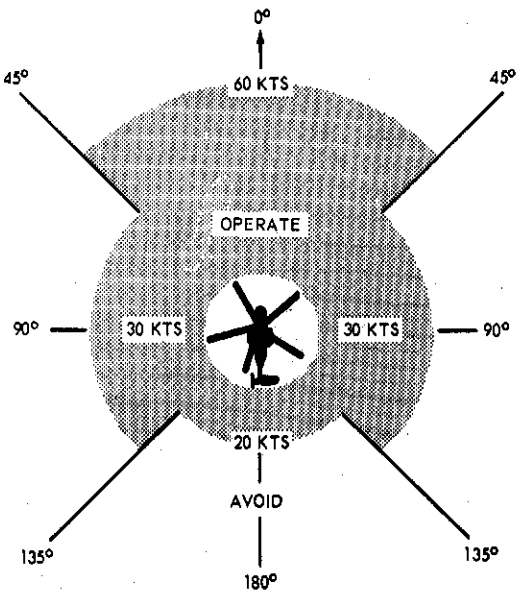
AN/ALE-20 safety pins and landing gear lock pins will be removed prior to removing the wheel chocks and wheel chocks will be removed prior to removing the auxiliary fuel tank pins. A visual inspection will be performed of the MK8 bomb shackle and plunger prior to pulling the safety pin. After removal of the auxiliary fuel tank pins, all personnel should remain clear of the area. If APU is inoperative, pins and chocks will be removed after rotor engagement. If an unusual amount of force is required to remove any safety pin, the operation will be terminated and the discrepancy annotated in the AFTO Form 781 for maintenance inspection/action.

7. Area - "CLEAR." (ALL)

WARNING

Before rotor engagement, make sure personnel are clear of the rotor blades. For ground clearances, see figure 2-4.

ROTOR ENGAGEMENT AND DISENGAGEMENT



NOTES

1. LIMITING VELOCITIES OF THE SHADED AREA REPRESENT MAXIMUMS FOR STEADY STATE, NONTURBULENT WINDS. WHEN TURBULENCE EXISTS WHICH MAY IN ANY WAY JEOPARDIZE THE SAFETY OF THE HELICOPTER OR PERSONNEL, THESE MAXIMUMS SHOULD BE REDUCED ACCORDINGLY.
2. ROTOR ENGAGEMENT IN WIND VELOCITIES NEAR THE LIMITING VALUES SHOULD BE MADE AS RAPIDLY AS POSSIBLE. HOLD CYCLIC STICK SLIGHTLY INTO THE WIND AND USE APPROXIMATELY 60% TORQUE TO ACCELERATE ROTOR SYSTEMS AS RAPIDLY AS POSSIBLE.
3. ROTOR DISENGAGEMENT IN WIND VELOCITIES NEAR THE LIMITING VALUES SHOULD BE MADE AS RAPIDLY AS POSSIBLE. APPLY ROTOR BRAKE FIRMLY AND SMOOTHLY.

Figure 2-3. Rotor Engagement Chart

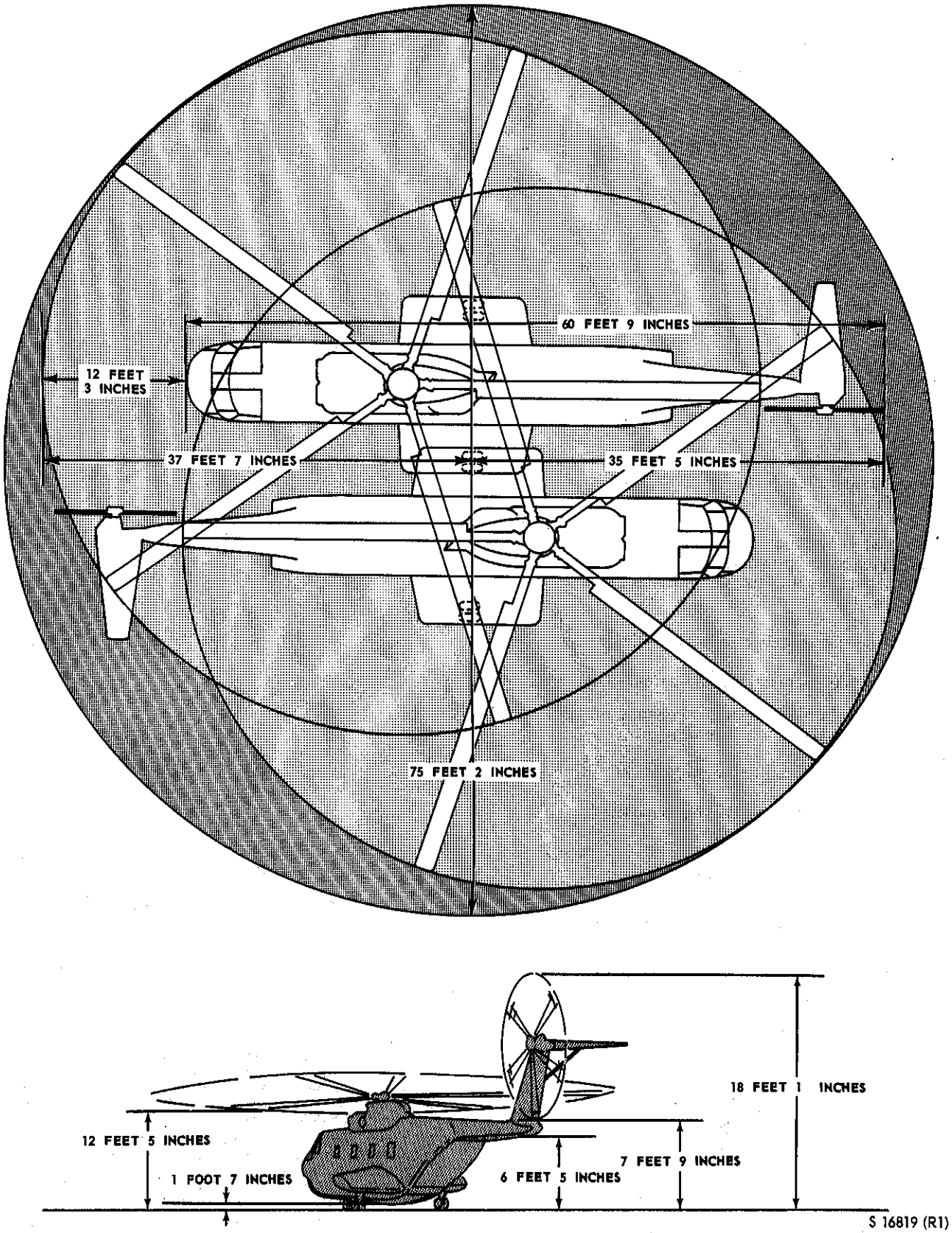


Figure 2-4. Turning Radius and Ground Clearance

WARNING

After the rotor is engaged, either the pilot or copilot should maintain a grip on the cyclic stick while the helicopter is on the ground. If the cyclic trim switch is left off, or the trim system malfunctions while the helicopter is on the ground, the cyclic stick may fall forward, if released, allowing the rotor blades to contact the top of the helicopter.

8. Rotors - "ENGAGED." (P)

High velocity or gusty winds can cause excessive blade flapping. The rotor should not be engaged in winds above 60 knots. (See figure 2-3.) When engaging or disengaging the rotor in high or gusty winds, the rotor should be accelerated or decelerated as rapidly as possible, limiting torque used to 60%. Refer to Starting and Rotor Engagement Procedures with APU Inoperative in Section VII and/or IX.

a. Flight controls - MONITORED.
The copilot will normally hold the controls.

(1) Cyclic neutral.

(2) Collective minimum.

(3) Tail rotor pedals neutral.

b. Engine speed selector — ADVANCE.

NOTE

- To minimize a possible one per revolution lateral roll during engagement, advance speed selector to take up dead-band travel prior to releasing rotor brake. Dead-band travel is removed when Ng and T5 start to increase.
- To distribute wear of unloaded engine input freewheeling unit evenly between both engines, rotor engagement should be made by alternating the engaging engine on a flight-to-flight basis.

c. Rotor brake - OFF (light out). Accelerate rotors smoothly to 100% N_r using approximately 40% torque. As N_r increases, insure that N_f increases on both engines. If no N_f is observed, return the speed selector to the shutoff position and accomplish the Engine Shutdown Checklist.

CAUTION

A rapid acceleration of the engine during or after rotor brake release can cause an overtorque condition during rotor engagement.

d. Anti-flapping restrainers and droop stops - RELEASED.
Anti-flapping restrainers should release at approximately 25% rotor speed and droop stops should release at approximately 75% rotor speed.

e. Flight controls - CHECK RESPONSE.
As rotor speed accelerates, actuate the flight controls a slight amount in all directions and check for proper response.

CAUTION

If flight controls do not respond correctly, shut down by retarding both speed selectors to SHUT-OFF and applying the rotor brake.

9. APU master switch - "OFF." (P)

a. Place the APU master switch in the OFF position. As the APU speed decreases the APU advisory light will go off.

b. Caution-advisory panel - CHECKED.

WARNING

Illumination of the generator caution lights indicates a possible malfunction of the tail takeoff free wheel unit. Advance the No. 1 engine to maximum and proceed with shutdown with tail takeoff free wheeling unit inoperative checklist in Section III. Do not shutdown the No. 1 engine until the rotor is stopped or the APU is started in order to maintain hydraulic servo pressure.

10. Unloaded engine speed selector — "SET — 102%." (P) (Pilot's and copilot's triple tachometer gages should be within 2% N_f/N_r of each other.)

If an external power unit is used during engine start and rotor engagement, proceed as follows:

a. Battery switch — ON.

b. External power switch — OFF.

c. External power — DISCONNECT.

11. Refueling probe - "CHECKED AS REQUIRED" (CP, FM)

    a. Probe will be checked if air refueling is anticipated.

NOTE

This check may be accomplished by observation from inside the helicopter to preclude any possible hazard associated with personnel working under turning rotors and/or the possibility of frost bite during cold weather operations.

    b. Check probe for proper extension, security, gages, trapped fuel and retraction.

WARNING

Insure area is clear before extending the probe.

12. Boost pumps - "OFF." (CP)

NOTE

The boost pump off check is to insure that no air leak exists in the fuel lines that would cause starvation of the engine-driven fuel pumps and subsequent flameout.

CAUTION

During high ambient temperature/pressure altitude, the fuel pumps should be turned on after approximately two minutes as prolonged operation with boost pumps off can cause engine flameouts under certain conditions. (See EQUIPMENT LIMITATIONS in Section V).

13. "Engine Starting and Rotor Engagement checklist completed." (CP)

BEFORE TAXIING.

1. ~~Engine anti-ice Caution and advisory lights~~ "CHECKED." (CP).

15-142

    a. Engine anti-ice switches — ON.

    b. Engine anti-ice caution and advisory lights — ON.

NOTE

Engine anti-ice valves can only be verified open by accomplishing the anti-ice system checks in the before takeoff checklist.

2. Doppler - "STANDBY." (CP)

CAUTION

To prevent damage to the doppler antenna, the doppler should be placed in STBY rather than OFF during flights when the doppler is not used. With the doppler OFF, the antenna is not stabilized and will bounce against the stops possibly damaging the mounts and gimbals.

NOTE

Doppler function switch should be placed in STBY position at least one minute prior to takeoff for adequate warm up.

3. Alarm bell - "CHECKED." (CP)

4. AFCS - "ON AND INDICATORS CHECKED." (CP, P)

SEE 13-144 CAUTION

Check AFCS indicators in Mode A, no hardover signals indicated, and CG trim centered. (If AFCS has not warmed up at this time, the check may be delayed until the BEFORE TAKEOFF checklist.)

WARNING

A malfunction of the AFCS can produce sudden control displacements which can result in abrupt changes in the attitude or trim of the helicopter. Control displacements may be either an AFCS hardover or an AFCS induced auxiliary Servo Hardover. Should control displacement occur when AFCS is turned on, immediately turn AFCS off. If turning AFCS off does not correct the problem, follow corrective action for Servo malfunctions in Section III.

5. Radio call - "COMPLETED." (P or CP)

6. Clocks and altimeters - "SET, STATE SETTING." (CP, P)

CAUTION

During normal use of the barometric setting knob, momentary locking of the counter drums may be experienced. If this occurs, do not force the setting knob. Application of force may cause internal gear disengagement and result in excessive altitude error. If locking occurs, the required setting may sometimes be established by rotating the knob a full turn in the opposite direction and approaching the setting again with caution.

7. Engine and windshield anti-ice — "CHECKED AS REQUIRED." (CP).

   a. Engine anti-ice caution lights — OFF.

NOTE

If the OAT is extremely low (-18°C, 0°F), the heating elements may not produce enough heat to raise the inlet duct temperature to 37.8°C to cause the caution lights to go off. However, at lower temperatures, where this may occur, icing conditions are not usually encountered due to lack of moisture in the air. Ensure that the anti-icing system is turned on before icing conditions are encountered. Icing may be expected when temperatures are 10°C (50°F) or below with high relative humidity, visible moisture, flight in clouds or in proximity of these phenomena.

b. 15-142
ANTI-ICE SWITCHES AS REQUIRED.
NOT REQUIRED WHEN NO POSSIBILITY
EXISTS OF FLYING IN TEMPERATURE
OF 10°C OR BELOW.

c. Windshield anti-ice switches — AS REQUIRED.

CAUTION

The windshield anti-ice switches should be placed in the LOW position before going to the HIGH position to avoid the possibility of the glass cracking due to sudden change in temperatures. Normally, the use of the HIGH position is not required except at very low outside temperatures when ice cannot be removed by the LOW position.

8. Personnel door emergency release handle - "CHECKED" (FM)

   With door closed, check handle in closed position, locking plunger seated in flange detent and lock pins full seated in slide and door hanger pin groove.

9. Crew and passengers - "READY FOR TAXI." (FM)

   The flight mechanic will ensure that all passengers, crew members and cargo are secured for takeoff. The cargo door and ramp will be as required.

WARNING

The aft ramp cables must be attached and forward ramp locked prior to all flights. If the ramp should extend beyond the horizontal position in forward flight, the helicopter may assume an extreme nose down attitude.

WARNING

The personnel door safety strap shall be attached whenever the personnel door is open and the helicopter is in motion unless cabin occupants have seat belts fastened or are wearing safety harnesses.

NOTE

The cabin entrance ladder, pins and chocks will be removed and stowed prior to taxi.

10. Area - "CLEAR." (ALL)

11. Nose wheel - "UNLOCKED." (P)

12. Parking brake - "OFF." (P)

13. "Before Taxiing checklist completed." (CP)

TAXIING.

Begin taxiing by increasing collective slightly. A small amount of forward cyclic may be necessary to assure forward motion is obtained. Rearward taxiing is accomplished, with nose gear locked, by raising the collective pitch and holding the cyclic aft, but not to the extent that it causes the blades to hit the droop stops. Caution should be observed when there are light planes within the immediate area as they may be upset by the turbulence caused by the rotors. If the rotor blades hit the droop stops while taxiing with the cyclic stick forward, adjust the cyclic and increase collective pitch slightly to lift the blades from the droop stops. Maximum N_r should be maintained when taxiing over rough terrain, in a strong crosswind, or whenever an immediate takeoff is anticipated. When taxiing crosswind, hold the cyclic stick slightly into the wind. Regulate taxi speed with collective pitch and wheel brakes. Regulate directional control using tail rotor pedals. When taxiing at high gross weights, maintain a small amount of up collective and move cyclic stick slightly in the direction of any turns to avoid excessive wear on the tires.

NOTE

Flight instruments and brakes will be checked during taxi.

BEFORE TAKEOFF.

1. Boost pumps - "ON." (CP), "CHECKED ON." (P)

WARNING

One boost pump must be on and operating in each tank to insure continuous engine operation during any condition listed under Equipment Limitations, Section V, paragraph 6.

2. Flight instruments - "CHECKED." (CP, P)

   Set attitude indicator, check turn and slip, heading, vertical velocity, and airspeed indicators.

3. Lights - "SET." (CP)

4. Anti-ice system - "CHECKED." (P, CP). With collective set at minimum and aircraft headed into the wind, perform the following checks:

IS-142 DELETE

   a. ~~Beep speed selectors to maximum and~~ note T_5.

   b. Place number one engine anti-ice switch OFF.

   c. T_5 should decrease approximately ten degrees.

   d. Return anti-ice switch to ON.

   e. Engine anti-ice advisory light should illuminate and T_5 should increase to the ~~value noted in step a. above.~~

15-142 DELETE

f. ~~Repeat procedures for number two engine.~~

g. ~~Anti-ice switches as required. Not required when no possibility exists of flying in temperature of 10°C or below.~~

5. Pitot heat - "CHECKED AS REQUIRED." (CP) Turn on pitot heat switch momentarily and observe loadmeter increase.

6. Engine acceleration-deceleration, flat pitch, and freewheeling - "AS REQUIRED." (P or CP)

The acceleration-deceleration, flat pitch, and freewheeling check will be performed on first flight of day or when engine deterioration is suspected.

CAUTION

Engage unloaded engine carefully, bringing that engine up slowly until it engages the transmission.

NOTE

A maximum of 2% N_f overshoot is allowed. No transmission engagement noises should be heard.

NOTE

When making this check, the pilot should observe operation of both engines simultaneously for signs of acceleration or deceleration stall since the engine set to drive the rotor at 100% will experience a rapid deceleration while the engine being checked is accelerated.

Abnormal indications which might be anticipated are: loud bangs with no unusual instrument indications, loud bangs accompanied by decreasing N_g and increasing T_5, hissing sounds accompanied by decreasing N_g and increasing T_5.

NOTE

Beeper trim should always be used when maximum N_f is required. Slack cables will sometimes prevent maximum N_f from being obtained when using the speed selectors.

a. With collective pitch lever at minimum, advance No. 2 speed selector and beep for maximum N_f. Retard No. 1 N_f to approximately 98 percent and check No. 2 N_f at 107 ($\pm$ 2)%. Confirm freewheeling by checking that No. 1 N_f is split from Nr. The limits of N_f flat pitch variation between engines is 2%.

b. With collective pitch at minimum, set N_f of No. 2 engine at 100%.

c. Carefully set No. 1 engine at 75% N_g.

d. Smoothly advance No. 1 engine speed selector to full forward within one second.

e. When No. 1 engine max N_g is reached, rapidly retard the speed selector to GND IDLE (being careful not to pass detent).

NOTE

For proper stator vane response, the N_g should accelerate from 75% to 90% in not more than 6 seconds. Timing will commence from 75% N_g and stop as N_g passes through 90%. If there are any abnormal indications or if time exceeds 6 seconds, the condition must be corrected prior to flight. N_g values over 90% may be encountered and are not considered abnormal. A reduction in opposite speed selector from 100% N_f may be necessary to reach the above N_g values which are a function of engine load requirements.

f. Beep the No. 1 speed selector for maximum N_f and repeat the check for No. 2 engine.

WARNING

Illumination of the generator caution lights indicates a possible malfunction of the tail takeoff freewheel unit. Advance the No. 1 engine to maximum and proceed with SHUTDOWN WITH TAIL TAKEOFF FREEWHEELING UNIT INOPERATIVE checklist in Section III. Do not shut down the No. 1 engine until the rotor is stopped or the APU is started in order to maintain hydraulic servo pressure.

CAUTION

Be alert for possible compressor stall on acceleration or deceleration which would be indicated by a rapid rise of T_5 and/or rumbling or explosive noises. If this occurs, shut down engine.

NOTE

Both engines should be accelerated and decelerated smoothly when advancing or retarding speed selectors.

7. Navigation equipment - "CHECKED AND SET." (CP, P)

   Tune, identify and check TACAN, ADF, ILS, VOR if required.

8. Electronic altimeter - "CHECKED." (CP, P)

   Depress PUSH-TO-TEST knob; pointer should indicate 100± 15 feet.

**9. Engine and transmission instruments - "CHECKED." (CP)

**10. Caution and advisory lights - "CHECKED." (P)

   Check all caution and advisory lights and reset master caution light.

**11. IFF - "AS REQUIRED." (CP)

**12. AFCS - "CHECKED ON" (P)

**13. Nose Wheel - "UNLOCKED" (P)

**14. Parking brake - "OFF." (P)

**15. Passenger and Crew - "READY FOR TAKEOFF" (FM)

**16. Speed Selectors - "AS REQUIRED" (State Setting) (CP)

   Maximum rotor rpm will normally be used for takeoff. A lower rpm setting may be used at the pilot's discretion.

WARNING

Do not allow N_r to droop below 100% as main and tail rotor effectiveness will be reduced.

17. Hover check - "COMPLETED." (P)

   a. **Power required to hover. Except when unable to hover, power required to hover should be checked and compared with that computed on the TOLD card. If actual power required to hover differs significantly from computed, evaluate the governing parameters (actual OAT, pressure altitude, and aircraft weight) to determine if they caused the difference or if an error was made in computation and if the difference warrants refiguring the TOLD card.**

   b. Maximum power available. Check maximum power available in accordance with Section VII prior to: (1) The first flight of the day and (2) operation at or near the maximum capability of the helicopter.

   c. Topping adjustment. Accomplish topping adjustment in accordance with Section VII when required as a result of the maximum power available check.

   d. Ng/T5 relationship check. Accomplish in accordance with Section VII before salt water operations, or the first flight following salt water operations, or whenever compressor deterioration is suspected. This check may be delayed and performed in cruise flight.

18. Doppler - "AS REQUIRED." (P)

**19. "Before Takeoff Checklist" - "COMPLETED." (CP)

TAKEOFF.

Factors which will determine the type of takeoff to be performed are: gross weight of the aircraft, meteorological conditions, characteristics and obstacles associated with takeoff area, and the tactical situation. The first objective during takeoff is to clear obstacles at a safe airspeed and then establish the airspeed which will result in the best rate-of-climb reflected in appropriate climb charts in the Appendix. This is also the airspeed that will produce best single engine performance. The appropriate takeoff charts in the Appendix show the factors necessary to clear a 50-foot obstacle. The appropriate height velocity diagrams in the Appendix should be used as a guide in determining takeoff climb speeds. There are many possible variations for takeoff, but the most commonly used are: takeoff to a hover, normal takeoff, maximum performance takeoff, and the running takeoff. Operational necessity may require a combination of these takeoffs.

CAUTION

To minimize possibility of a mishap, if a rolling takeoff is made, it should be straight ahead with no turning. This will insure that the piston is centered permitting an uneventful rollout on landing. If a rolling takeoff is executed while turning or pivoting, a vertical landing should be made, especially on unprepared landing surfaces. If due to inflight circumstances a vertical landing is not possible, landing speeds up to 35 knots with the piston up to 25 degrees off center are possible without suffering airframe or strut failure.

During normal takeoffs and landings with the helicopter light on the gear, bank angle, sidedrift, or crosswind may cause the helicopter to begin pivoting or rolling laterally. Under these conditions, lateral cyclic stick inputs are less effective in generating a rate of roll than for a free hovering helicopter. If bank angle and roll rate is allowed to increase, a critical combination of rate and angle will be reached where lateral cyclic inputs do not stop the rolling tendency. Full lateral cyclic will be insufficient to keep the helicopter from rolling over. Without proper corrective action, bank angles as little as five degrees, coupled with roll rates and crosswinds, can cause the helicopter to roll over in approximately two seconds.

WARNING

When performing normal takeoffs and landings, the pilot must maintain precise control of roll attitudes so as not to allow the helicopter to reach a critical bank angle and roll rate that cannot be controlled with lateral cyclic. If a rolling tendency commences, corrective action must be taken immediately. Depending on the situation, either raise collective and lift off or reduce collective to stop the rolling tendency. Reduction of collective is most effective in controlling rolling motions and is the recommended procedure if conditions permit. Raising collective and lifting off is acceptable, but be prepared for an abrupt roll in the opposite direction.

CAUTION

The helicopter may have a tendency to leave the ground in a slightly nose-down attitude. Care should be exercised to avoid striking the nose wheel or air refueling probe (if installed) on the ground.

NOTE

A safe single engine airspeed of 70-80 knots IAS should be attained as soon as practical after takeoff.

TAKEOFF TO A HOVER.

(Refer to figure 2-5.)

The takeoff to a hover is used to facilitate engine and flight control systems checks, for hover taxiing, and is used in conjunction with other takeoffs. To accomplish, increase collective pitch to establish the desired hover altitude. Maintain the desired heading with tail rotor pedals and aircraft position with the cyclic stick. When a stable hover is established, check the engine performance as required, flight controls, and CG trim before continuing flight.

TAKEOFF FROM A HOVER.

(Refer to figure 2-5.)

Initiate forward flight with cyclic control and adjust collective pitch lever for desired performance and terrain clearance. After obtaining translational lift, climb by increasing airspeed and altitude simultaneously. After obtaining climb airspeed, establish the desired rate of climb.

TAKEOFF WITHOUT HOVER.

(Refer to figure 2-6.)

The takeoff without a hover is accomplished by steadily increasing collective until a definite climb is established. As the aircraft leaves the ground and adequate terrain clearance is obtained, forward cyclic is applied and the nose lowered to allow the aircraft to accelerate and climb simultaneously. The aircraft should be accelerated to climb speed as soon as practical after clearing obstacles.

MAXIMUM PERFORMANCE TAKEOFF.

(Refer to figure 2-7.)

The maximum performance takeoff may be required when operating from small and/or restricted areas. Under extreme conditions, sufficient power to hover out of ground effect may be required to perform this type takeoff. With speed selectors set at maximum N_r, increase collective pitch smoothly to maximum

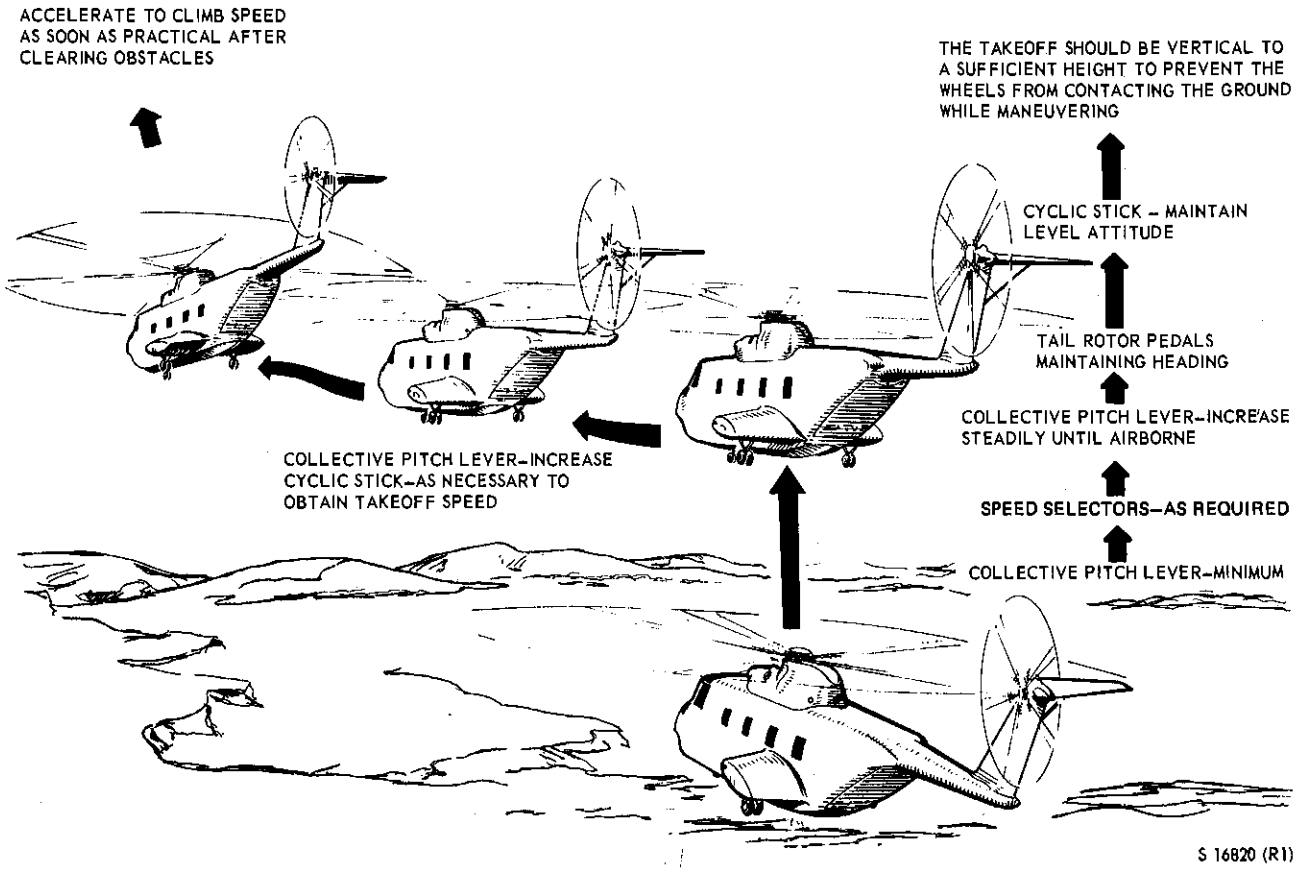


Figure 2-5. Normal Takeoff (Typical)

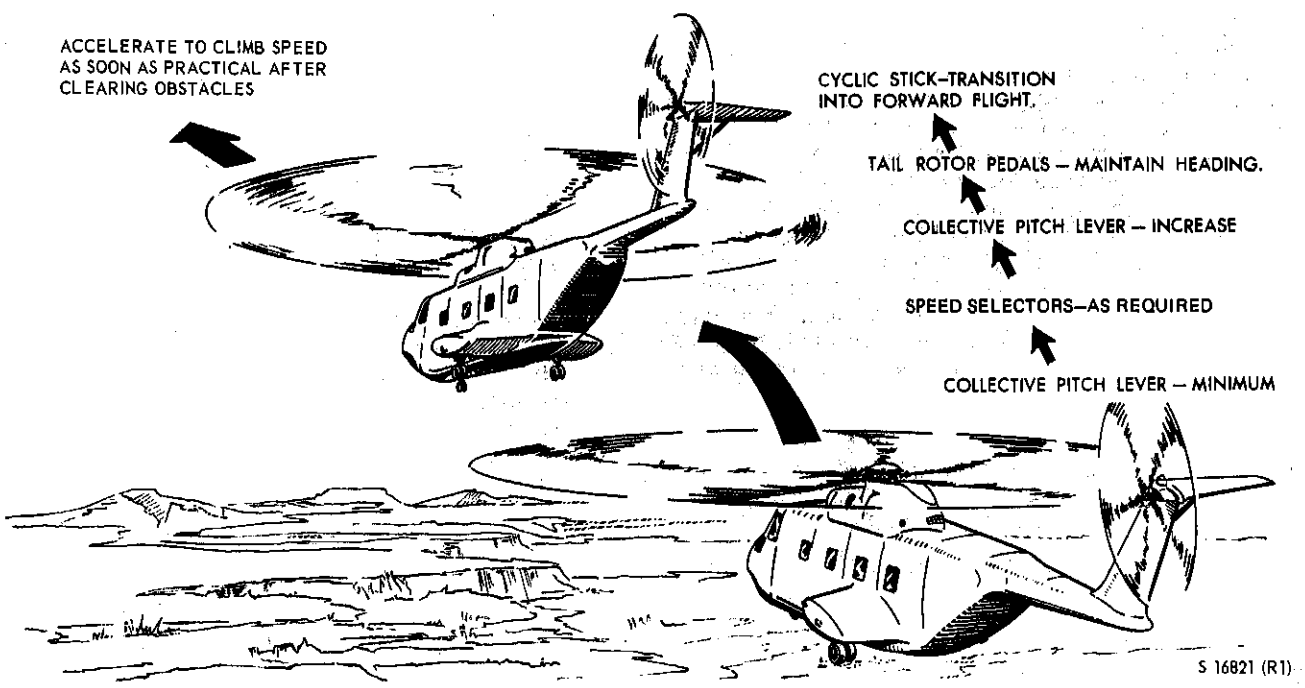


Figure 2-6. TakeOff Without a Hover (Typical)

