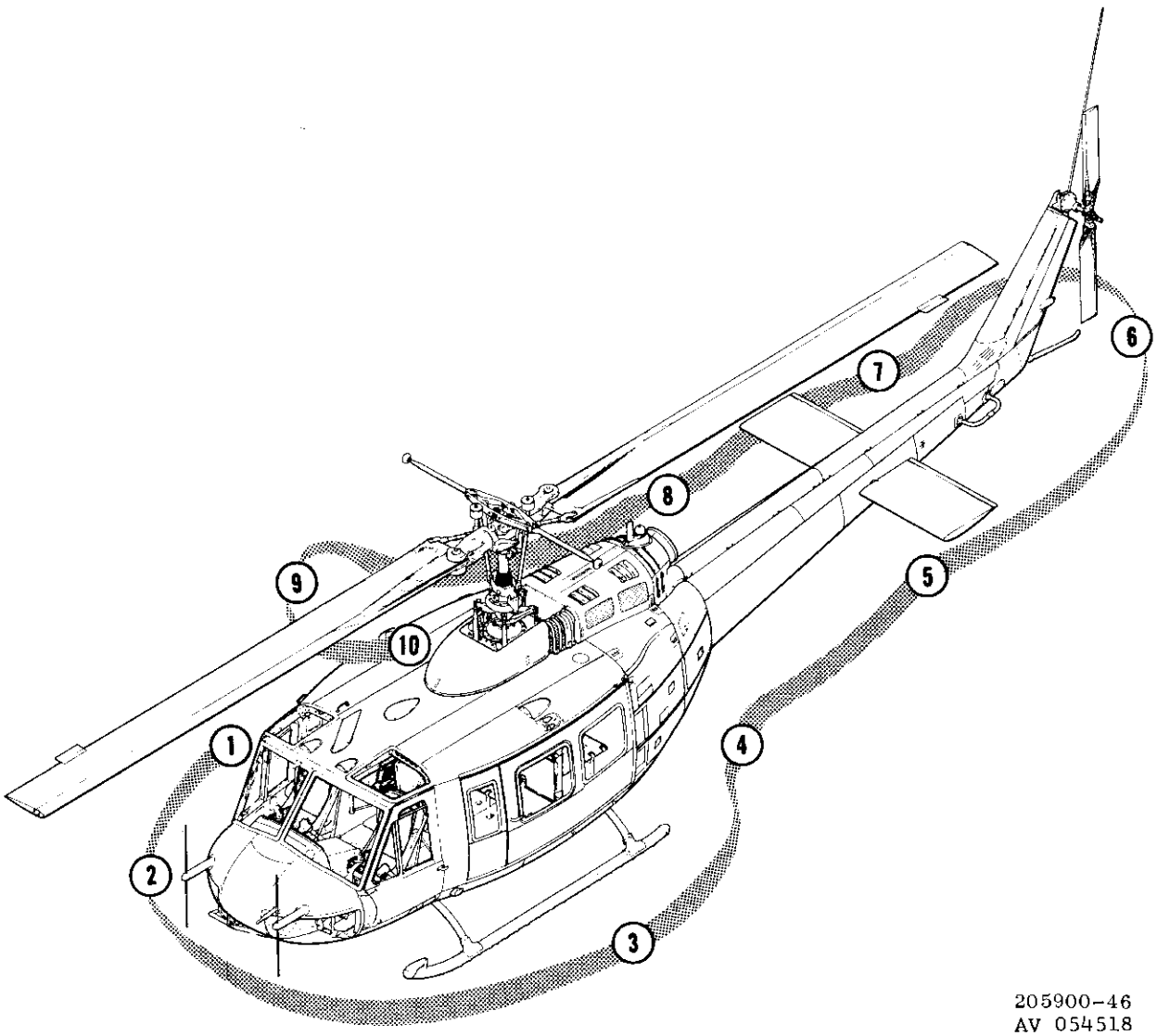


Figure 3-1. Exterior check diagram

3-23. AFT FUSELAGE (TAIL BOOM - RIGHT SIDE AREA 7.

1. