SECTION II

NORMAL PROCEDURES

This section contains checklist items amplified to explain how or why certain procedures are performed. The steps cover all procedures necessary to insure safe flight which are to be performed from the time the pilot arrives at the helicopter until he completes the mission, and leaves his parked helicopter. The mission is assumed to be nontactical and under normal conditions.

TABLE OF CONTENTS

PREPARATION FOR FLIGHT.

FLIGHT RESTRICTIONS.

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

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 I.

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 Appendix I.

The TAKEOFF AND LANDING DATA CARD (TOLD CARD) is located in the ABBREVIATED FLIGHT CREW CHECKLIST, T.O. 1H-3(C)B-1CL-1.

The Takeoff and Landing Data (TOLD) Card is designed as an aid in assuring safe and efficient mission planning. If a locally standardized TOLD Card for the weather conditions and gross weight is not on file, the pilot will complete a TOLD Card before takeoff. 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 from 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. If the aircraft is away from its home station, a TOLD card will be accomplished.

WEIGHT AND BALANCE.

The takeoff and anticipated landing gross weight should be obtained prior to each mission and

determined to be within specified limitations. If a locally standardized weight and balance clearance Form 365F, which shows the helicopter to be within limits, is not on file, the pilot will file a correct Form F, prior to takeoff. For additional information, refer to manual of weight and balance data, T.O. 1-1B-40.

CHECKLISTS.

The instructions contained in this flight manual should be complied with. However, every phase of operation shall also be presented in checklist form. It is intended that, insofar as possible, the flight crew will perform each phase of action with a direct reference to a checklist. However, it would be both impractical and unsafe to require the use of a checklist during certain emergency situations. When a crewmember is changed or passengers are on loaded and rotors were not disengaged, begin checklist with TAXI PROCEDURES. The crewmember who normally accomplishes a particular item on the checklist is designated at the right of each checklist item.

Checklist Accomplishment.

The Preflight Check has two portions: the Interior and Exterior Inspection. These are the responsibility of the pilot, but may be delegated. The flight mechanic will insure that all access panels, engine doors, and personnel exits are secure before flight, and so notify the pilot. The remainder of the checklist is the challenge type, performed on each flight with necessary crewmembers in their respective positions. The flight mechanic reads the checklist aloud issuing the challenge. The response is given by the crewmember indicated (i.e. (P), (CP), (FM) and if the action is in quotes, he reports that action to the person reading the checklist. The sequence of response will be as shown on the checklist. When a checklist item requires a response by more than one crewmember, the crewmember will state the response and his crew position. If the action is not in quotes, he completes the action and remains silent. During accomplishment of the checklist, AS REQUIRED or STATE SETTING will not be used as a response; instead, the actual position or setting of the unit and/or item will be stated. The flight mechanic will not initiate any checklist without approval from the pilot. A checklist will not be continued until all responses have been received.

PREFLIGHT CHECK.

INTERIOR INSPECTION.

1. Aircraft Form 781 - CHECKED.
2. Flight information publications - CHECKED.
3. Fire extinguisher, first aid, and pyrotechnic kits - CHECKED.
4. Emergency air bottle charged - 2500-3000 PSI.
5. Cabin escape hatches and areas - SECURE.
6. Fuel dump valves - CLOSED and SAFETIED.

NOTE

The fuel dump valves must be closed to prevent fuel being dumped when boost pumps are turned on.

7. Auxiliary fuel transfer pump switches - OFF.
8. Auxiliary fuel tank jettison switches - COVERS DOWN AND SAFETIED.
9. Transmission area - CHECKED FOR LEAKS.
10. Emergency equipment and personal equipment - CHECKED.

EXTERIOR INSPECTION.

1. Aircraft general - CHECKED. The pilot will make a walk around in accordance with figure 2-1, checking for visible fuel and oil leaks, security of inspection panels and doors, and presence of foreign matter such as ice, snow, and frost.
2. Main landing gear pins and chocks - IN PLACE.
3. Auxiliary fuel tank safety pins - IN PLACE.
4. Auxiliary fuel tanks - CHECKED FOR SECURITY, LEAKS AND QUANTITY.

NOTE

A visual check of fuel quantity shall be made since no direct reading gage is provided. A dip stick shall be used if fuel quantity is questionable.

5. Protective covers and tiedown equipment - REMOVED.

BEFORE STARTING ENGINES.

1. Passengers and crew - BRIEFED. Refer to Section VIII for CREW BRIEFING, PASSENGER BRIEFING, PRE-DEPARTURE BRIEFING, OVER-WATER BRIEFING, and ARRIVAL BRIEFING.
2. Safety belt and shoulder harness - "FASTENED." (P/CP)
3. Seats and tail rotor pedals - ADJUSTED. (P/CP)

NOTE

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

4. Circuit breakers - "CHECKED." (P/CP)
5. Switches - "SET." (P/CP)
   All switches marked OPEN and CLOSED will be CLOSED and all those switches marked OFF and ON will be OFF.
6. Brakes and tail wheel - "LOCKED." (P)
7. Battery switches - "CHECKED." (P)
   Check batteries one at a time and observe in-

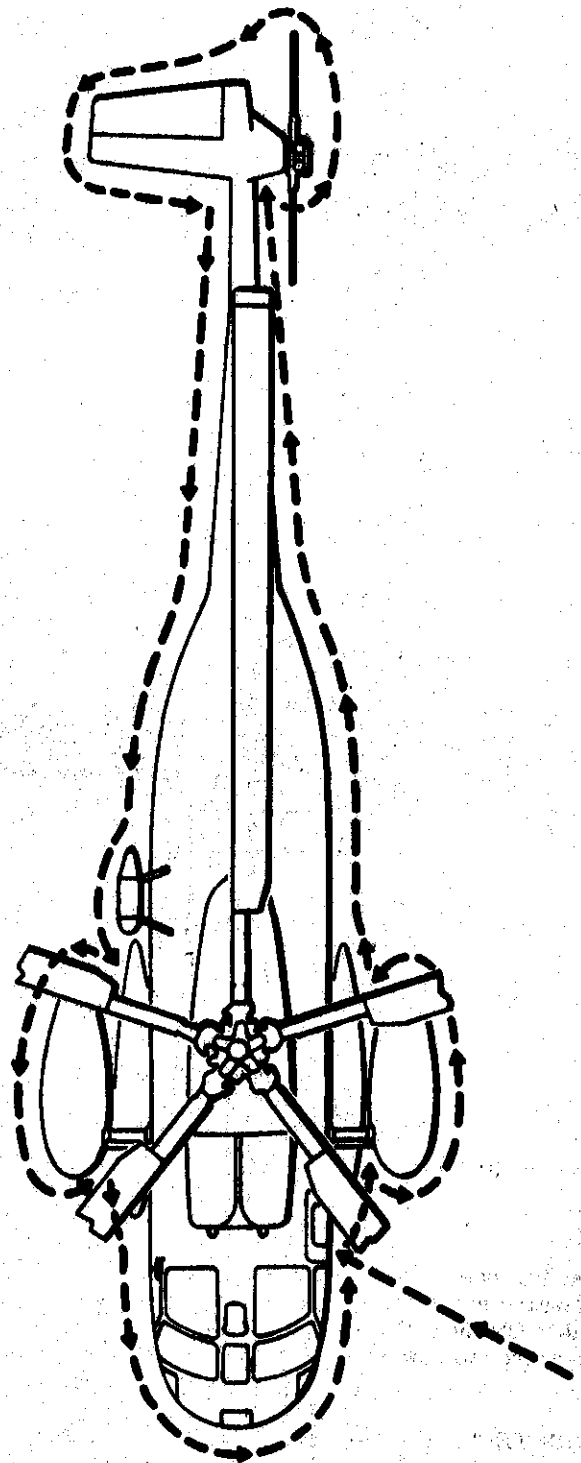
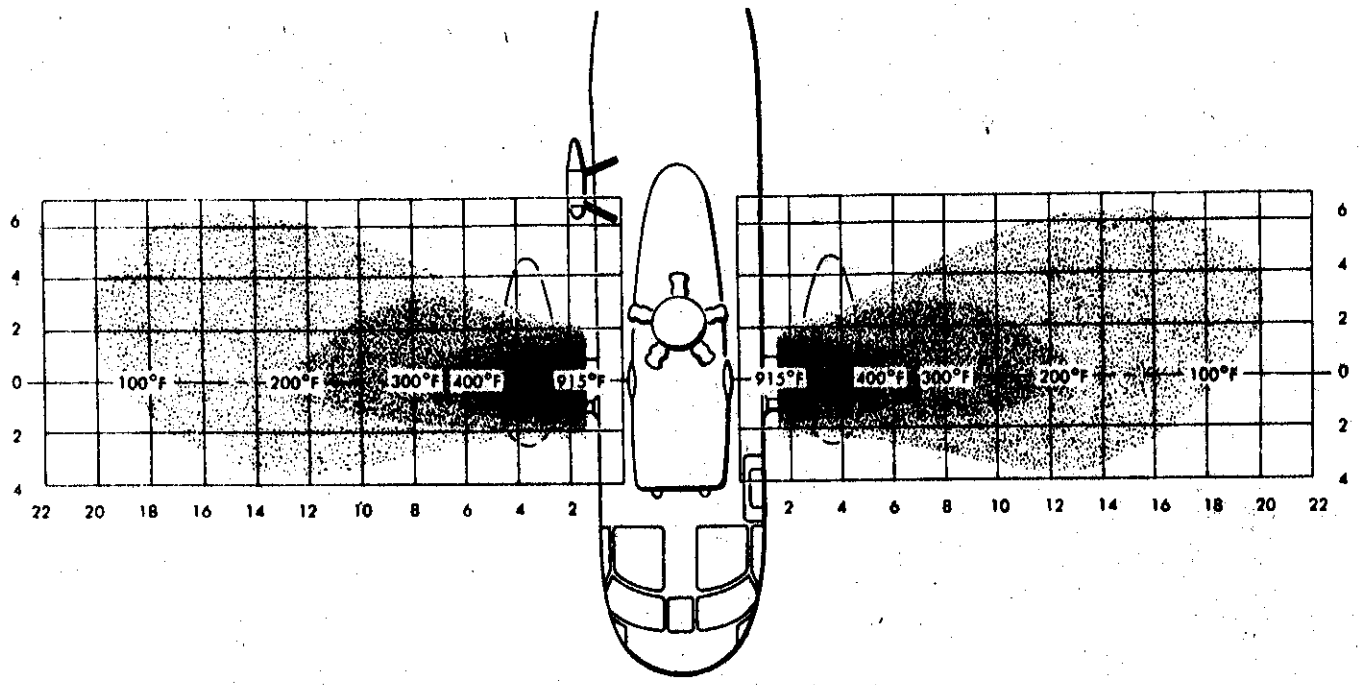
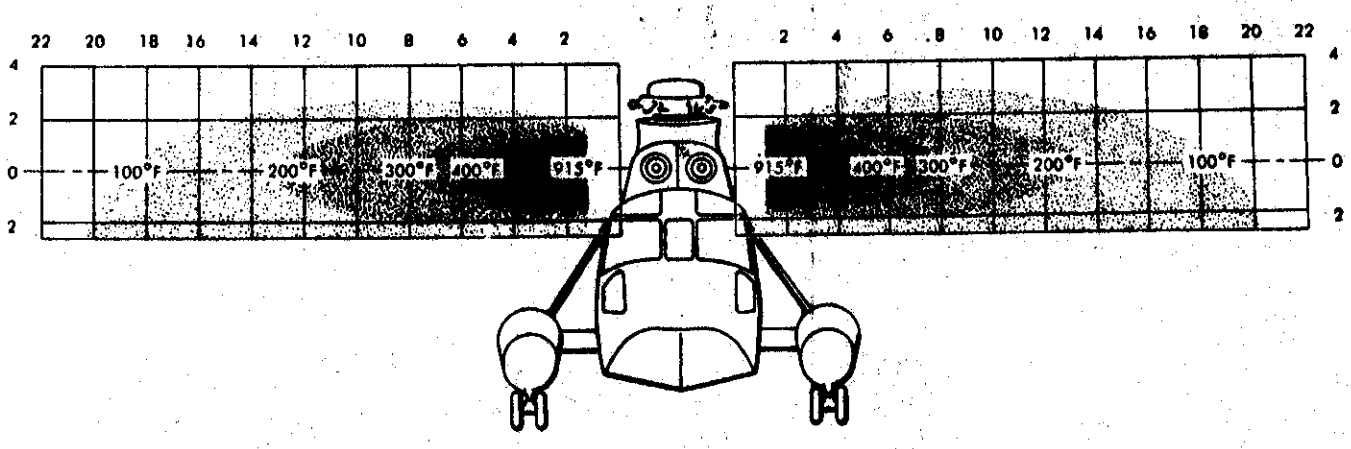


Figure 2-1. Exterior Inspection



DISTANCE FROM EXHAUST EXIT IN FEET
TOP ELEVATION



DISTANCE FROM EXHAUST EXIT IN FEET
SIDE ELEVATION

Figure 2-2. Danger Area

struments and lights to insure both batteries will operate.

NOTE

If external electrical power has been connected prior to turning on batteries, a battery switch must be cycled to ON then OFF to permit the external power source to power the battery bus.

8. External power - "CONNECTED". (P)

CAUTION

If warning light power circuit breaker has popped and ac external power is connected and turned on, the No. 2 generator load will be lost.

9. Battery switches - "OFF" (ON FOR MANUAL MODE START OR IF EXTERNAL POWER NOT USED). (P)
10. UHF radio - "ON." (P)
11. Landing gear - "CHECKED." (CP)
    a. Landing gear handle - DOWN.
    b. Landing gear position indicator - DOWN.
    c. Landing gear warning light test button - PRESS-TO-TEST.
    d. Emergency landing gear extension handle - DOWN and SAFETIED.
    e. Emergency landing gear release handle - AFT and SAFETIED.

12. Blade fold panel - "CHECKED." (CP)
    a. Blades spread and flight position lights - ON.
    b. Warning and indicator lights - PRESS-TO-TEST.
    c. If blades are folded, BLADE FOLDED, CONT LOCKPIN ADV and SAFETY VALVE LIGHTS - ON.
13. Trim and radio master switches - "ON." (CP)
14. Ignition switches - "NORMAL." (CP)
15. Speed selector friction - "OFF." (CP)
16. Manual throttle - "FREE AND OFF." (CP)
17. Speed selectors - "FREE AND OFF." (P)
18. Accessory drive switch - "FWD (ACCESS DR) LIGHT ON." (CP)
19. Lights - "ON." (FM)
    a. Master light switch - ON.
    b. Position light switch - FLASH.
20. Start mode switch - "AS REQUIRED." (P)
21. Emergency start switches - "OFF." (P)
22. Auxiliary fuel transfer pump switches - "OFF." (P)
23. Auxiliary fuel transfer pump indicator lights - "PRESS-TO-TEST." (P)
24. Rotor brake - "ON" (320 psi min). (P)

CAUTION

If the rotor brake is released with the blades folded care should be exercised to preclude blade damage by rotor movement.

25. Fire warning, caution, and advisory panels - "CHECKED." (P)
    a. Fire warning test switch - PRESS-TO-TEST.
    b. Advisory and caution light test switch - CHECK LIGHT AND PRESS-TO-RESET.

CAUTION

If the warning light power circuit breaker has popped, the warning light circuits are inoperative even though they illuminate when the test switch is depressed.

26. BEFORE STARTING ENGINES check list - "COMPLETED." (FM)

NO. 1 ENGINE STARTING PROCEDURES.

The No. 1 engine is started first to provide power for the accessory drive section. The No. 1 engine may be started using either ac or dc external power or if neither is available, by using both batteries. After the No. 1 engine is started and run up above generator cut-in speed, generator power can be used to start the No. 2 engine. A fire guard must be standing by when starting engines.

NOTE

No. 1 engine anti-ice switch - ON below 10 degrees C, OAT.

1. Fuel panel/quantity - "CHECKED." (CP)
   a. In checking the fuel panel, the firewall valve switch is open, crossfeed switch as desired, fuel quantity observed, and gage checked for operation.
   b. If the fuel system was drained for maintenance or service, it may be necessary to turn the boost pumps on for 20 to 40 seconds before starting engines.

NOTE

Motoring the engine to 19% N_g with booster pumps off will assist in reducing engine purifier contaminant washout.

2. No. 1 engine - "STARTING NO. 1 ENGINE." (P)

To start No. 1 engine the speed selector is moved forward to the stop, starter button depressed, speed selector moved to SHUT-OFF, and starter button released. At 19% N_g turn booster pumps on and advance speed selector to GRD IDLE.

CAUTION

Do not operate starter continuously for more than 30 seconds except in an emergency. Do not attempt more than three starts in any 30 minute period. Allow 3 minutes between starts. The starter should be capable of motoring the engine to 19 percent N_g. Failure to do so may result in hot starts.

CAUTION

Power turbine inlet temperature (T_5) should be less than 100°C prior to advancing the speed selector to GRD IDLE. If engine lite-off does not occur within 15 seconds after the speed selector has been advanced to the GRD IDLE position, move the speed selector to the SHUT-OFF position. Depress the starter button and move the booster pump switches to the OFF position. Before attempting another start, allow the engine to stop rotating and wait 3 minutes for fuel to drain from the manifolds, combustion chambers, and exhaust hood before repeating starting procedure. If the gas generator does not accelerate, monitor the power turbine inlet temperature indicator. If the temperature continues to rise and/or a hot start is evident, abort the start immediately by moving the speed selector to the SHUT-OFF position and depressing the starter button momentarily.

NOTE

When the engine lites-off and accelerates to approximately 45% N_g speed, the current sensitive holding coil in the automatic drop-out relay automatically cuts off electrical power to the starter and ignition systems.

CAUTION

If power turbine inlet temperature rises abnormally or reaches 700°C, immediately shut down the engine. If engine fire follows, as may be indicated by a continuous temperature of 300°C, engage the starter without ignition and motor until the fire is extinguished.

3. All gages - "CHECKED." (P)

CAUTION

Upon initial indication of a lack of accessory drive when operating in accessory drive, the helicopter should be shut down immediately and not restarted. Continued operation can cause severe damage to the main transmission. Lack of accessory drive is indicated by the loss of hydraulic (primary, auxiliary, and utility) pressure, generator power, and transmission oil pressure.

4. Booster pump switches - "OFF." (CP)

NOTE

Booster pumps should be off to check for engine flameout due to possible leak in fuel line.

5. Speed selector - "104% N_f." (P)

NOTE

During operation in accessory drive, minor oscillations in the power turbine speed of the No. 1 engine may be encountered due to actuation of the overspeed protection system. Normally, decreasing No. 1 N_f slightly will eliminate these oscillations.

6. Generators - "ON." (P)

7. External power - "DISCONNECTED." (P)

8. BATTERIES - "ON." (P)

9. IFF, MA-1, console switches - "CHECKED."(P)

10. RAD ALT, BAR ALT - "CHECKED." (P/CP)

11. NO. 1 ENGINE STARTING PROCEDURES checklist - "COMPLETED." (FM)

NO. 1 ENGINE STARTING PROCEDURES (MANUAL MODE BATTERY START)

The No. 1 engine is started first to provide power for the accessory drive section. After the No. 1 engine is started and run up above generator cut-in speed, generator power can be used to start No. 2 engine. A fire guard must be standing by when starting engines.

NOTE

No. 1 engine anti-ice switch - ON below 10 degrees C, OAT.

1. Fuel panel/quantity - "CHECKED." (CP)

   a. In checking the fuel panel, the firewall valve switch is open, crossfeed switch as desired, fuel quantity observed and gage checked for operation.

   b. The fuel booster pumps will be inoperative due to their ac power requirement. Therefore if the fuel system was drained for maintenance or service, the engine driven fuel pumps will be incapable of supplying sufficient fuel for starting.

2. No. 1 engine - "STARTING NO. 1 ENGINE." (P)

   To start the engine move the speed selector forward to the stop, depress the starter button and hold depressed, then move the speed selector aft to the SHUT-OFF position. When the engine has accelerated to maximum N_g and T_5 is below 100°C, advance the speed selector to GRD IDLE.

3. Engine start switch - "DEPRESS AS REQUIRED TO CONTROL T_5". (P)

   When engine lite-off is evident, depress the engine start switch on the cyclic stick grip. Hold the switch depressed as necessary until T_5 stabilizes.

CAUTION

Do not operate starter continuously for more than 30 seconds except in an emergency. Do not attempt more than three starts in any 30 minute period. Allow 3 minutes between starts.

CAUTION

Power turbine inlet temperature (T_5) should be less than 100°C prior to advancing the speed selector to GRD IDLE. If engine lite-off does not occur within 15 seconds after the speed selector has been advanced to GRD IDLE position, move the speed selector to the SHUT-OFF position and release the starter button. Before attempting another start, allow the engine to stop rotating and wait 3 minutes for fuel to drain from the manifolds, combustion chambers, and exhaust hood before repeating starting procedure. If the gas generator does not accelerate, monitor the power turbine inlet

temperature indicator. If the temperature continues to rise and/or a hot start is evident, abort the start immediately by moving the speed selector to SHUT-OFF position and releasing the starter button.

NOTE

Compressor stalls may occur if N_g is allowed to decelerate.

4. At 45% N_g starter - "DISENGAGED." (P)

   Disengage starter by releasing the starter button.

CAUTION

If power turbine inlet temperature rises abnormally or reaches 700°C, immediately shut down the engine. If engine fire follows, as may be indicated by continuous temperature of 300°C, engage the starter without ignition and motor until the fire is extinguished.

5. All gages - "CHECKED." (P)

CAUTION

Upon initial indication of lack of accessory drive when operating in accessory drive, the helicopter should be shut down immediately and not restarted. Continued operation can cause severe damage to the main transmission. Lack of accessory drive is indicated by the loss of hydraulic (primary, auxiliary, and utility) pressure, generator power, and transmission oil pressure.

6. Speed selector - "104% N_f." (P)

   During operation in accessory drive, minor oscillations in the power turbine speed of the No. 1 engine may be encountered due to actuation of the overspeed protection system. Normally, decreasing No. 1 N_f slightly will eliminate these oscillations.

7. Generators - "ON." (P)

8. IFF, MA-1, console switches - "CHECKED." (P)

9. RAD ALT, BAR ALT - "CHECKED." (P/CP)

10. Start mode switch - "NORMAL." (P)

11. NO. 1 ENGINE MANUAL MODE STARTING PROCEDURES Checklist - "COMPLETED." (FM)

AUTOMATIC BLADE SPREADING.

1. Servo sensor - "CHECKED." (P)
   a. Primary servo pressure - Zero.

CAUTION

The primary servo is not normally pressurized when the blades are folded, but will pressurize if all electrical power to the aircraft is lost or secured or if an open circuit develops in the safety valve switch. Pressurization of the primary servo when the blades are folded will put undue stress on control linkage and may damage the control lockpins.

   b. Servo switch - AUX OFF. If auxiliary servo pressure drops, the servo sensor is defective.

2. Collective pitch lever - "MINIMUM and LOCKED." (P)
3. Main blade fold panel - "CHECKED." (P)
   a. Control lockpin advance light - ON.
   b. Blades folded light - ON.
   c. Pylon unlocked light - OFF.
   d. Safety valve warning light - ON.
   e. Safety valve switch - OFF.
   f. Blade fold master switch - OFF.
   g. Blades fold-spread switch - OFF.
   h. Storage rack - Blades free.
4. Safety valve switch - "OPEN." (P)
5. Blade fold master switch - "ON." (P)
   a. Fold power indicator light - ON.
   b. No. 1 blade position light - ON.
6. Blades fold-spread switch - "SPREAD." (P)
   a. Blades folded light - OFF (when first blade moves).
   b. Control lockpins advance light - OFF (when pins are disengaged).
   c. Blades spread light - ON.
7. Safety valve switch - "CLOSED." (P)
   a. Safety valve warning light - OFF.
   b. Fold power indicator light - OFF.
   c. Primary servo hydraulic pressure - 1500 PSI.
8. Blade fold master switch - "OFF." (P)
   a. No. 1 blade position light - OFF.

b. Flight position light - ON.

9. Blades fold-spread switch - "OFF." (P)

10. Blade lockpins - "CHECKED." (P)

CAUTION

Check with ground crewmen to insure that blades are in proper spread position and that the blade lockpins are securing the blades in place.

t. AUTOMATIC BLADE SPREADING checklist - "COMPLETED." (FM)

LIGHT CONTROL SERVO SYSTEM CHECK.

1. Rotor brake lever - "OFF." (P)

NOTE

Observe freedom of the main rotor to turn for approximately 1/8 of a revolution. Rotation may be slow due to the low residual torque in accessory drive. However, rotation should be an indication of freedom of the rotor brake pucks from dragging on the rotor brake disc. Movement of the cyclic stick may assist in rotating the rotor head.

2. Rotor head rotation - "CHECKED." (P)

3. Rotor brake lever - "ON." (P)

4. Servos - "CHECKED." (P)

a. Auxiliary and primary servo hydraulic pressure indicators - NORMAL RANGE.

b. Flight control servo switch - PRI OFF. Primary servo pressure indicator should indicate a drop to zero and caution light should come on.

c. Trim release button (on cyclic stick) - DEPRESS. Using a "T" motion, actuate cyclic stick from one extreme to the other in lateral then fore-and-aft directions.

d. Collective pitch lever - ACTUATE FULLUP AND FULLDOWN.

e. Flight control servo switch - ON. Primary servo hydraulic pressure indicator should indicate normal pressure and caution light should go off.

f. Flight control servo switch - AUX OFF. Auxiliary servo hydraulic pressure indicator should indicate a drop to zero and 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.

g. Trim release button depress when moving the cyclic stick. Collective pitch lever fulldown. Using a "T" motion, actuate cyclic stick from one extreme to the other in lateral then fore-and-aft directions. Depress left rudder to stop. Lift collective to upper stop. Note left pedal rearward movement of approximately two inches due to collective yaw coupling. Repeat the "T" as noted above. Depress right rudder pedal to stop. Lower collective to fulldown position noting right pedal rearward movement of approximately two inches.

NOTE

Full actuation of flight controls can be accomplished in any one direction in one second with no evidence of binding.

h. Flight control servo switch - ON. Auxiliary servo hydraulic pressure indicator should indicate normal pressure and caution light should go off.

5. FLIGHT CONTROL SERVO SYSTEM CHECK checklist - "COMPLETED." (FM)

AUXILIARY FLOTATION GEAR CHECK.

1. Auxiliary flotation gear - "CHECKED." (P)

a. Rotary selector test switch - L1, L2, R1, and R2.

b. Indicating light - ON, IN EACH POSITION.

c. Rotary selector test switch - OFF.

2. AUXILIARY FLOTATION GEAR CHECK checklist - "COMPLETED." (FM)

NAVIGATIONAL EQUIPMENT CHECK.

1. Doppler navigator - "STANDBY." (CP)

a. Function switch to STANDBY.

b. Navigator preflight data - INSERT AS TIME ALLOWS.

2. Tacan - "AS REQUIRED." (CP)

3. ADF - "AS REQUIRED." (CP)

4. NAVIGATIONAL EQUIPMENT CHECK checklist - "COMPLETED." (FM)

AUTOMATIC STABILIZATION EQUIPMENT CHECK.

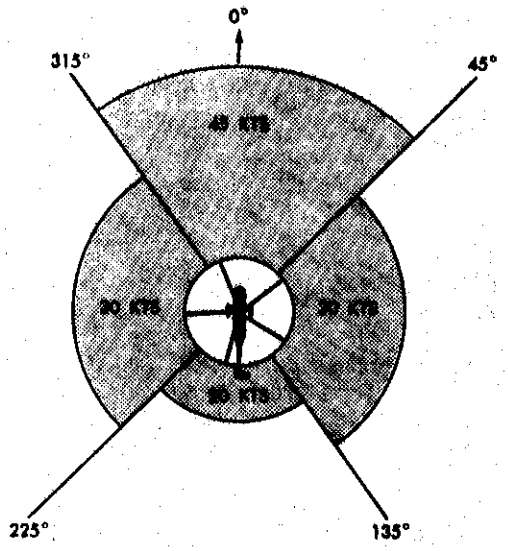
1. ASE - "ON." (P)

a. Hover indicator - A Mode. (P)

2. CG trim knob - "CHECKED." (P) Move knob and note that pitch bar on hover indicator can be moved full travel in each extreme and follows movement of CG trim knob.

ROTOR ENGAGEMENT AND DISENGAGEMENT

MAXIMUM WIND VELOCITIES



NOTES

1. LIMITING VELOCITIES OF THE SHADED AREA REPRESENT MAXIMUMS FOR STEADY STATE, NONTURBULENT WINDS. WHEN TURBULENCE OR PITCHING DECK CONDITIONS EXIST WHICH MAY IN ANY WAY JEOPARDIZE THE SAFETY OF THE HELICOPTER OR FLIGHT DECK PERSONNEL, THESE MAXIMUMS WILL BE REDUCED ACCORDINGLY.
2. ROTOR ENGAGEMENT IN WIND VELOCITIES NEAR THE LIMITING VALUES SHOULD BE MADE AS RAPIDLY AS POSSIBLE. USING APPROXIMATELY 60% TORQUE.
3. ROTOR DISENGAGEMENT IN WIND VELOCITIES NEAR THE LIMITING VALUES SHOULD BE MADE AS RAPIDLY AS POSSIBLE. APPLY ROTOR BRAKE FIRMLY AND SMOOTHLY.

5 2013(R2)

Figure 2-3. Rotor Engagement Chart

3. Yaw trim knob - "CHECKED." (P) Center pedals. Slowly turn the trim knob. At initial movement of the pedals check yaw indicator deflection (1/2 to 1 increment). Depress the closest rudder pedal (approximately six pounds force) and observe that the yaw indicator returns to midposition. Repeat for opposite rudder.

4. Collective channel - "CHECKED." (P)

   a. Collective pitch lever - MAXIMUM. The vertical arrow (collective indicator) on the hover indicator should move to fulldown position.

   b. BAR REL button - DEPRESS MOMENTARILY. The vertical arrow (collective indicator) on the hover indicator should return approximately to center.

   c. Collective pitch lever - MINIMUM. The vertical arrow (collective indicator) on the hover indicator should move to fullup position.

   d. BAR REL button - DEPRESS MOMENTARILY. The vertical arrow (collective indicator) on the hover indicator should return approximately to center.

5. Pitch and roll channel - "CHECKED." (P)

   a. Cyclic stick - Move FORE, AFT, RIGHT, and LEFT. Note that the roll and pitch bars on hover indicator can be moved full travel in each extreme and follow movement of cyclic stick.

6. ASE & BAR ALT engage-release - "CHECKED." (P/CP)

   a. ASE ENG & BAR ALT ENG buttons - DEPRESS.

   b. Pilot's auto stabe release button (cyclic stick) - DEPRESS. Check that all engage button lights go off.

   c. ASE ENG & BAR ALT ENG buttons - DEPRESS.

   d. Copilot's auto stabe release button (cyclic stick) - DEPRESS. Check that all engage button lights go out.

7. AUTOMATIC STABILIZATION EQUIPMENT CHECK checklist - "COMPLETED." (FM)

STARTING NO. 2 ENGINE AND ROTOR ENGAGEMENT.

1. Fuel panel/quantity - "CHECKED." (CP)

2. No. 2 engine - "STARTING NO. 2 ENGINE."(P) The procedure for starting the No. 2 engine is the same as for the No. 1 engine.

3. All gages - "CHECKED." (P)

4. Booster pump switches - "OFF." (CP)

5. Collective pitch lever - "MINIMUM." (CP - MONITOR)

6. Area - "CLEAR." (P/CP)

WARNING

Before rotor engagement, be sure personnel are clear of the main and tail rotor blades.

7. Rotors - "ENGAGING ROTORS." (P)

   a. No. 2 speed selector - Advance to obtain a slight N_g rise.

   b. Rotor brake - OFF and light out.

   c. No. 2 speed selector - Advance, accelerate rotor smoothly, and maintain torque of approximately 40 to 60%.

CAUTION

The rotor should not be engaged in winds above 45 knots due to excessive rotor blade flapping. When engaging the rotor in high or gusty winds, the rotor should be accelerated as rapidly as possible without exceeding torque limits.

8. N_f - "MAXIMUM." (P)

9. No. 2 engine FLAT PITCH - "CHECKED." (CP)

   Normal power turbine speed (N_f) is 107 ± 2% for single engine with maximum travel on speed selector. If a single engine flat pitch check does not fall within the normal readings, the pilot can expect one of the following:

   a. In the area below 105% N_f, 100% N_r may not be available for maximum power performance.

   b. Difference of more than one-half percent between both engines, torque will be split.

NOTE

A differential of more than one-half percent is not considered a safety of flight item; however, this information should be noted on the discrepancy sheet upon return from the flight. Any reading below 105% N_f is a safety of flight item.

10. No. 1 speed selector - "GROUND IDLE, N_f STABILIZED." (CP)

CAUTION

Illumination of either the TAIL TAKE-OFF caution light (if installed) or the generator caution lights at this time indicates malfunction of the main transmission tail takeoff freewheel unit. Do not switch to the flight position. Advance the No. 1 engine to 104% N_f, cycle the generator switches, and proceed with normal shutdown. Do not secure No. 1 engine until rotor has stopped to preclude loss of servo pressure.

11. Accessory drive switch - "AFT (FLIGHT), ACCESSORY DRIVE, and BLADE PANEL LIGHTS OUT." (CP)

CAUTION

If, after placing the accessory drive switch in the AFT position, the accessory drive light remains on (or in case of any other indication that the transmission did not actually shift to the flight mode), return the accessory drive switch to the forward position before moving the No. 1 engine speed selector from the ground idle position.

12. No. 1 speed selector - "MAXIMUM." (CP)

13. No. 2 speed selector - "ZERO TORQUE." (CP)

14. No. 1 engine FLAT PITCH - "CHECKED." (CP)

15. N_f, TORQUES, FRICTION - "104%, MATCHED, SET." (CP)

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

    CP gives signal to ground crew to remove pins and chocks, and FM will ascertain that pins and chocks are aboard the aircraft prior to taxi.

17. Auxiliary fuel tank safety pins - "REMOVED." (FM)

18. STARTING NO. 2 ENGINE AND ROTOR ENGAGEMENT checklist - "COMPLETED." (FM)

TAXIING.

TAXIING PROCEDURE.

All ground taxiing in congested areas shall be done under positive control of a qualified taxi director. Utilize his signals as an aid; however, remember that the pilot and not the ground crew is responsible for the safety of the helicopter.

WARNING

The tip-path height forward of the helicopter must be monitored to prevent endangering taxi directors and ground crew personnel.

While taxiing, too much forward cyclic will cause the main rotor blades to hit the droop stops. If the droop stops are hitting, move the cyclic toward center and increase collective pitch slightly to maintain forward speed. Aerodynamic braking should be used with caution.

1. Area - "CLEAR." (P/CP)

2. Parking brake - "RELEASED." (P)

3. Tail wheel - "UNLOCKED." (P)

   a. Permit helicopter to taxi forward a few feet to relieve possible binding of the lockpin due to tail wheel tire side loading.

   b. Position the tail wheel lock handle to the UNLOCKED position.

   c. Exert left tail rotor pedal pressure in varying amounts to balance inherent torque which may prohibit disengagement of tail lockpin during step b. (Unlocking of the tail wheel will be felt by a slight jolt transferred through the locking handle.)

   d. Do not place the tail wheel lock handle in the LOCKED position during ground turns. The helicopter must be rolling in a relatively straight line when the tail wheel is LOCKED to prevent shearing of the lockpin.

   e. Tail rotor pedals - Use cautiously to prevent swerving.

4. Brakes - "CHECKED." (P)

CAUTION

Taxi speed is controlled with coordinated use of cyclic, collective, and toe brakes. Rapid application of excessive aft cyclic without sufficient load on the rotor system may cause the retreating blade to strike the tail cone.

5. TAXIING PROCEDURE checklist - "COMPLETED". (FM)

AIR TAXIING.

Air taxiing should not be used when in the vicinity of parked aircraft or debris that will be displaced by rotor wash. Extreme care should be taken when air taxiing. The pilot, copilot, and crewman should act as vigilant lookouts. Taxiing altitude should be high enough to clear all obstructions and to prevent dust, dirt, and debris from blowing into the helicopter.

BEFORE TAKEOFF CHECK.

1. Tail wheel - "LOCKED". (P)
2. Parking brakes - "SET". (P)
3. Lights - "CHECKED". (FM)
   a. Position lights - STEADY.
   b. Rotating beacons - ON.
4. Rotor brake - "CHECKED". (P)

   Rotor brake handle in detent and pressure is at zero psi.
5. BAR ALT, RAD ALT, and VGI - "CHECKED". (P/CP)
6. Boost pumps and crossfeed valve switches - "CHECKED". (CP)
   a. Turn on the FWD No. 1 boost pump. The boost pump failure warning light should flicker on then go off. The No. 1 fuel flow indicator should jump momentarily.
   b. Repeat check for other three boost pumps.
   c. Check crossfeed valve. With one boost pump on, open the crossfeed valve. The opposite engine fuel flow indicator should increase momentarily.
   d. Boost pump switches - ON. One pump per tank should be on for all takeoffs and landings.
7. Auxiliary fuel transfer pumps - "CHECKED." (P)

   Turn transfer pump switches - ON. Green indicator lights should illuminate. Turn pump switches - OFF.
8. Instrument, warning, caution, and advisory lights - "CHECKED". (P)
   a. All instruments - NORMAL. (P)
   b. Warning, caution, advisory, and blade fold panel lights - Proper indications.
9. Parking brakes - "AS REQUIRED". (P)
10. Shoulder harness - "CHECKED". (P/CP)
11. External tiedowns - "REMOVED". (P)
12. Doppler - "ON" (Sea or Land). (CP)
13. IFF - "AS REQUIRED". (CP)
14. ASE - "ON". (CP)

CAUTION

If any erratic behavior in the control system is encountered when the automatic stabilization equipment is engaged, press the AUTO STABE RELEASE button on the cyclic stick grip.