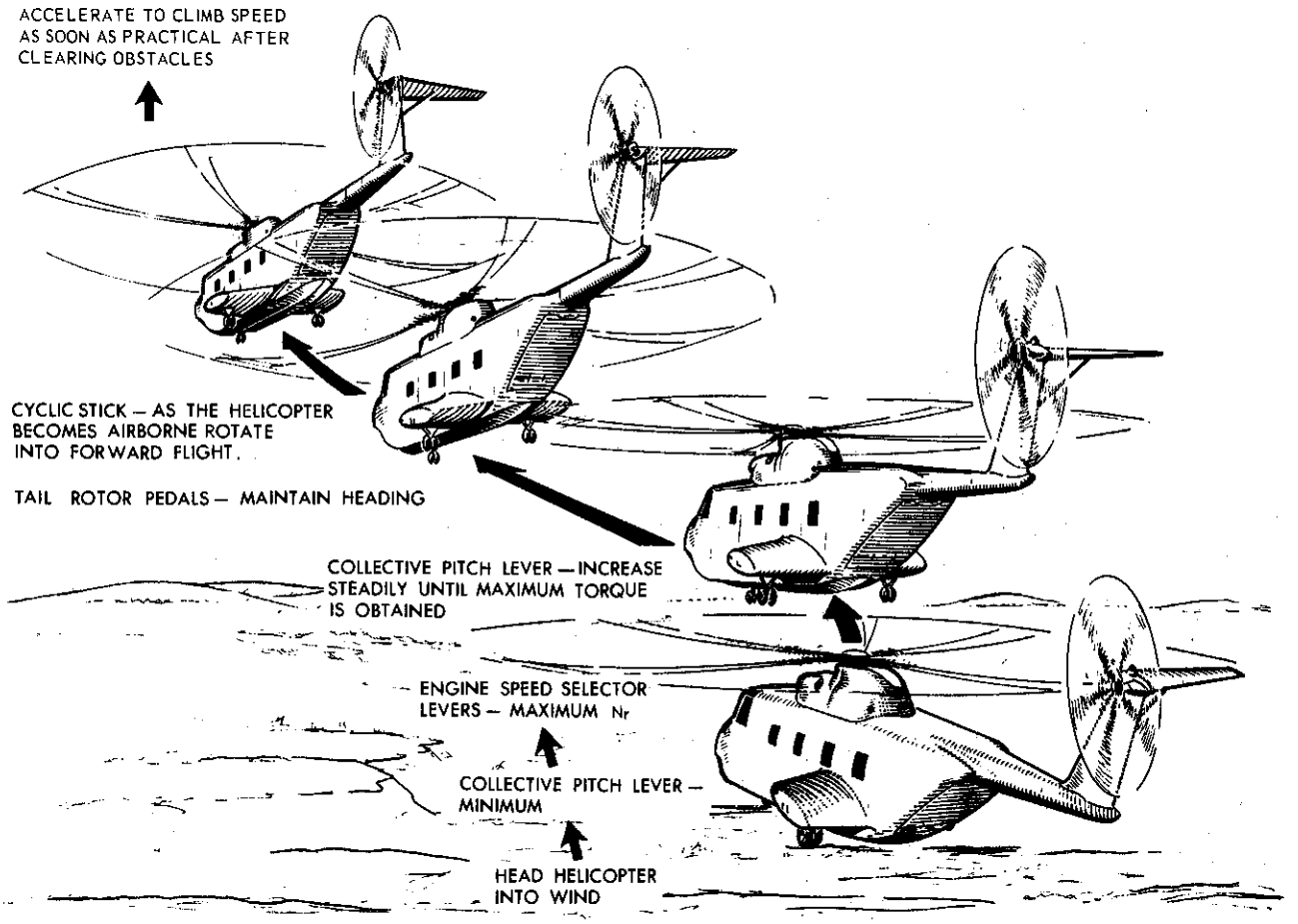


Figure 2-7. Maximum Performance TakeOff (Typical)

power. Simultaneously increase airspeed to the extent consistent with safely clearing the obstacles until climb airspeed can be attained.

CAUTION

Minimize operating time in the AVOID CONTINUOUS OPERATION area of the Height-Velocity Diagrams in the Appendix.

NOTE

Under critical operational conditions, it may be necessary to parallel the ground at near hover altitude while accelerating to best climb speed.

NOTE

Vertical takeoffs and climb to out-of-ground-effect altitude are not normally required; however, if operational requirements dictate, accelerate to climb airspeed as soon as possible after clearing obstacles.

RUNNING TAKEOFF.
(Refer to figure 2-8.)

When sufficient power to accomplish a normal takeoff is not available, it may be possible to perform a running takeoff. Accomplish by heading the helicopter into the wind, if practical, and adjust the speed selectors to maximum N_r. Increase collective pitch and apply cyclic control as necessary to obtain takeoff speed. (See appropriate takeoff charts in the Appendix.) The aircraft will normally fly off the surface; however, some aft cyclic may be necessary. During takeoff, apply power to continue acceleration to climb airspeed and maintain directional control with tail rotor pedals throughout the maneuver. To practice running takeoffs, use approximately 10% torque less than required to hover at 5 feet wheel clearance.

CAUTION

Running takeoffs should not be attempted over rough or rocky terrain due to the possibility of damage to the helicopter.

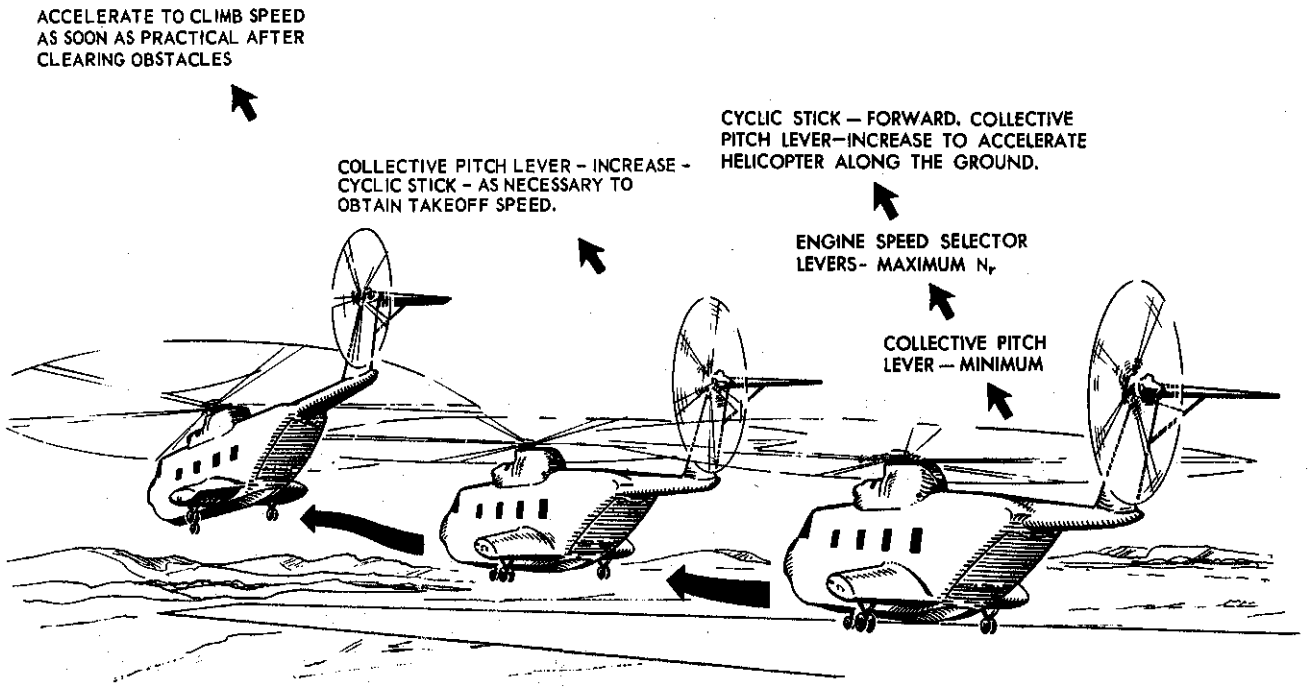


Figure 2-8. Running Takeoff (Typical)

AFTER TAKEOFF.

As the helicopter accelerates from hovering to forward flight, it enters translational lift. If engine power, rotor rpm, and collective pitch remain constant and the cyclic stick is moved forward to tilt the tip-path plane of the rotor to obtain forward speed, a momentary settling will be noted. As the helicopter accelerates forward, less power is required due to the large air mass contacted by the rotor in forward flight. As forward speed increases, the helicopter will begin to climb. Maintain approximately 70-80 knots and monitor all instruments. Refer to the climb data in Appendix for best climb speeds. The pilot initiates this check by stating "Landing gear (as required), After Takeoff checklist." The copilot responds, "Landing gear (as required)," positions the gear handle and silently completes 1 through 5, calling out item 6.

NOTE

There are no structural limitations, based on airspeed, for extension or retraction of the gear. The landing gear should be down and locked at all times when over land below 100 feet or below a minimum safe single engine airspeed of 70 KIAS. Helicopters engaged in a mission which may be compromised by having the gear down (e.g., mid-air recovery (MARS), etc.) may deviate from the 70-knot airspeed requirements during performance of the mission. If desired, the electronic altimeter may be set to serve as a reminder to extend or retract the landing gear.

1. Engine and transmission instruments - CHECKED. (CP)
2. Lights - SET (CP)

IS-143 DELETE a, b & c

~~a. Strobe lights - ON (white - day, red - night)~~

b. Position lights - STEADY

~~c. Other lights - AS REQUIRED~~

3. Landing gear - INDICATORS CHECKED. (CP)
4. Speed selectors - ADJUSTED. (CP)
5. AN/ALE-20 arming switch - ON (ARMED) (CP)
6. "After Takeoff checklist completed." (CP)

NOTE

The flight mechanic will check the aircraft interior for fuel, oil, and hydraulic leaks, cabin windows security and general aircraft condition as soon as practical after initial takeoff. This check will be repeated periodically during flight.

CRUISE.

Refer to Appendix, as necessary, to determine best cruise airspeeds. After cruise airspeed has been established, adjust rotor speed between 100 and 103% to that speed which produces the smoothest flight, or which will give the desired performance. Readjust pitch, as necessary, to maintain the desired airspeed. The smoothest rotor speed in forward flight may vary, depending on the vibration characteristics of each helicopter at various gross weights, airspeed, altitude, CG, etc. The helicopter is tuned at 103% N_r to attain optimum performance and smooth operation, and N_r should be selected in the range of 100 to

103% which results in smoothest flight. The notes on the performance charts in the Appendix indicate the differences in performance, if any, when operating at other than 103% N_r. For proper management of fuel, refer to FUEL SYSTEM MANAGEMENT, section VII.

DESCENT.

To perform descent, reduce collective as required for a comfortable rate of descent. The rapid or autorotative descent is made whenever a rapid descent is desired.

1. Passenger and crew briefing - "COMPLETED - DESCENT CHECK COMPLETE." (P)

The pilot will brief on approach procedures, intentions, significant terrain features, specific crew requirements and other pertinent facts. Insure barometric altimeters are set properly. Advise passengers as required and ensure cabin security.

RAPID DESCENT (AUTOROTATIVE).

To perform a rapid control descent, reduce collective pitch to minimum and establish autorotation. The rate of descent will increase as airspeed is increased over 70 knots. Use collective pitch lever to control rotor rpm.

CAUTION

It has been established that during flight, critical combinations of engine and rotor conditions coupled with rapid control inputs, may cause rotor blade fuselage contact. Avoid retarding speed selectors prior to entering autorotations and/or rapid reduction of collective pitch, especially at reduced rotor rpm. Upon entering autorotation, avoid abrupt cyclic movements. Excessive forward cyclic could cause the main rotor blades to contact engines and/or cockpit.

BEFORE LANDING.

The pilot initiates this check by stating "Landing gear - (as required), Before Landing checklist." The copilot responds, "Landing gear - (as required)", positions the gear handle and silently completes items 1 through 6. He verbally calls item 7.

NOTE

A maximum power available check is required prior to the first landing in a remote area and prior to operation at or near the maximum capability of the helicopter.

1. Fuel - CHECKED. (CP)

CAUTION

If one fuel low level caution light comes on, turn on all available boost pumps and open the crossfeed. If both fuel low caution lights come on, turn on all available boost pumps, open the crossfeed and avoid nose-up attitudes greater than 6 degrees.

2. Engine and transmission instruments - NORMAL. (CP)
3. Parking brake - AS REQUIRED. (CP)

NOTE

Parking brake should be locked when landing with nose wheel lock engaged.

4. Speed selectors - 103% N_r. (CP)

   Use maximum N_r on final approach as required.

5. AN/ALE-20 arming switch - AS REQUIRED. (CP)
6. Landing gear - AS REQUIRED. (CP)

   Check landing gear position indicators.

7. "Before Landing checklist completed." (CP)

TRAFFIC PATTERN.

The pilot initiates this checklist after takeoff by stating "Landing Gear - (as required), Traffic Pattern Checklist." The copilot responds, "Landing gear (as required)," verbally confirms the gear handle is positioned properly and silently completes item 1 through 4, calling out item 5.

NOTE

The landing gear will remain down during all multiple land traffic patterns and will remain up during all multiple water traffic patterns.

1. Engine and Transmission Instruments - CHECKED. (CP)
2. Landing Gear - INDICATORS CHECKED. (CP)
3. Lights - AS REQUIRED. (CP)
4. Speed Selectors - 103% Nr. (CP)
5. "Traffic Pattern Checklist Completed." (CP)

GROSS WEIGHT AND CENTER OF GRAVITY LIMIT.

The landing gross weight and center of gravity of the helicopter are important factors to be considered when determining the feasibility of a helicopter landing. In all instances, the fuel load, equipment, cargo, and personnel should be situated so as not to disturb the desired center of gravity of the helicopter. Refer to WEIGHT LIMITATIONS, section V, to insure that the maximum gross weight for landing is not exceeded.

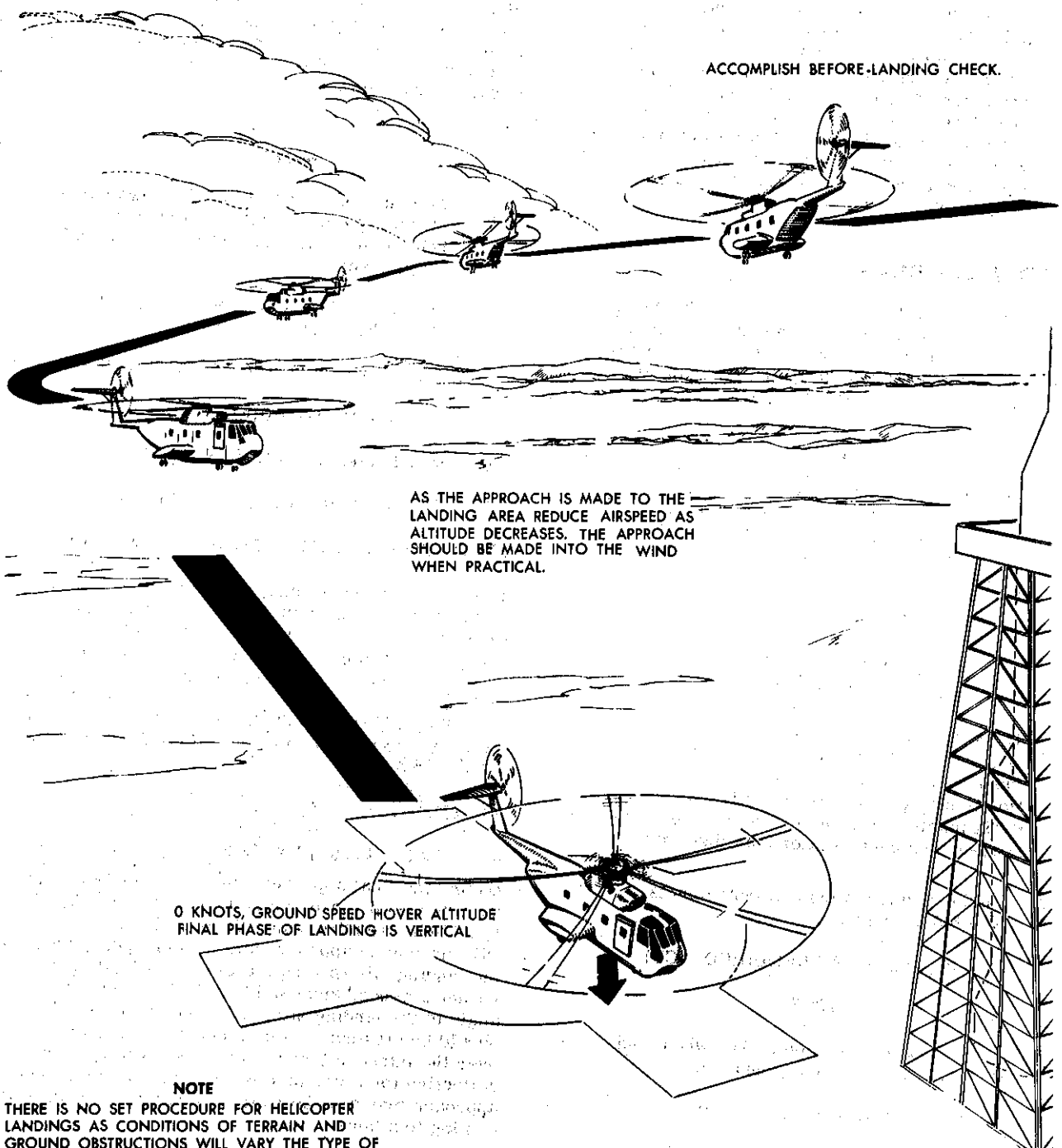
LANDING.

APPROACH AND LANDING.

During the final approach phase, recheck the landing gear and beep speed selectors to maximum N_r, if operational requirements dictate. Fly a pattern that will provide an approach and landing appropriate for the landing site (see figure 2-9). On final approach reduce airspeed and establish desired approach angle to the landing site. Airspeed and altitude should be dissipated simultaneously to attain a hover over the intended landing site, then slowly reduce collective for a vertical descent and landing. The approach may also be made to a touch-down without coming to a hover.

WARNING

High rates of descent combined with low forward airspeed should be avoided. For hazards associated with power settling refer to Section VI.



NOTE

THERE IS NO SET PROCEDURE FOR HELICOPTER LANDINGS AS CONDITIONS OF TERRAIN AND GROUND OBSTRUCTIONS WILL VARY THE TYPE OF APPROACH. THIS DIAGRAM ILLUSTRATES A TYPICAL APPROACH PATTERN FOR LANDING IN AN UNOBSTRUCTED AND A DESIGNATED LANDING AREA. THE APPROACH MAY ALSO BE MADE LONG AND LOW OR NEARLY VERTICAL AS REQUIRED BY LOCAL CONDITIONS.

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Figure 2-9. Normal Landing (Typical)

CAUTION

Do not exceed 12 degree, nose-up attitude at the point of ground contact. At 15 degree, nose-up attitude, the tail pylon will contact the ground on landing.

CAUTION

Those helicopters equipped with a refueling probe normally will not accomplish takeoffs and landings with the probe extended.

TOUCH AND GO LANDINGS.

For touch and go landings follow the procedures for a normal running landing. Check collective lever in the minimum position, speed selectors forward, then follow the procedures for a normal running takeoff.

RUNNING LANDING.

Before attempting a running landing, the surfaces should be checked from low altitude to determine the feasibility of accomplishing the landing. Running landings are usually accomplished from a shallow approach when the helicopter cannot be hovered due to a high gross weight or altitude. Running landings should be accomplished with the nose wheel unlocked and parking brakes off. Adjust collective pitch, as necessary, to maintain the desired approach angle and dissipate speed gradually throughout the approach so the landing can be accomplished while maintaining translational lift. Establish a straight track over the ground and a shallow approach with a slow rate of descent. Use tail rotor pedals to maintain heading in direction of track and cyclic stick to control drift. As the helicopter approaches the ground, increase collective pitch slightly to reduce rate of descent and airspeed to minimum value compatible with gross weight and altitude conditions, and maintain a steady attitude. Aircraft should not exceed 40 knots ground speed during touchdown. As the wheels contact the ground, hold the cyclic stick steady and slowly decrease collective pitch to minimum. The helicopter should be stopped with the wheel brakes.

CAUTION

To avoid skidding and blowing tires, reduce collective pitch to minimum before applying brakes.

CROSSWIND LANDING.

CAUTION

Crosswind landings are prohibited in winds exceeding 35 knots. Crosswind landing procedures are the same as into the wind vertical landing procedures, except the cyclic stick must be displaced into the wind to prevent sideward drift. The cyclic displacement should not be released on the touchdown as this will reduce the force holding the helicopter in a vertical position. Under extreme conditions, crosswinds could result in the helicopter being overturned. During crosswind landings, with the wind from the right, it may be noted that tail rotor control may run out. This happens at high gross weights when leaving an approach and entering a hover. This is a result of weather vaning and rotor torque which causes the helicopter to turn to the right.

REMOTE AREA OPERATIONS.

MOUNTAIN AND ROUGH TERRAIN FLYING.

Many helicopter missions require flight and landings in rough and mountainous terrain. Refined flying techniques along with complete and precise knowledge of the individual problems to be encountered is required: Landing site condition, wind direction and velocity, gross weight limitations, and effects of obstacles are but a few of the considerations for each landing or takeoff. In a great many cases, meteorology facilities and information are not available at the site of intended operation. The effects of mountains and vegetation can greatly vary wind conditions and temperatures. For this reason each landing site must be evaluated at the time of intended operation. Altitude and temperature are major factors in determining helicopter power performance. Gross weight limitations under specific conditions can be computed from the performance data in the Appendix. A major factor improving helicopter lifting performance is wind. Weight carrying capability increases rapidly with increases in wind velocity relative to rotor system. However, accurate wind information is more difficult to obtain and more variable than other planning data. It is therefore not advisable to include wind in advanced planning data except to note that any wind encountered in the operating area may serve to improve helicopter performance. In a few cases operational necessity will require landing on a prepared surface at an altitude above the hovering capability of the helicopter. In these cases a roll-on

landing and takeoff will be necessary to accomplish the mission. Data for these conditions can be computed from the charts in the Appendix.

WIND DIRECTION AND VELOCITY.

There are several methods of determining the wind direction and velocity in rough area. The most reliable method is by the use of smoke generators. However, it must be noted that the hand held day/night distress signal and the standard ordnance issue smoke hand grenade are satisfactory for wind indication but constitute a fire hazard when used in areas covered with combustible vegetation. Observation of foliage will indicate to some degree the direction of the wind, but is of limited value in estimating wind velocity. Helicopter drift determined by eyesight without the use of navigational aids is the first method generally used by experienced pilots. The accuracy with which direction may be determined through the "drift" method becomes a function of wind velocity. The greater the wind value the more closely the direction may be defined.

CAUTION

Depending on wind velocity, the apparent airspeed/ground speed relationship changes when turning downwind. After the turn less airspeed is required to maintain ground speed. Reducing airspeed may result in loss of translational lift which increases the power required to maintain altitude. When operating close to the surface, especially during downwind maneuvering, airspeed and power required must be monitored closely.

LANDING SITE EVALUATION.