15. Engine anti-ice switches - "AS REQUIRED". (P)

    Anti-ice will be utilized below 10°C OAT.
16. BEFORE TAKEOFF CHECK checklist - "COMPLETED". (FM)

TAKEOFF.

The governing factors for determining the type of takeoff are gross weight, density altitude, and size and condition of the takeoff area. Vertical climbs are possible at low gross weights; however, at high gross weights, the ability of the helicopter to climb vertically exceeds the ability to make a safe landing if one engine fails. The Single Engine Failure Height Velocity Chart and Dual Engine Failure Height Velocity Chart in Appendix I should be used as a guide in determining minimum takeoff climb speeds. The first objective during takeoff is to clear obstacles at a safe airspeed and then to establish a best rate-of-climb or airspeed (see Climb Charts in Appendix I), which is also the airspeed that will produce best single engine performance. The following paragraphs describe the types of takeoff to be accomplished under various conditions. 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.

NOTE

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

ENGINE POWER CHECK IN A HOVER.

Hover the helicopter into the wind at the appropriate height and accomplish the following checks:

1. Engine power - "CHECKED". (P)
   a. Power required - Check power required to hover and compare with TOLD Card.
   b. Power available. Power available will normally be checked in flight. However, if a power available check is required prior to takeoff, perform the MAXIMUM POWER CHECK (TOPPING PROCEDURES) in Section VII.
2. ENGINE POWER CHECK IN A HOVER checklist - "COMPLETED". (FM)

NOTE

MINIMUM GROUND CLEARANCES

MAIN ROTOR BLADES STATIONARY	9 FEET
MAIN ROTOR BLADES ROTOR ENGAGED COLLECTIVE PITCH – MINIMUM CYCLIC PITCH – NEUTRAL	11 FEET 10 INCHES
TAIL ROTOR BLADES STATIONARY OR ENGAGED	6 FEET 6 INCHES
BOTTOM OF FUSELAGE	1 FOOT 6 INCHES
WIDTH BETWEEN SPONSONS	16 FEET 4 INCHES

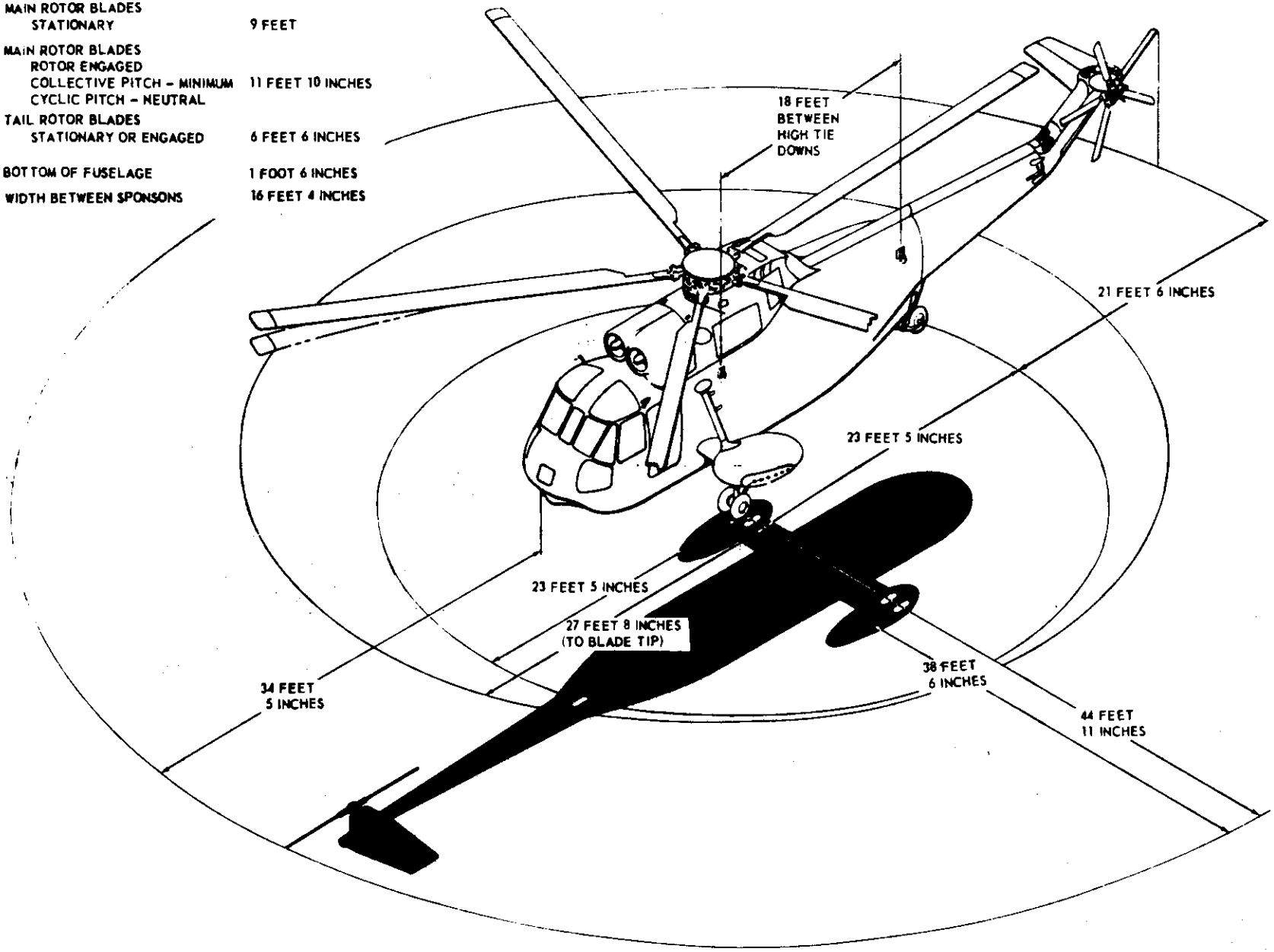


Figure 2-4. Turning Radius

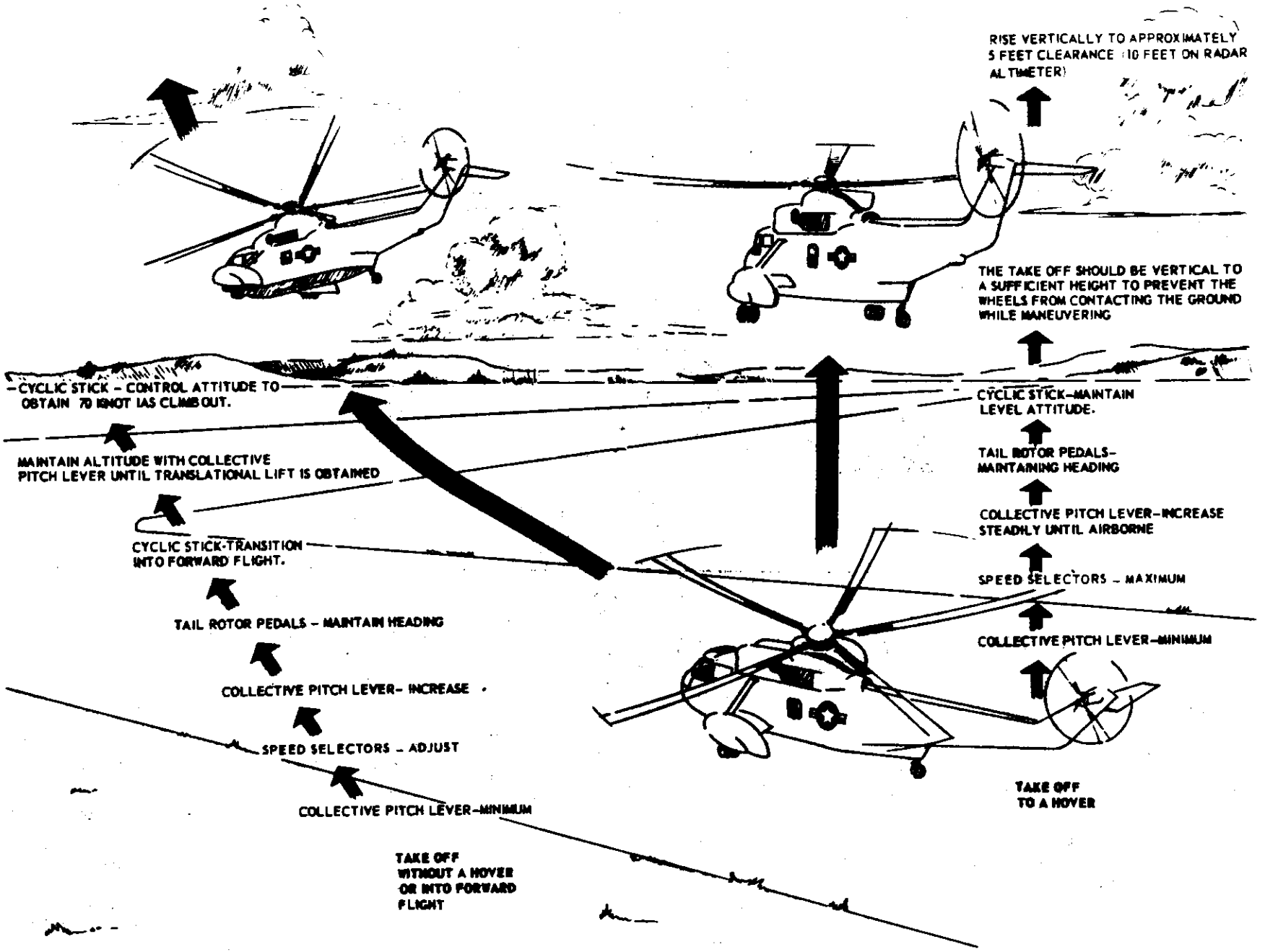


Figure 2-5. Normal Takeoff (Typical)

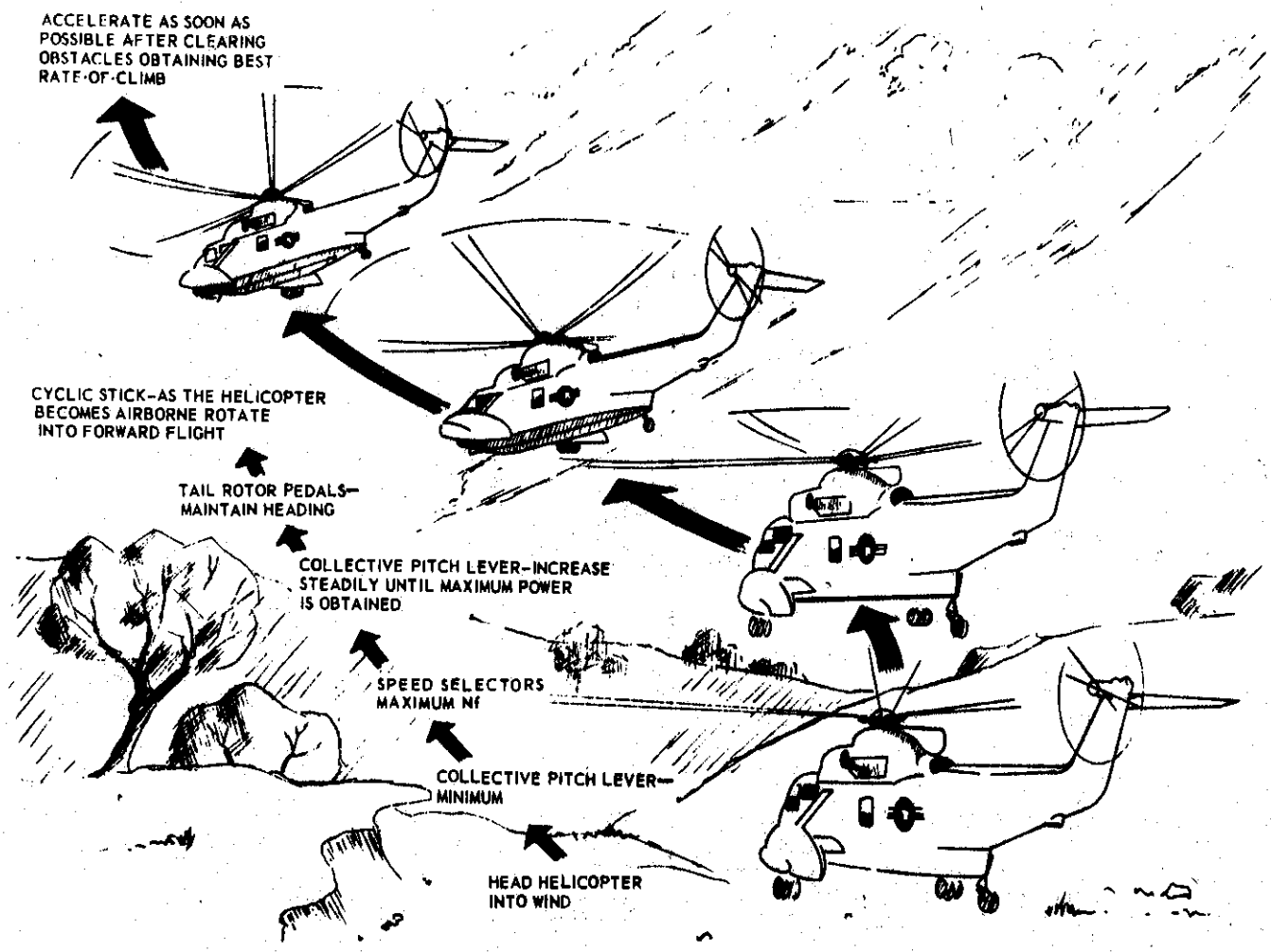


Figure 2-6. Maximum Performance Takeoff (Typical)

NORMAL TAKEOFF.

A normal takeoff is accomplished by adjusting the speed selector to 104% N_r with collective pitch lever in minimum pitch while on the ground. The Vernier Knobs may be used, if necessary, to maintain N_r during the takeoff climb. Maintain heading by use of tail rotor pedals and a level attitude by use of the cyclic stick. Increase collective pitch until approximately 5 feet off the surface, (10 feet on radar altimeter), and check engine instruments, flight controls, and CG trim, before continuing flight. Initiate forward movement with cyclic stick, and increase collective pitch as necessary to prevent settling. A gradual increase in airspeed is desired, while paralleling the ground at hovering altitude, until translational lift is attained. Increase power and airspeed with a gradual increase of altitude. After obtaining climb airspeed, adjust power to establish the desired rate-of-climb.

MAXIMUM PERFORMANCE TAKEOFF (RESTRICTED AREA).

The maximum performance takeoff is required when operating from small and/or restricted areas where obstructions surround the site. It is basic to note that this takeoff can usually be accomplished when there is sufficient power to hover out of ground effect. It may be necessary to climb vertically, or nearly vertically, as dictated by surrounding obstacles. Set speed selector at maximum N_r; check wind direction and area clear. Increase collective pitch lever smoothly to maximum power, simultaneously increasing airspeed to the extent consistent with safely clearing the obstacles, until best climb speed can be attained and climbout continued. Every effort should be made to minimize operating time in the Avoid Continuous Operation Area of the HEIGHT VELOCITY DIAGRAMS in Appendix I.

RUNNING TAKEOFFS.

Running takeoffs are used under certain conditions of high gross weight and high density altitude (low air density) where there may not be sufficient power developed by the engines and lift developed by the main rotor blades to accomplish a vertical takeoff. Running takeoffs should never be attempted over rough terrain. Under conditions requiring a running takeoff, it is necessary to increase lift through forward motion prior to becoming airborne. With the helicopter lined up on desired takeoff heading,

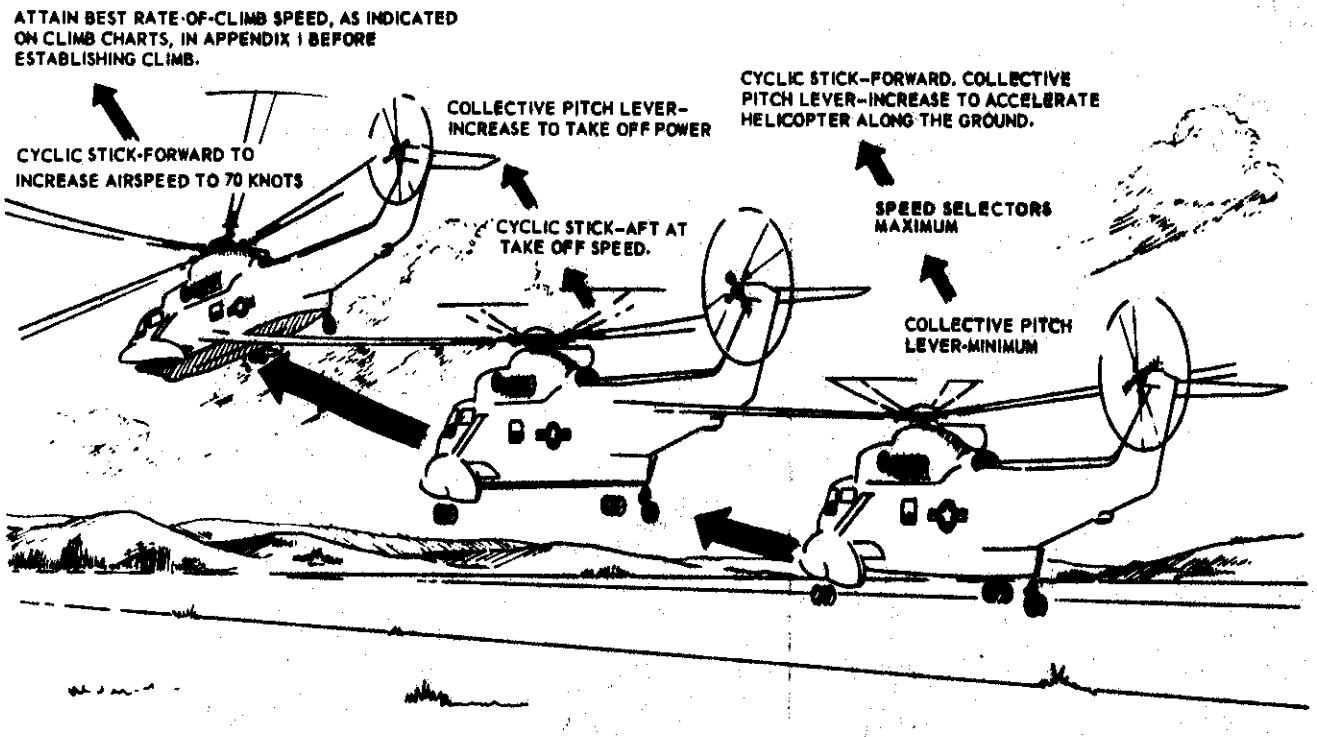


Figure 2-7. Running Takeoff (Typical)

smoothly increase collective pitch and at the same time move the cyclic stick forward to commence forward motion over the ground. As the helicopter becomes light on the landing gear, the combinations of the nosedown attitude to roll forward and the collective to cyclic coupling may tend to pitch the aircraft forward and possibly bring the ARA-25 antenna and beacon in contact with the ground. As groundspeed increases, sufficient lift will be developed to accomplish a takeoff. Do not attempt to rush the forward movement as settling into the ground will result. Utilize tail rotor and wing down methods control as necessary to maintain a straight track into the wind. As the helicopter becomes airborne, establish a shallow climb and gradually displace the cyclic stick forward to increase airspeed to 70 knots while maintaining necessary torque to obtain normal acceleration. Do not exceed maximum twin engine torque of 95%. When comfortably airborne, adjust power as necessary for climbing. Throughout the maneuver the required torque will be less than that required to hover.

AFTER TAKEOFF.

As the helicopter accelerates from hovering to forward flight it passes through translational lift. If engine power, rotor rpm, and collective pitch remain constant as 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 knots, and monitor all instruments. Refer to the climb data in Appendix I for best climb speeds.

AFTER TAKEOFF CHECK.

1. Landing gear - "UP". (CP)
2. Landing lights - "OFF/AS REQUIRED". (P)
3. Instruments, caution, advisory panel - "CHECKED". (FM)
4. AFTER TAKEOFF CHECK checklist - "COMPLETED". (FM)

CRUISE.

Refer to Appendix I, as necessary, to determine best cruise airspeeds. After cruise airspeed has been established, adjust rotor speed to 100% N_r which will give the desired performance. Re-adjust 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 electronics equipment reliability is dependent upon operation at 100 percent N_r. The vibration absorber also is adjusted for best operation at 100 percent N_r. For optimum electronic and automatic navigation system performance and lowest vibration levels, the helicopter should be flown at 100 percent N_r. The cruise checklist is intended for use when clear of control zones and traffic congestion.

CRUISE CHECK.

1. Speed selectors - "ADJUSTED". (CP)

2. Compass - "CHECKED". (P)

3. Auxiliary fuel transfer pumps - "AS REQUIRED". (P)

4. CRUISE CHECK checklist - "COMPLETED". (FM)

For proper management of fuel, refer to FUEL SYSTEM MANAGEMENT, Section VII.

WARNING

The boost pumps in an empty tank should be shut off to conserve the life of the boost pumps and to prevent the possibility of fire. If the boost pumps are inadvertently left on, thermal limit switches in the pumps will automatically shut the pumps off if the temperature of the pumps rises to 204°C (400°F) due to lack of lubrication. This temperature is considerably lower than the spontaneous flash point of the fuel and/or vapors.

WARNING

A flameout will occur when operating on cross-feed if one tank runs dry and the boost pumps are off in the tank containing fuel.

NOTE

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 pump operation and life and insure one boost pump operation if one generator should fail.

NOTE

It is necessary to operate the boost pumps whenever one or more of the following conditions occur:

1. Above 6000 feet pressure altitude.

2. Above 43°C FAT.

3. Below 600 pounds of fuel per tank.

4. When a fuel filter bypass caution light comes on.

5. All takeoffs and landings.

6. When fuel dumping from the main tanks is required.

   a. One pump per tank; 95 pounds of fuel dumped per minute.

   b. Two pumps per tank; 170 pounds of fuel dumped per minute.

TURNS USING ASE.

Turns, using the ASE, may be made in two ways: (1) By actuating the tail rotor pedals; after the turn is completed and the helicopter is on the desired course, the feet should be removed from the pedals and the helicopter will maintain the new heading. (2) By using the yaw trim knob for turns while hovering, rotate the knob left or right slowly and smoothly to produce the turn desired. With forward speed this control will be very convenient for small turns of from 1 to 10 degrees. Large turns can be made, but will cause the helicopter to skid unless they are made very slowly or the pilot banks the helicopter while the knob is rotated to prevent skidding.

WATER RECOVERY/INFLIGHT REFUELING CHECK

1. No smoking - "CHECKED". (P/FM)

2. Safety harness - "SECURED". (FM)

3. Hot mike - "CHECKED". (FM)

4. Hoist - "CREW POSITION" (CP) "CHECKED". (FM)

5. External cargo sling - "AS REQUIRED". (FM)

6. Cargo sling master switch - "AS REQUIRED". (CP)

7. Rescue seat - "AS REQUIRED". (FM)

8. Divers - "AS REQUIRED". (FM)

9. APN-117 - "ON". (P/CP)

10. Booster pumps - "ALL ON". (CP)

11. Auxiliary fuel transfer pumps - "OFF". (P)

12. Shoulder harness - "CHECKED". (P/CP)

13. Speed selectors - "MAXIMUM". (CP)

14. WATER RECOVERY/INFLIGHT REFUELING CHECK checklist - "COMPLETED". (FM)

POST WATER RECOVERY CHECK.

1. Speed selectors - "AS REQUIRED". (CP)

2. Hoist - "OFF". (CP)

3. Booster pumps - "AS REQUIRED". (CP)

4. Cargo sling - "AS REQUIRED". (FM)

5. Cargo sling master switch - "AS REQUIRED". (CP)

6. APQ-107B circuit breaker - "IN". (FM)

7. Recovery equipment - "SECURED". (RS/FM)

8. POST WATER RECOVERY CHECK checklist - "COMPLETED". (FM)

CLOSED PATTERN BEFORE LANDING CHECK.

1. Landing gear - "DOWN AND LOCKED". (P) Copilot places landing gear lever in the DOWN position, and performs visual check of left landing gear. Pilot performs visual check of right landing gear and checks cockpit indicators to ascertain that a safe gear extension appears in landing gear position indicators.
2. Speed selectors - "ADJUSTED". (CP)
3. CLOSED PATTERN BEFORE LANDING CHECK checklist - "COMPLETED". (FM)

BEFORE LANDING CHECK.