Five major considerations in evaluating the landing area are: (1) height of obstacles which determine approach angle, (2) size and topography of the landing zone, (3) possible loss of wind effect, (4) power available, and (5) departure route. The transition period is the most difficult part of any approach. As helicopter performance decreases, the transition period becomes more critical, and of necessity approaches must be shallower and transition more gradual. Therefore, as the height of the obstacle increases, larger areas will be required. As wind velocity increases so does helicopter performance; however, when the helicopter drops below an obstacle a loss of wind generally occurs as a result of the airflow being unable to immediately negotiate the change prevalent at the upwind side of the landing zone where a virtual null area exists. This null area extends toward the downwind side of the clearing and will become larger as the height of the obstacle and wind velocity increases. It is therefore increasingly important in the landing phase that this null area be avoided if marginal performance capabilities are anticipated. The null area is of particular concern in making a takeoff from a confined area. Under heavy load, or limited power conditions it is desired to achieve a significant value of forward velocity and translational lift prior to transitioning to a climb, so that the overall climb performance of the helicopter will be improved. If the takeoff cycle is not commenced from the most downwind portion of the area, and translational velocity achieved prior to arrival in the null area, a significant loss in lift may occur at the most critical portion of the takeoff. It must also be noted that in the vicinity of the null area nearly vertical downdrafts of air may be encountered, which will further reduce the actual climb rate of the helicopter. It is feasible that under certain combinations of limited area, high obstacles upwind, and limited power available, the best takeoff route would be either crosswind or downwind, terrain permitting. The effects of detrimental wind flow and the requirement to climb may thus be minimized or circumvented. Even though this is a departure from the cardinal rule of "takeoff into the wind", it may well be the proper solution when all factors are weighed in their true perspective. Never plan an approach to a confined area wherein there is no reasonable route of departure. The terrain within a site is considered from an evaluation of vegetation, surface characteristics, and slope. Care must be taken to avoid placing the rotors in low brush or branches. Obstacles covered by grass may be located by flattening the grass with rotor wash prior to landing. Power should be maintained so that an immediate takeoff may be accomplished should the helicopter start tipping from soft earth or a gear being placed in a hidden hole.

CAUTION

Extreme care must be taken to prevent the rotor blades from striking terrain or obstacles on either side of the helicopter.

CAUTION

When operating in the vicinity of any loose objects (i.e, signal panels, parachutes, debris), use extreme caution to preclude objects being blown up into the aircraft rotor system.

NOTE

The pilot should always maintain takeoff rotor speed on an unprepared surface until it has been determined that the surface will support the helicopter. This will permit immediate takeoff if the helicopter should start to tip over or sink into the surface.

Landing on Slippery Areas.

Landing on wet or icy areas in hazardous, and due caution must be exercised when landing or taxing. Brake action will tend to induce skidding.

EFFECTS OF HIGH ALTITUDES.

Engine power available at altitude is less, and operations can easily be in a situation of limited hovering ability. High gross weight at altitude increases the susceptibility of the helicopter to blade stall. Conditions that contribute to blade stall are high forward speed, high gross weight, high altitude, low rpm, induced G loading and turbulence. Shallower turns at slower airspeeds are required to avoid blade stall. A permissible maneuver at sea level must be tempered at a higher altitude. Smooth and timely control application and anticipation of power requirements will do more than anything else to improve altitude performance.

TURBULENT AIR FLIGHT TECHNIQUES.

Helicopter pilots must be constantly alert to evaluate and avoid areas of severe turbulence; however, if encountered, immediate steps must be taken to avoid continued flight through it, to preclude the structural limits of the helicopter being exceeded. Severe turbulence is often found in thunderstorms and helicopter operations should not be conducted in their vicinity. The most frequently encountered type of turbulence is orographic turbulence. It can be dangerous if severe and is normally associated with updrafts and downdrafts. It is created by moving air being lifted by natural or manmade obstructions. It is most prevalent in mountainous regions and is always present in mountains if there is a surface wind. Orographic turbulence is directly proportional to the wind velocity. It is found on the upwind of slopes and ridges near the tops, and extending down the downwind slope (figure 2-12). It will always be found on the tops of ridges associated with updrafts on the upwind side and downdrafts on the downwind side. Its extent on the downwind slope depends on the strength of the wind and the steepness of the slope. If the wind is fairly strong (15 to 20 knots) and the slope is steep, the wind will have a tendency to blow off the slope and not follow it down; however, there will still be some tendency to follow the slope. In this situation there will probably be severe turbulence several hundred yards downwind of the ridge at a level just below the top. Under certain atmospheric conditions, a cloud may be observed at this point. On more gentle slopes the turbulence will follow down the slope, but will be more severe near the top. Orographic turbulence will be affected by other factors. The intensity will not be as great when climbing a smooth surface as when climbing a rough surface. It will not follow sharp contours as readily as gentle contours. Man made obstructions and vegetation will also cause turbulence. Extreme care should be taken when hovering near buildings, hangars, and similar obstructions. The best method to overfly ridgelines from any direction is to acquire sufficient altitude prior to crossing to avoid leeside downdrafts. If landing on ridgelines, (figure 2-10), the approach should be made along the ridge in the updraft, or select an approach angle into the wind that is above the leeside turbulence. When the wind blows across a narrow canyon or gorge, (figure 2-14), it will often veer down into the canyon. Turbulence will be found near the middle and downwind side of the canyon or gorge. When a helicopter is being operated at or near its service ceiling and a downdraft of more than 1.6 feet per second is encountered, the helicopter will descend. Although the downdraft does not continue to the ground, a rate of-

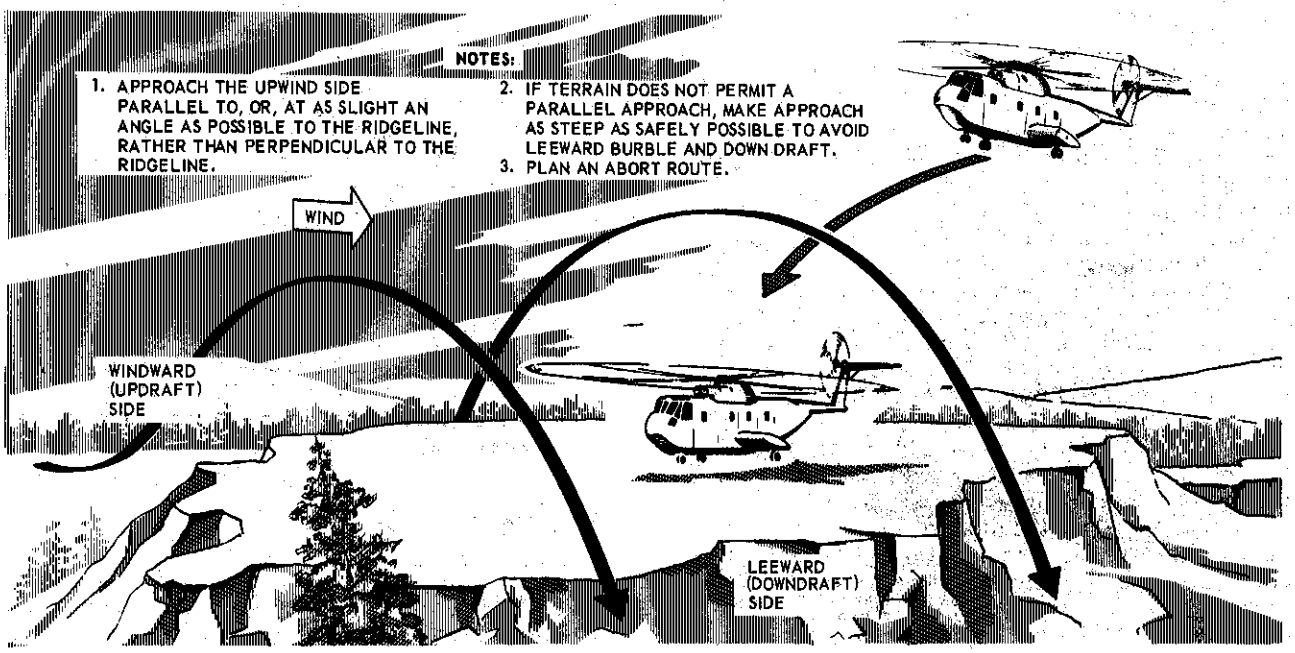

Figure 2-10. Wind Effect on Ridgeline Approach

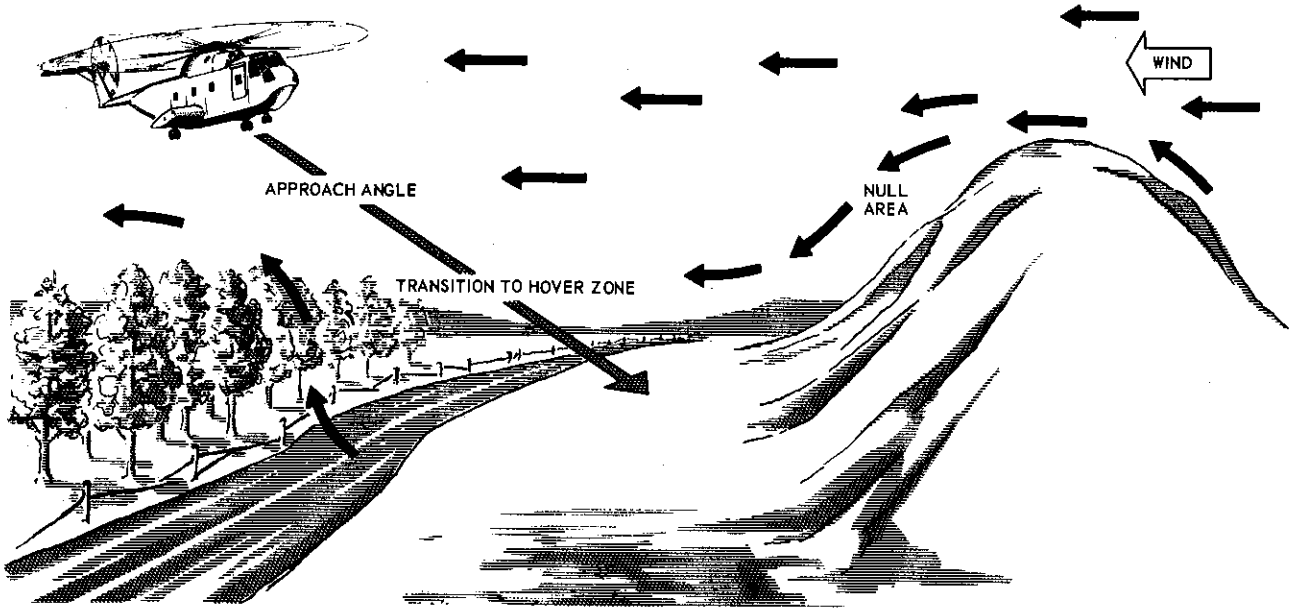

Figure 2-11. Wind Effect In A Confined Area

descent may be established of such magnitude that the helicopter will continue descending and crash, even though the helicopter is no longer affected by the downdraft. Therefore, the procedure for transiting a mountain pass shall be to fly close aboard that side of the pass or canyon which affords an upslope wind. This procedure not only provides additional lift, but also provides a readily available means of exit in case of emergency. Maximum turning space is available and a turn into the wind is also a turn to lower terrain. The often used procedure of flying through the middle of a pass to avoid mountains invites disaster. This is frequently the area of greatest turbulence (figure 2-13) and in case of emergency, the pilot has little or no opportunity to turn back due to insufficient turning space. Rising air currents created by surface heating causes convective turbulence. This is most prevalent over bare areas. Convective turbulence is normally found at a relatively low height above the terrain, generally below 2000 feet. It may, however, under certain conditions, and in certain areas, reach as high as 8000 feet