1. Boost pump switches - "ON". (CP)
2. Shoulder harness - "CHECKED". (P/CP)
3. Tail wheel - "LOCKED". (P)
4. Parking brakes - "AS REQUIRED". (P)
   a. Toe brake pedals - CHECK FOR PRESSURE.
   b. Parking brake - SET AS REQUIRED.
5. Landing gear - "DOWN AND LOCKED". (P)

NOTE

Landing gear should extend in approximately 5 seconds. Visually check landing gear position.

6. Cargo sling master switch - "AS REQUIRED". (CP)
7. Speed selectors - "ADJUSTED". (CP)
8. Landing lights - "AS REQUIRED". (P)
9. BEFORE LANDING CHECK checklist - "COMPLETED". (FM)

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.

APPROACHES AND LANDINGS.

NORMAL APPROACH.

To accomplish a normal approach, accomplish the BEFORE LANDING CHECK, establish 100% N_f, and match torques. The approach will be initiated at 300 feet, 65-70 knots, and 30 degrees apparent angle. Decrease collective pitch to initiate a descent (not over 1,000 feet per minute) while raising the nose slightly to decrease airspeed slowly. At 200 feet airspeed should not be below 40 knots. The approach should continue to zero airspeed at 10 feet over the intended landing spot. The copilot will maintain a minimum of 100% N_f during the approach.

SHALLOW APPROACH.

To accomplish a shallow approach, complete the landing check, establish 100% N_f, and match torques. The approach will be initiated at 200 feet, 70 knots, and 20 degrees apparent angle. Decrease collective pitch slightly to decrease airspeed slowly. The approach should continue to zero airspeed at 10 feet over the intended landing spot. The copilot will maintain a minimum of 100% N_f during the approach.

STEEP APPROACH.

To accomplish a steep approach, complete the landing check, and establish maximum N_f with matched torques. The approach will be initiated at 300 feet, 50 knots, and 45 degrees apparent angle. Decrease collective pitch to begin a descent (not to exceed 1,000 feet per minute and 500 feet per minute for the last 150 feet) while raising the nose slightly to decrease the airspeed slowly. The approach should continue to zero airspeed at 10 feet over the intended landing spot. The copilot will maintain a minimum of 100% N_f and match torques during the approach.

LANDING AFTER ATTAINING A HOVER.

After attaining a hover over the spot of intended landing, decrease the collective pitch to commence a vertical descent, maintaining position over the ground with cyclic stick and directional control with the tail rotor pedals. Smooth reduction of collective pitch will limit directional control problems. Under normal wind conditions the helicopter will touchdown tail wheel first followed in a nearly level attitude by both main landing gears. Upon firm contact with the surface decrease collective pitch slowly and smoothly, simultaneously applying forward cyclic; stop any forward rolling motion with wheel brakes. To facilitate smooth landings and avoid undue stresses on the landing gear, all sideward or rearward drift should be eliminated prior to touchdown. When conditions will allow, a smoother landing is sometimes accomplished by moving forward over the landing area at one or two knots on touchdown. In the event a soft surface is unintentionally encountered and the wheels begin to settle, add collective pitch immediately and become airborne. This helicopter does not have a history of susceptibility to ground resonance; however, if any unusual vibration or unbalanced condition is experienced during landing, execute an immediate takeoff. Normal vertical landings on land should be made with tail wheel locked. Changes in the main rotor torque may cause a slight swerve if the tail wheel is unlocked.

CAUTION

During landings and ground operations it is possible, by abrupt movement of the collective pitch lever to the down position and the cyclic stick to the aft position, to cause the main rotor blades to strike the tail section. To prevent this, avoid abrupt movements of the collective and cyclic controls while the wheels are in contact with the ground.

RUNNING LANDING.

Prior to 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 landing should be accomplished with the tail wheel locked, parking brakes off, and 100% N_f. 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 trail 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. Maintain a level attitude and minimum practical rate of decent prior to touchdown. The helicopter should be stopped with the wheel brakes. Normally, the helicopter should not land at ground speeds greater than 40 knots.

WARNING

Touchdown landings with low rotor rpm or excessive aft cyclic can cause the rotor blades to strike the tail pylon.

CAUTION

A running landing should not be attempted on rough terrain or at ground speeds above 40 knots. Eliminate all sidedrift before touchdown.

CROSSWIND LANDINGS.

Crosswind landing procedures are the same as into-the-wind vertical landing procedures with the exception of the required cyclic displacement into the wind. This cyclic displacement should not be released upon touchdown since this will reduce the force holding the helicopter in a vertical position and under extreme conditions could result in the helicopter being overturned. It is most important to have no sideward drift when making crosswind landings. These landings are prohibited in winds exceeding 30 knots.

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.

Blade Folding/Spreading.

The maximum safe nonturbulent winds relative to the helicopter for rotor folding/spreading are limited to 45 knots except in an emergency situation.

CAUTION

At any time blades are to be spread or folded aboard ship, two personnel should act as "BLADE WALKERS" while the number three and number four blades are in motion to prevent excessive blade flapping which could result in the blade tips striking the deck.

CAUTION

If the rotor brake is released with the blades folded, care should be exercised to preclude blade damage by rotor head movement.

CAUTION

During tail pylon folding and unfolding in strong winds the lowest tail rotor blade should be held to prevent the tail rotor from windmilling and causing damage to tail rotor blades and folded main rotor blades.

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. Tail wheel locked, parking brakes on.
4. Winds below maximum wind velocities for rotor engagement.

CAUTION

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

Shipboard Landing.

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 80 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. The tiedowns, chocks, and gear pins should be installed prior to accomplishing the after landing checklist.

CAUTION

The parking brakes can be set for one wheel without the other. This could be hazardous during shipboard operations. Insure that both pedals are depressed firmly when setting the parking brake.

Shipboard Takeoff.

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

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

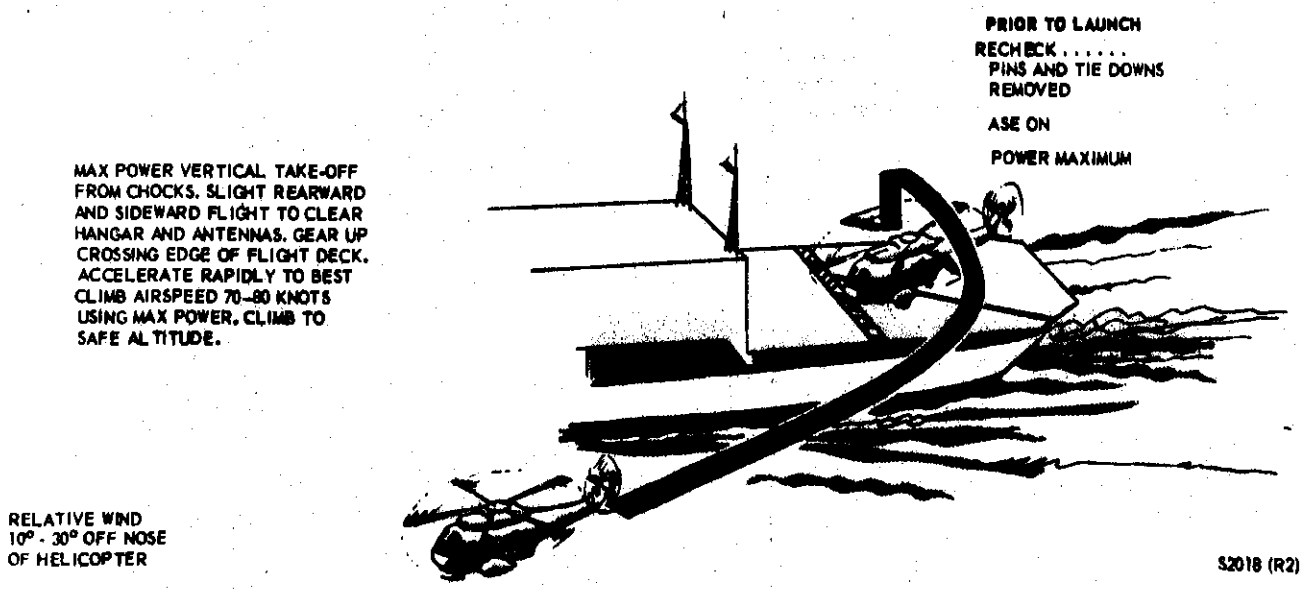


Figure 2-8. Typical Shipboard Takeoff

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 Appendix I. 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 helicoptsr 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 Appendix I.

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 wind 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.

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

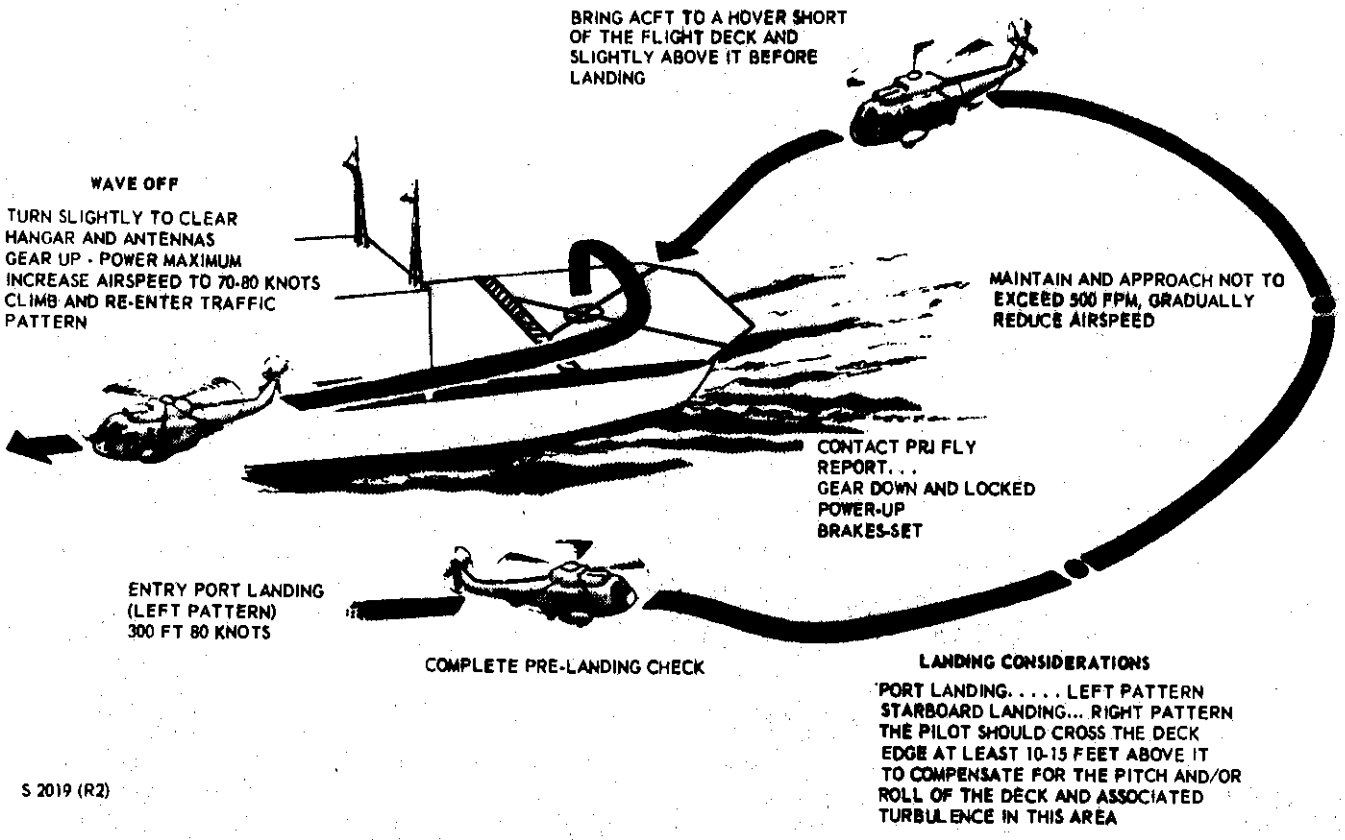


Figure 2-9. Typical Shipboard Landing and Waveoff

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 downdraft 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.

EFFECTS OF HIGH ALTITUDE.

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

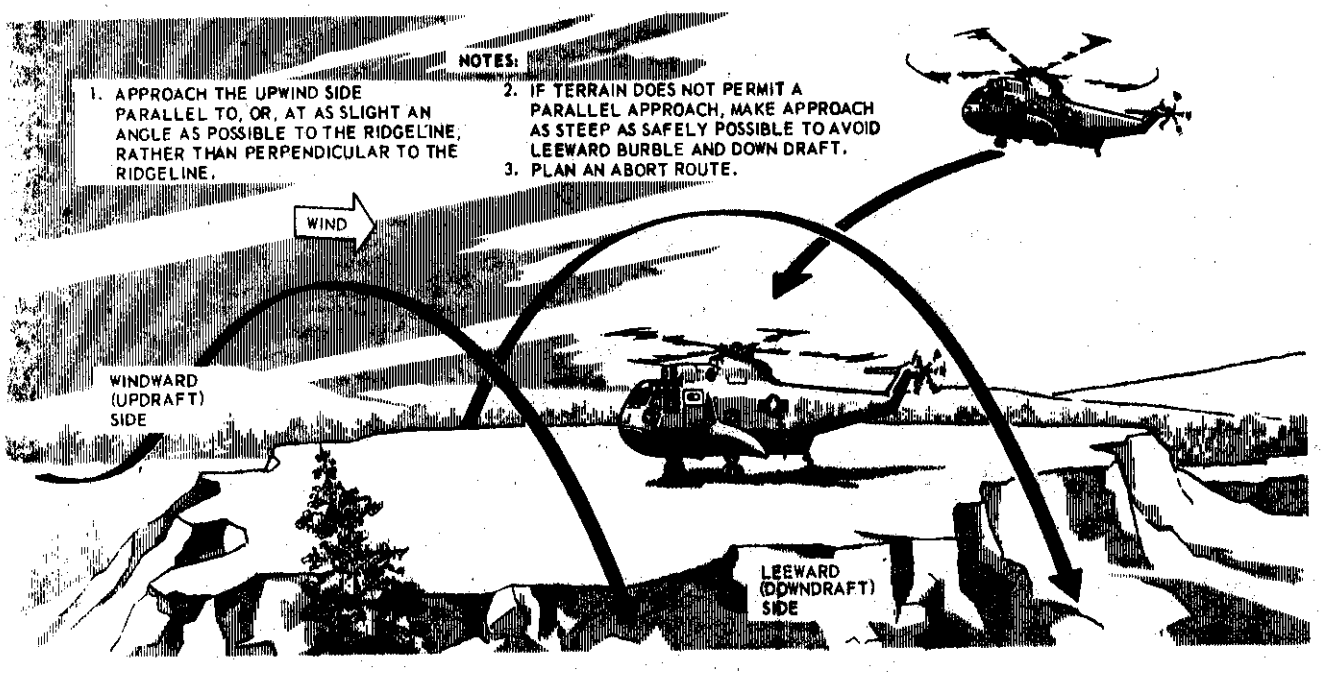


Figure 2-10. Wind Effect on Ridgeline Approach

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

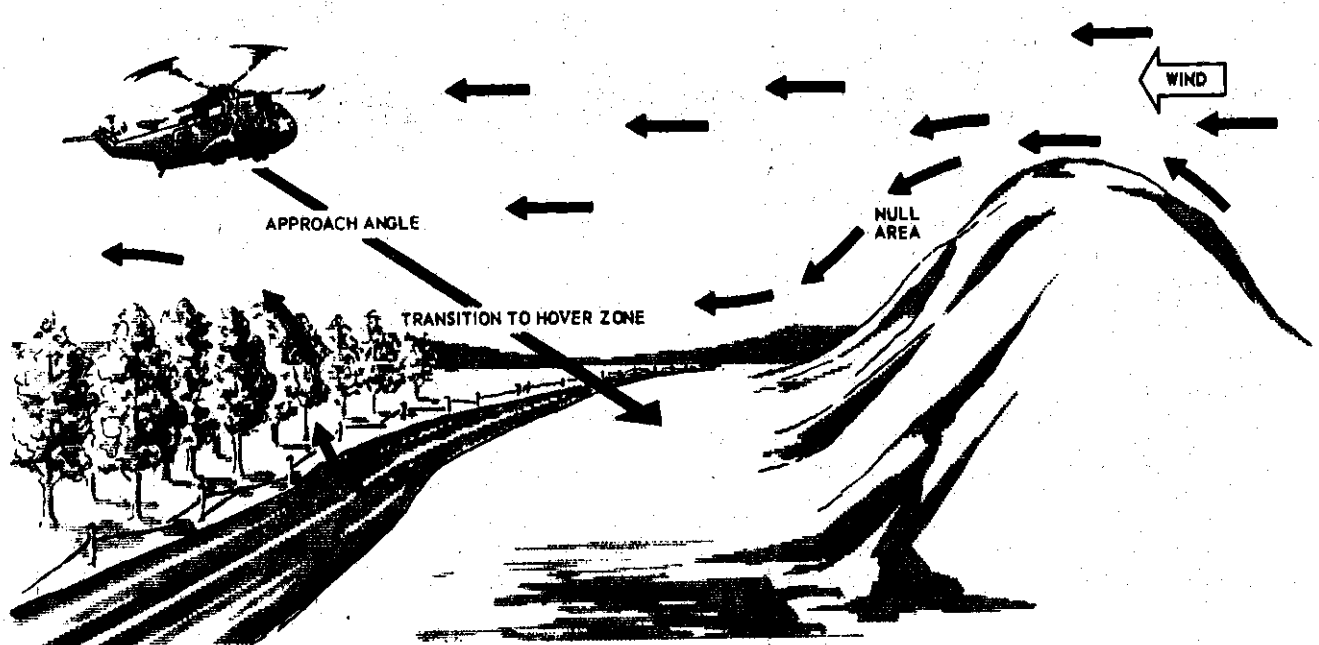
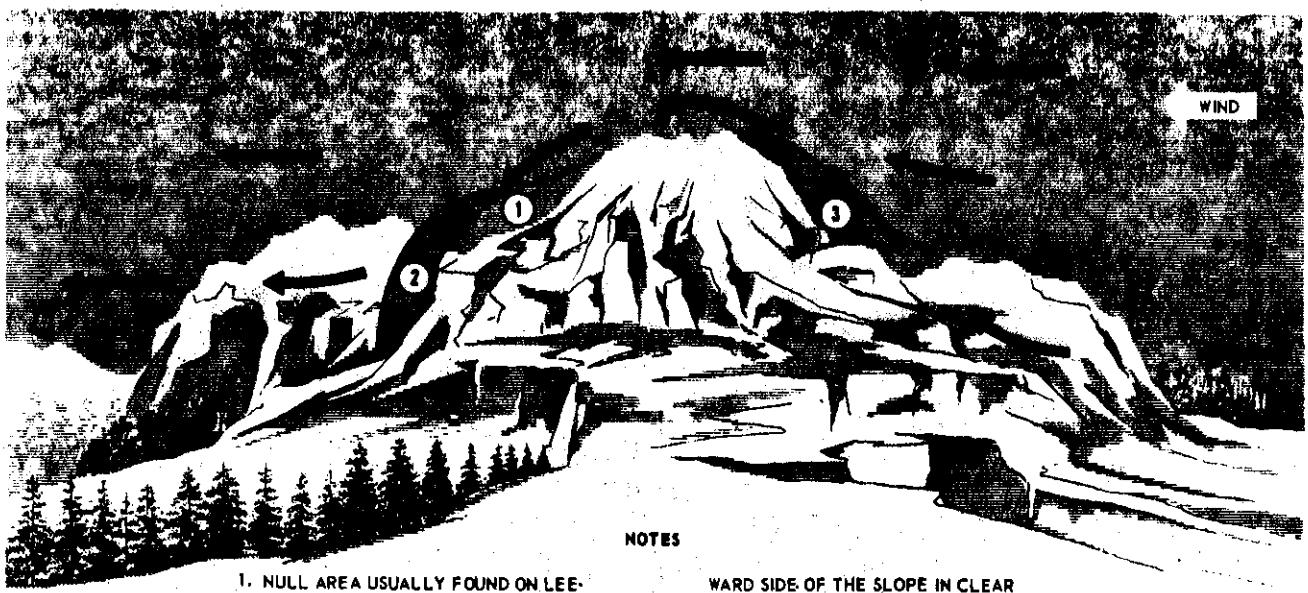


Figure 2-11. Wind Effect In A Confined Area



NOTES

1. NULL AREA USUALLY FOUND ON LEEWARD SIDE AT CREST OF SLOPE.
2. IN VERY STRONG WIND CONDITIONS, AND/OR ON VERY STEEP SLOPES, TURBULENCE WILL BE FOUND ON THE LEEWARD SIDE OF THE SLOPE IN CLEAR AIR.
3. UP-DRAFTS WILL EXTEND ABOVE THE SURFACE FURTHER THAN THE TURBULENCE, DEPENDING ON WIND SPEED.

Figure 2-12. Wind Flow Over and Around Peaks

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-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 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 possiblity 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:

Figure 2-13. Wind Flow In Valley Or Canyon

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

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 revelant factors.

g. Determine ability to hover out of ground effect 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.

Figure 2-14. Wind Flow Over Gorge Or Canyon

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.

GO-AROUND.

When a go-around becomes apparent, advance speed selectors to maximum N_f and increase collective pitch lever to maximum power. After establishing a 70 knot climb and upon reaching a safe altitude raise the landing gear.

AFTER LANDING.

*1. ASE - "OFF". (P)

*2. Tail wheel - "AS REQUIRED". (P)

*3. Speed selectors - "104% N_f." (CP)

4. Lights - "CHECKED". (FM)

   a. Rotating beacons - OFF.

   b. Position lights - FLASH.

5. RAD ALT - "OFF". (P/CP)

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

*7. Doppler - "STANDBY". (CP)

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

9. Auxiliary fuel transfer pump switches - "OFF". (P)

10. Ignition - "OFF". (CP)

11. Cargo sling - "CHECKED". (FM) Insure ground clearance for taxi if sling was lowered.

12. AFTER LANDING checklist - "COMPLETED". (FM)

NOTE

Only asterisked steps will be completed on turnaround sorties.

SHUTDOWN.

NO. 2 ENGINE AND ROTOR DISENGAGEMENT.

1. Collective pitch lever (copilot monitor) - "MINIMUM". (CP)

2. Brakes and tail wheel - "LOCKED". (P)

3. Landing gear lockpins and chocks - "IN" (tie-downs as required). (P/CP)

4. Auxiliary fuel tank safety pins - "IN PLACE". (P/CP)

5. Speed selector friction - "OFF". (CP)

6. Speed selectors - "100% N_f". (CP)

7. No. 1 speed selector - "GRD IDLE - N_f - STABILIZED". (P)

CAUTION

To preclude damage to the main gear box freewheel unit when switching from FLIGHT to ACCESS DR position, make certain that the No. 1 engine power turbine speed (N_f) is at least 12% below the speed of the main rotor.

CAUTION

Illumination of either the TAIL TAKE-OFF caution light (if installed) or the generator caution lights at this time indicates malfunction of the main transmission tail takeoff wheel unit. Do not secure No. 1 engine until rotor is stopped to preclude loss of servo pressure.

8. Accessory drive switch - "FWD (ACCESS DR) - LIGHT ON". (CP)

CAUTION

Upon initial indication of lack of accessory drive when operating in accessory drive, the helicopter should be shut down immediately and not restarted. Continued operation can cause severe damage to the main transmission. Lack of accessory drive is indicated by the loss of hydraulic (primary, auxiliary, and utility) pressure, generator power, and transmission oil pressure.