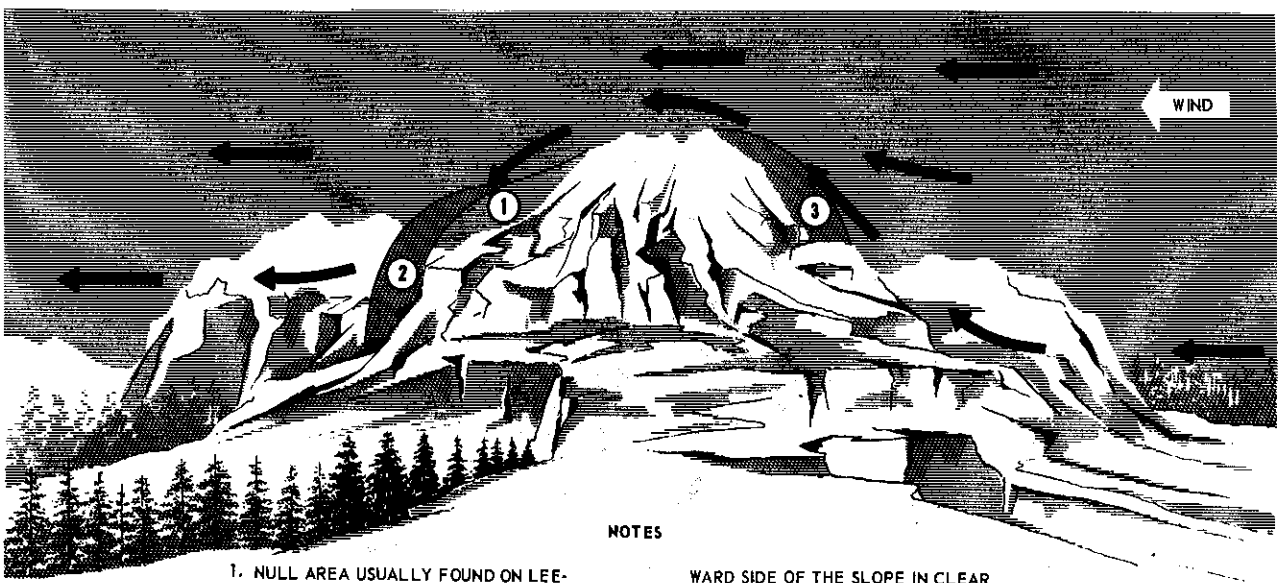

Figure 2-12. Wind Flow Over and Around Peaks

Figure 2-13. Wind Flow In Valley Or Canyon

above the terrain. Attempting to fly over convective turbulence should be carefully considered, depending on the mission assigned. The best method is to fly at the lowest altitude consistent with safety. Attempt to keep your flight path over areas covered with vegetation. Turbulence can be anticipated when transitioning from bare areas to areas covered by vegetation or snow. Convective turbulence seldom gets severe enough to cause structural damage.

ADVERSE WEATHER CONDITIONS.

When flying in and around mountainous terrain under adverse weather conditions, it should be remembered that the possibility of inadvertent entry into clouds is ever present. Air currents are unpredictable and may cause cloud formations to shift rapidly. Since depth perception is poor with relation to distance from cloud formation and to cloud movement, low hanging clouds and scud should be given a wide berth at all times. In addition to being well-briefed, the pilot should carefully study the route to be flown. A careful check of the helicopter compass should be maintained in order to fly a true heading, if the occasion demands.

SUMMARY.

The following guide lines are considered to be most important for mountain and rough terrain flying.

a. Make a continuous check of wind direction and estimated velocity.

Figure 2-14. Wind Flow Over Gorge Or Canyon

b. Plan your approach so that an abort can be made downhill and/or into the wind without climbing.

c. If wind is relatively calm, try to select a hill or knoll for landing so as to take full advantage of any possible wind effect.

d. When evaluating a landing site, execute as many fly-bys as necessary with at least one high and one low pass before conducting operations into a strange landing area.

e. Evaluate the obstacles in the landing site and consider possible null areas and routes of departure (figure 2-11).

f. Landing site selection should not be based solely on convenience, but consideration should be given to all relevant factors.

g. Determine power available and power required prior to attempting a landing.

h. Watch for rpm surges during turbulent conditions. Strong updrafts will cause rpm to increase, whereas downdrafts will cause rpm to decrease.

i. Avoid flight in or near thunderstorms.

j. Give all cloud formations a wide berth.

k. Fly as smoothly as possible and avoid steep turns.

l. Cross mountain peaks and ridges high enough to stay out of downdrafts on the leeside of the crest.

m. Avoid downdrafts prevalent on leeward slopes.

n. Plan your flight to take advantage of the updrafts on the windward slopes.

o. Whenever possible, approaches to ridges should be along the ridge rather than perpendicular.

p. Avoid high rates of descent when approaching landing sites.

q. Know your route and brief well for flying in these areas.

SLOPE LANDINGS.

When hovering over a slope, the amount of ground effect is less than when hovering over level ground. The percentage of ground effect lost will vary with the degree of slope. Prior to landing on slopes, the parking brake should be applied and the nosewheel locked to prevent the aircraft from rolling or turning. Ground contact should be made using a vertical descent. Sideward motion of the nose gear should be avoided to prevent breaking the nose gear lock.

Landings on slopes up to approximately 4 degrees differ very little from normal, level landings, and any direction of landing may be accomplished. On slopes greater than 4 degrees, a cross-slope landing with the right side up-slope is recommended whenever possible. The normal left-side low-hover attitude makes this type landing easier to accomplish than in other directions. If a right-side up-slope landing is not possible, the following order of preference in landing is recommended: Nose up-slope, left side up-slope, and nose down-slope. Nose-down, slope landings should be avoided due to danger of ground contact by the tailboom. Takeoffs and landings should be accomplished with smooth positive control movements to permit stopping or aborting the maneuver at any time. The helicopter will have a tendency to slide down-slope slightly during landings; however, rapid or excessive control movement should not be used to eliminate this characteristic. Proper cyclic trim position for takeoff will be retained if the trim is not adjusted after landing.

WARNING

Avoid using a combination of excessive cyclic and low collective setting. During slope operations with the AFCS engaged, cyclic control inputs will be induced by the AFCS due to fuselage attitude changes. These inputs will be in a direction to hold the helicopter on the slope but will reduce rotor-to-fuselage and rotor-to-ground clearance. If a large cyclic control movement or rapid reduction of collective is applied, excessive rotor blade flapping may occur. If the cyclic control is near the fore or aft position and the collective is lowered rapidly, the rotor blades may flex or dip sufficiently for the blades to contact the aircraft.

Cross Slope.

After the up-slope gear is on the ground, use smooth control inputs to maintain a near-level attitude. Reduce collective to place the nose gear on the ground and further reduce collective to lower the down-slope gear to the ground. As the collective is reduced, additional lateral cyclic control may be used to help control the rate of roll; however, avoid overcontrolling that could result in rotor blade contact with obstructions on the up-slope side of the aircraft. After the helicopter is firmly on the ground, decrease the collective to full down.

To take off from a cross-slope, slowly increase collective to bring the helicopter to a level attitude before breaking clear of the ground. The helicopter will normally roll towards the down-slope side just as the last gear breaks ground, and a large up-slope

lateral cyclic input should not be used to avoid reducing rotor-to-ground clearance on the up-slope side.

Nose Up-Slope.

Use a normal vertical rate of descent until the nose gear contacts the ground. As the nose gear touches, slow the rate of descent slightly and use a small (approximately one inch) forward cyclic input to hold the nose gear firmly on the ground as the strut compresses. Then lower the main gear at normal rate of descent by reducing collective to the full down position. When the slope is near the limit of 8 degrees, there will be more of a tendency for the helicopter to roll down hill as the main gear descends; however, the roll is normally negligible. Use extreme care in applying additional forward cyclic, as it could result in rotor-blade-to-fuselage contact as the collective is lowered. After the initial forward cyclic input to get the nose gear firmly on the ground, only very small inputs (1/8 to 1/4 inch) are required to stabilize the pitch and roll attitude.

Takeoff is accomplished by increasing collective to establish a level attitude as the nose gear breaks clear of the ground. The cyclic control is used only to stabilize the attitude and not to lift the main gear off the ground.

Nose Down Slope.

The aft ramp may be opened enough to permit a crewmember to observe and report tailboom and rotor clearance. However, if the ramp is opened to the level position, its ground clearance will also be critical at near-maximum slopes or on uneven terrain. While descending vertically and as the main gear touches down, hold the cyclic stick essentially fixed, using only small stabilizing inputs, to prevent rotating the tail into the ground. The collective is then decreased to lower the nose gear to the ground. There is very little tendency for the helicopter to slide or to roll if brakes are applied prior to landing.

Takeoff is accomplished by increasing collective to establish a level attitude. As the main gear breaks ground, there is a tendency for the helicopter to move forward. Extreme caution must be used if this movement must be stopped, since any aft cyclic input may rotate the tail into the ground. If possible, it is best to let the helicopter move forward with little or no aft cyclic input until well clear of the ground. If this is not possible, a crisp and positive vertical rate of climb should be used from just before main gear lift-off until well clear of the ground.

SHIPBOARD OPERATING TECHNIQUES.

Helicopter Deck Handling.

Due to the topheavy configuration of the helicopter, precautions must be observed in all movements to preclude possibility of damage to the relatively light structural members and rotor blades. Chains and tiedowns should be installed at all times.

ROTOR ENGAGEMENT.

When the helicopter is ready in all respects and upon signal from primary flight control (PRI-FLY), the rotors may be engaged. Mandatory requirements for engagement of the rotor consist of the following items:

1. Main landing gear tiedowns secured with 2 to 3 inches slack and chocks in place.
2. Flight deck clear of unnecessary personnel.
3. Parking brakes on.
4. Winds below maximum wind velocities for rotor engagement.

CAUTION

With the rotors engaged on the flight deck, disengage the automatic flight control system. This is extremely important, especially when the ship is turning, as the turn will be resisted by the yaw channel and cause the helicopter to turn in relation to the deck of the ship.

SHIPBOARD LANDING.
(Refer to figure 2-15.)

When approaching a ship for landing or hover rescue operations, caution must be exercised to avoid the ship's superstructure, antennas, and cargo masts. Various ships, ship loads, winds, sea conditions, and ship's heading will cause a different pitch and roll cycle that must be evaluated prior to approaching the ship. For shipboard landing to port a left hand pattern should be flown at 300 feet and 70 knots. For landing to starboard a right-hand pattern should be flown. Prior to landing a before landing check should be performed and parking brakes should be set ON. The helicopter should be brought to a hover or near hover (not to exceed 5 knots in relation to the ship) short of and higher than the flight deck at the top of its pitch. Once the helicopter is on the deck, collective should be maintained in a full down position, and the AFCS disengaged. The tiedowns, chocks, and gear pins should be installed prior to accomplishing the after landing checklist.

SHIPBOARD TAKEOFF.
(Refer to figure 2-16.)

With the tiedowns removed, the chocks in place, and the parking brakes set, the helicopter should take off vertically and clear the ship. Landing gear should be raised as soon as the helicopter is clear of the ship.

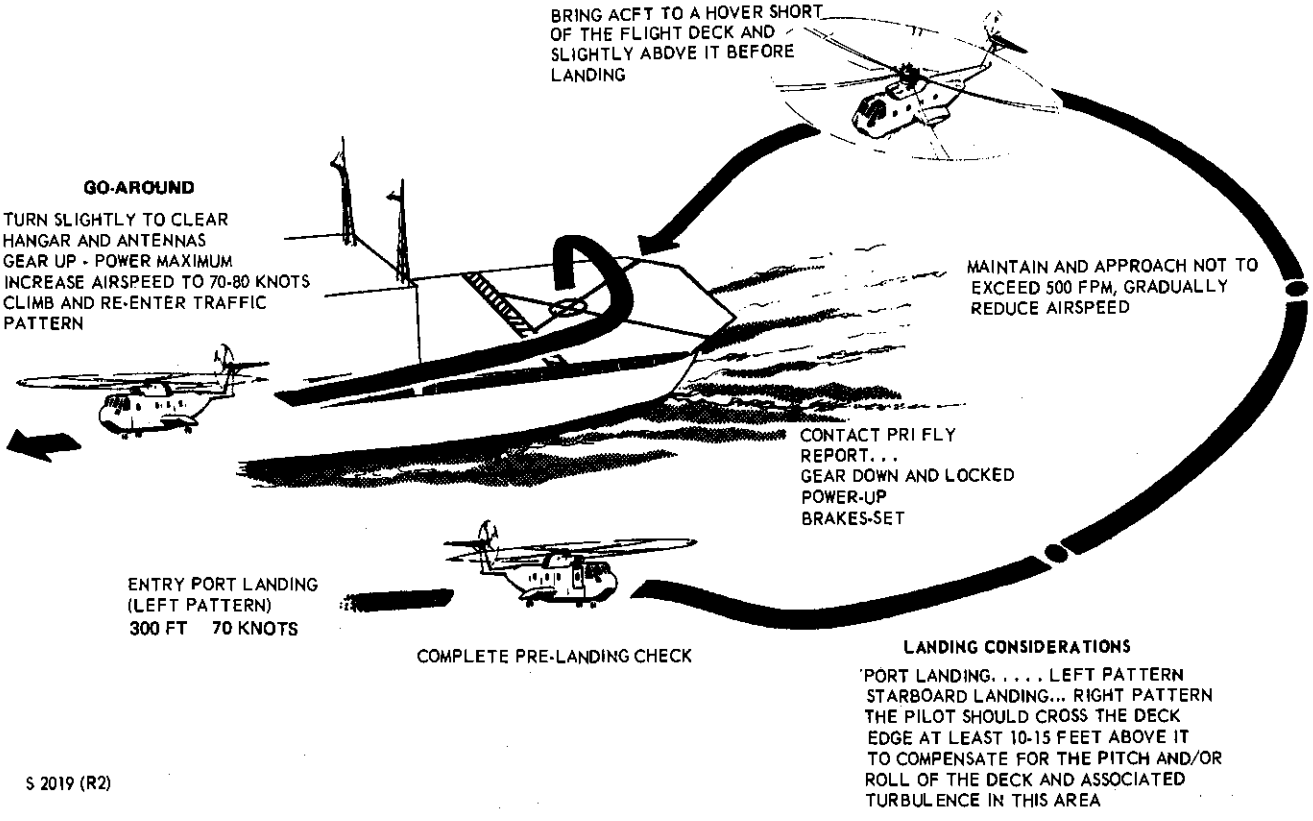

Figure 2-15. Typical Shipboard Landing and Go-Around

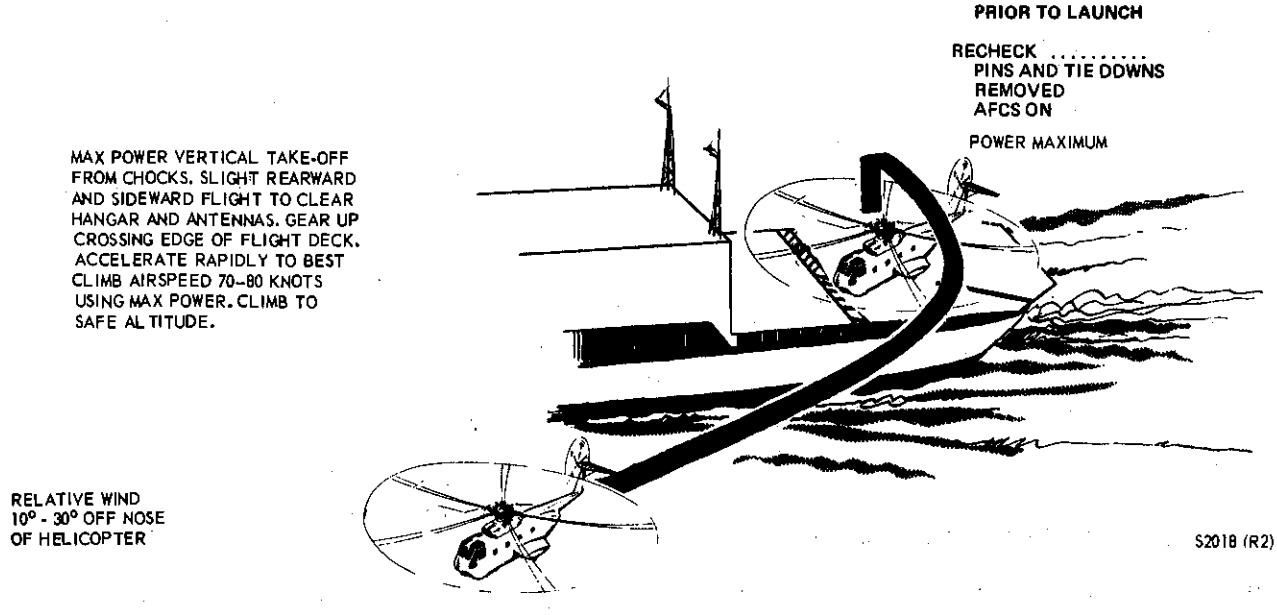

Figure 2-16. Typical Shipboard Takeoff

GO-AROUND.

Attain a minimum forward speed of 70 knots and establish a climb. Above 100 feet altitude, complete the AFTER TAKEOFF checklist.

AFTER LANDING.

The after landing check provides for reducing various electrical and other loads. After landing, if no portion of the AFTER LANDING checklist is accomplished and no change is made in the aircraft configuration from that prior to landing, or the ROTOR SHUTDOWN AND ENGAGEMENT (ENGINES RUNNING) checklist is used, use of the BEFORE TAKEOFF checklist is not required for the subsequent takeoff. For all practical purposes, the helicopter is still being controlled aerodynamically until the rotor is shutdown. The only action required on these short duration stops or landings is to maintain appropriate rotor speed and continuously monitor engine instruments.

1. Speed selectors - 102% N_r. (CP)
2. Lights - SET (CP)

IS-143 DELETE a, b & c

~~a. Strobe lights - OFF~~

b. Position lights - FLASH

c ~~Other lights - AS REQUIRED~~

3. Heater switch - OFF. (CP)

NOTE

The vent fan will continue to operate after the heater is shut off. Allow two minutes after the heater is shut off to allow the temperature in the plenum chamber to drop to 49°C (120°F) prior to removal of required electrical power sources. After shutdown, the temperature may rise due to residual heat, causing the fan to come on, especially if the free air temperature is very high.

4. Pitot heater switch - OFF. (CP)
5. IFF - AS REQUIRED (CP)

NOTE

Turn the IFF to STBY or OFF to eliminate signals which may block the controllers scope and interfere with the control of airborne aircraft.

6. "After Landing checklist completed." (CP)

ENGINE SHUTDOWN.

WARNING

When engine shutdown is to be accomplished with the APU inoperative, pull the No. 1 engine speed selector back to ground idle with the No. 2 engine driving the rotor at 100% N_r or above. If the generator caution lights illuminate, proceed with the Shutdown with Tail Takeoff Free Wheel Unit Inoperative checklist in Section III. If the generator caution lights do not illuminate proceed with the Engine Shutdown checklist.

NOTE

During engine shutdown, a designated crewmember or ground personnel should be positioned in front of the helicopter to monitor engine shutdown, droop stop positioning, and to preclude personnel from inadvertently trespassing into danger area. (See figure 2-2.)

1. Parking brake - "ON." (P)
2. AFCS - "OFF." (P)
3. Navigation sets, unnecessary radios, and doppler - "OFF." (CP)

NOTE

Doppler navigation equipment should be turned off prior to rotor shutdown as damage to the doppler power supply may result.

4. APU - "START." (CP or P)

This will insure utility hydraulic pressure until the landing gear lock pins have been installed.

WARNING

If the APU is not running, pins and chocks will be inserted prior to rotor shutdown.

5. Engine and windshield anti-ice - "OFF." (CP)
6. Ignition switches - "OFF." (CP)
7. Speed selectors - "GRD IDLE." (CP)

NOTE

To provide engine cooling prior to engine shutdown, one of the following conditions must transpire before moving the speed selectors to the SHUT-OFF position. However, in an emergency, the engine may be shut down immediately.

a. One minute of taxiing.

b. One minute of operation at, or above, the minimum governing range and with minimum collective pitch.

c. One minute at ground idle.

8. Droop stops - "IN." (FM)

CAUTION

One or more droop stops may not position properly during rotor shutdown. To preclude rotor blades from striking the tail pylon, neutralize flight controls and apply rotor brake as soon as practical.

9. Speed selectors - "SHUT-OFF." (CP)

10. Fuel management system - "OFF." (CP)

a. Fuel shut-off valve and crossfeed valve switches - CLOSE.

b. Fuel boost pump switches - OFF.

11. Rotor brake - "ON." (P)

Apply smoothly when rotor speed drops below 45%. Whenever the rotor brake hydraulic pressure is 10 PSI, and electrical power is supplied to the essential bus, the caution light will go on. When the rotor brake hydraulic pressure drops below 10 PSI, the light will go out.

NOTE

To reduce wear and to provide a smooth rotor shutdown, it is recommended to use 30% shutdown speed, wind permitting.

12. Electronic altimeter - "OFF." (CP, P)

13. T_5 - "CHECKED" (for possible post shutdown fire). (P or CP)

NOTE

A slow build-up of T_5 to temperature above 200°C after engine coastdown cooling is not abnormal, especially in warm weather. However, if T_5 reaches 260°C, monitor closely for possible post shutdown fire. If T_5 reaches 300°C, engage the starter with ignition off and motor the engine until T_5 is below 200°C.

CAUTION

If high T_5 persists, monitor fire warning lights and have engine exhaust stack visually checked for fire. If fire is detected proceed with ENGINE COMPARTMENT FIRE procedures in section III.

14. Pins and chocks - "IN." (FM)

WARNING

The auxiliary fuel tank pins will be installed prior to installing the wheel chocks and the wheel chocks will be installed prior to installing the landing gear lock pins and AN/ALE-20 safety pins.

15. APU - "OFF." (CP or P)

CAUTION

Permit the APU to coast down to 10% or below prior to turning the battery switch off or fire warning system will be inoperative.

NOTE

The fire warning system may activate momentarily on shutdown of engines or APU.

16. All radios - "OFF." (CP or P)

17. All electrical switches - "OFF." (CP or P)

18. Emergency exit lights switch - "RESET." (CP or P)

19. "Engine Shutdown checklist completed." (CP)

BEFORE LEAVING THE HELICOPTER.

The pilot will ensure that classified IFF codes (if used) have been removed and all required entries have been completed in the Form 781.

NOTE

The flight crew shall make entries in the Form 781 indicating when any flight limits have been exceeded.