9. No. 1 speed selector - "104% N_f". (P)

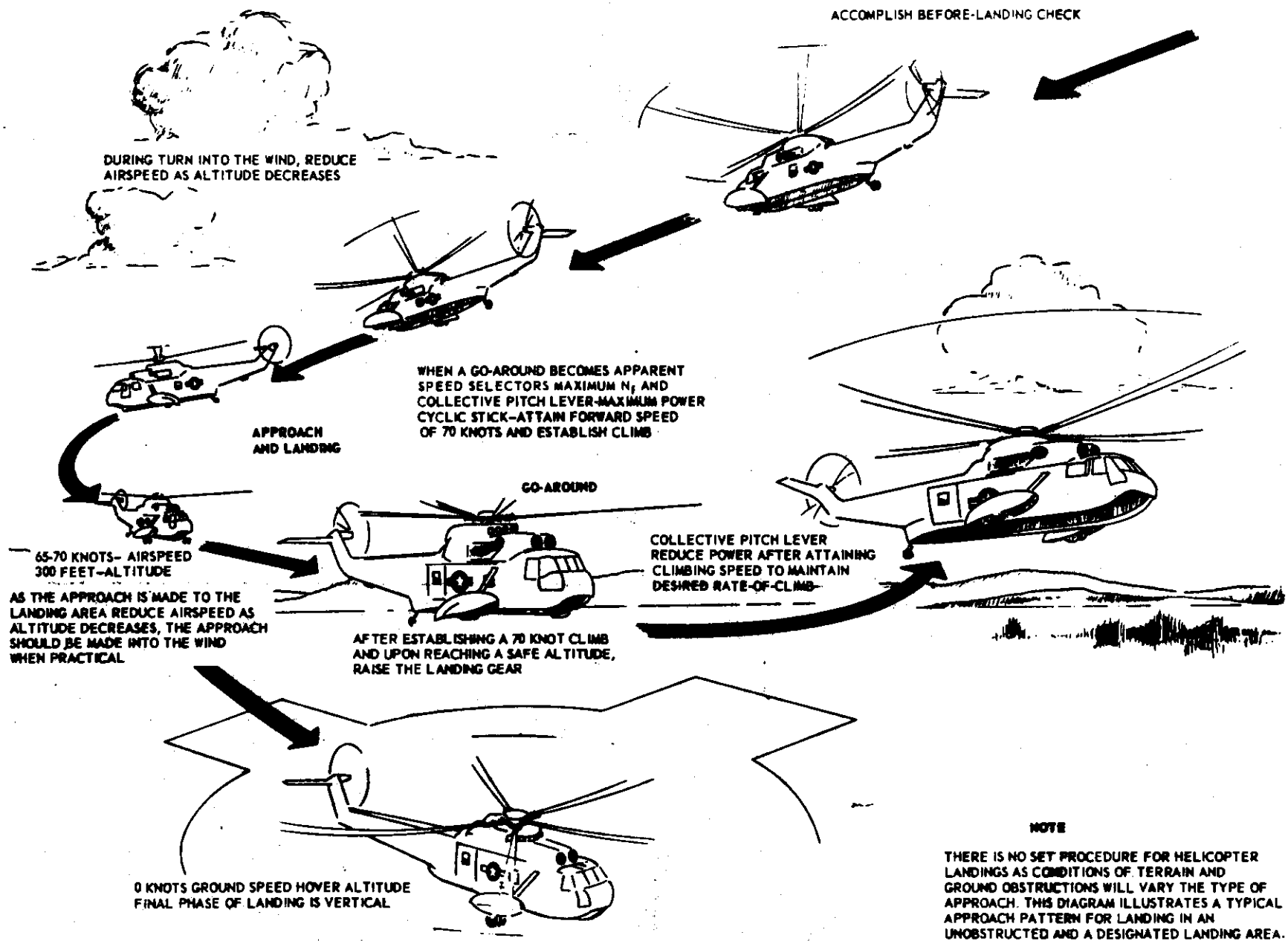
10. No. 2 speed selector - "GRD IDLE". (P)

11. Droop stops - "IN" (observe). (P)

12. No. 2 speed selector - "SHUT-OFF". (P)

NOTE

To obtain the most efficient cooling of the No. 2 engine, maintain a constant T_5 for one minute, at minimum collective pitch.



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

Figure 2-15. Approach Landing and Go-Around

CAUTION

In an emergency, the engine may be shut down immediately, observing power turbine inlet temperature (T_5) for indication of post shutdown fire. However, indiscriminate use of emergency shutdown procedure from high performance conditions will increase the possibility of engine seizure and decrease the useful life of the engine.

13. No. 2 firewall valve switch - "CLOSED". (CP)

14. Rotor brake - "ON" (below 45% N_r). (P)

NOTE

For normal shutdown the rotor brake should be applied firmly and smoothly. As rotation nears complete deceleration, rotor brake pressure should be reduced in order to ease rotor blades to a stop, precluding any tendency of "whip stopping".

NOTE

If the rotor brake is weak, it is necessary to place the handle in the full up position and then reapply the rotor brake. This may have to be repeated until sufficient pressure is built up to slow the main rotor.

15. All navigation equipment - "OFF". (CP)

16. NO. 2 ENGINE AND ROTOR DISENGAGEMENT checklist - "COMPLETED". (FM)

AUTOMATIC BLADE FOLDING PROCEDURE.

With the No. 2 engine of the helicopter shut down and the No. 1 engine driving the accessory drive to fold the rotor blades, proceed as follows:

1. Droop and antiflap restrainers - IN (FM) (checked by ground personnel).

2. No. 1 blade position - CHECKED. (P)

3. AREA - CLEAR. (P/CP/FM)

4. Collective pitch lever - MINIMUM AND LOCKED. (P)

5. Cyclic stick - NEUTRAL. (P)

   a. Beeper trim switch - TRIM TO CENTER.

6. Safety valve switch - OPEN. (P)

   a. SAFETY VALVE OPEN red warning light - ON.
   b. FLIGHT POS green light - OFF.

7. Blade fold master switch - ON. (P)

   a. FOLD PWR red light - ON.
   b. Primary servo pressure - Zero.
   c. CAUTION panel PRI SERVO PRESS light - ON.

8. Rotor brake lever - OFF. (P)

   a. Rotor brake caution light - OFF.

9. Blades fold-spread switch - FOLD. (P) Observe the following sequence:

   a. No. 1 blade positions aft.
   b. No. 1 BLADE POS indicator light - ON.

NOTE

Check visually that the two forward blades are positioned an equal distance from the centerline of the helicopter. If the blades are not in the correct position, refer to MANUAL FOLDING PROCEDURE in this section.

10. Rotor brake lever - ON. (P)

    a. Dampers position all blades against their autorotation stops.
    b. CONT LOCK PINS ADV indicator light - ON. BLADES SPREAD indicator light. OFF as soon as one flight control lockpin advances

NOTE

It may be necessary to actuate the cyclic stick slightly to seat all the lockpins.

11. BLADES FOLDED indicator amber light - CHECKED ON (FM) (when all blades are folded).
    a. If folding cycle should stall at any point proceed as follows:

       (1) Blades fold-spread switch - OFF.

       (2) BLADES fold-spread switch - SPREAD (until blades spread amber light comes - ON).

       (3) Blades fold-spread switch - FOLD.

12. Safety valve switch - CLOSED. (P) (The safety valve red warning light remains ON.)

13. Blade fold master switch - OFF. (P)

14. Blades fold-spread switch - OFF. (P)

15. AUTOMATIC BLADE FOLDING PROCEDURE checklist - COMPLETED. (FM)

MANUAL BLADE FOLDING PROCEDURE.

1. If improper blade positioning is experienced during automatic blade folding and it is necessary to complete blade folding rapidly, proceed as follows:

   a. Blade fold master switch - OFF. (P)

b. Rotor brake lever - OFF. (P)
c. No. 1 blade - AFT (FM)(position manually).
d. Blade fold master switch - ON (P) (proceed with automatic operation).

2. If necessary to fold the blades manually the following procedure will apply:

a. Safety valve switch - OPEN (P) (warning light on).
b. Rotor brake lever - OFF. (P)
c. No. 1 blade - DIRECTLY AFT (FM)(position manually).
d. Rotor brake lever - ON. (P)
e. Servo switch - PRI OFF. (P)
f. Collective pitch lever - FULLY DOWN AND LOCKED. (P)

3. Cyclic stick - NEUTRAL AND LOCKED (P) (have ground crew check control lockpin alignment).
4. (FM) Trip Fold manual override and observe the following sequence:

a. Dampers position.
b. Control locks engage.
c. Blade lockpins retract.
d. Blades fold.

NO. 1 ENGINE SHUTDOWN.

1. Speed selector - SHUT-OFF. (P)

NOTE

To obtain the most efficient cooling of the No. 1 engine, maintain 104 percent N_f in ACCESS DR for one minute.

2. No. 1 firewall valve switch - CLOSED. (CP)
3. All engine instruments - CHECKED. (P)

CAUTION

If an engine post shutdown fire should occur which would be indicated by a continuous power turbine inlet temperature (T_5) of 300°C or higher, engage the starter without ignition.

4. All switches - OFF. (P/CP)
5. No. 1 ENGINE SHUTDOWN checklist - COMPLETED. (FM)

ABBREVIATED CHECKLIST.

Your abbreviated checklist is now contained in T. O. 1H-3(C)B-1CL-1.

PASSENGER INFORMATION

1. Smoking is prohibited during ground operation, takeoffs, landings, and when directed by the helicopter commander.
2. Safety belts will be securely fastened for all takeoffs, landings, and flight through turbulent air.
3. Operation of portable electronic equipment is prohibited.
4. If it becomes necessary to evacuate the helicopter, refer to diagram on reverse side for exits.
5. If a crash landing becomes necessary, proceed as follows:
   a. Jettison emergency exits as directed by the helicopter commander.
   b. Loosen tie.
   c. Fasten safety belt tight.

Just prior to contact with the surface, passengers will fold arms resting them on their knees. Bend body forward as far as possible and rest head firmly on arms. If available, hold pillow, blanket, or clothing in front of head to cushion possible impact.

NOTIFICATION OF AN EMERGENCY WILL BE MADE BY THE HELICOPTER FLIGHT MECHANIC.

Figure 2-16. Passenger Information

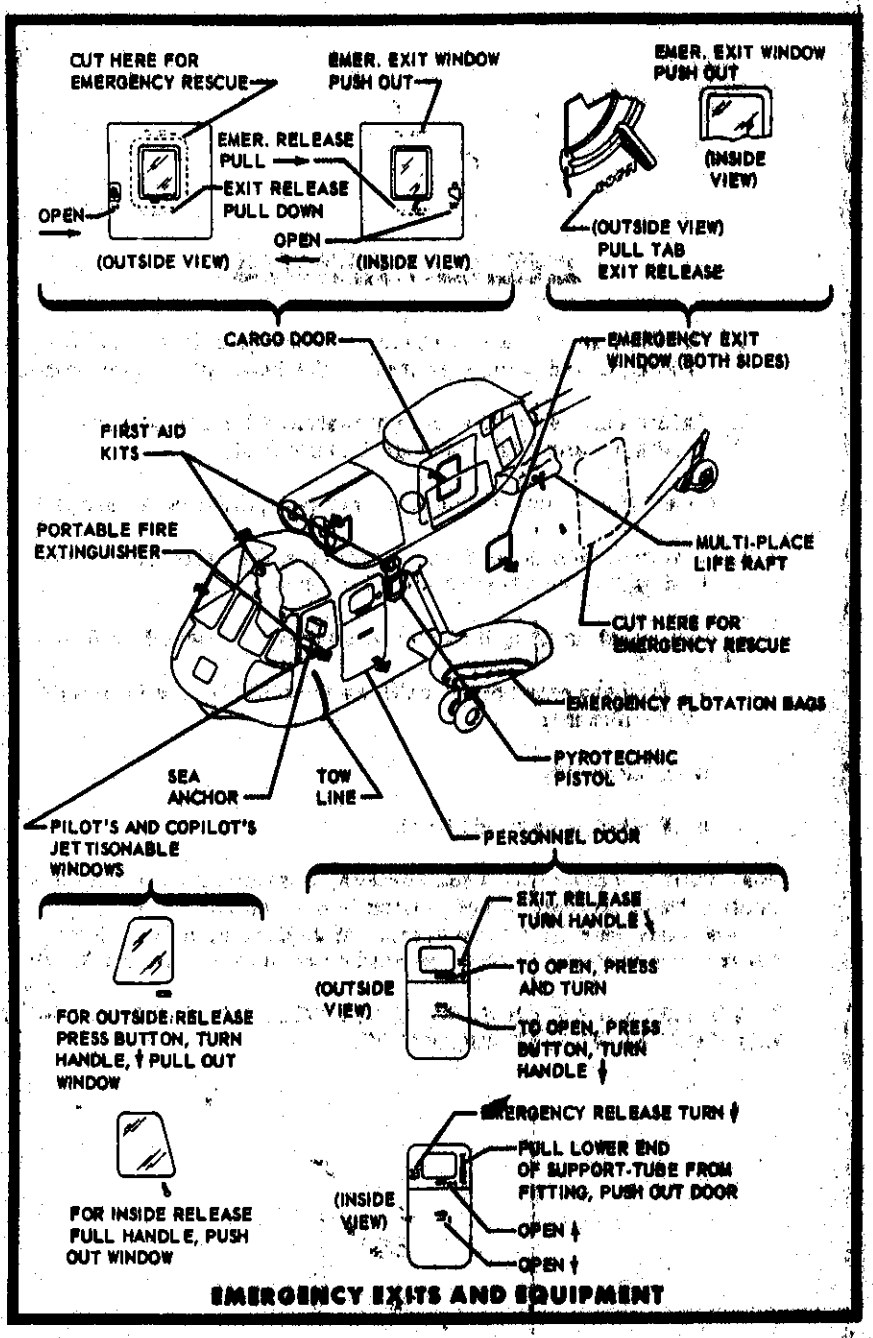


Figure 2-17. Emergency Exits and Equipment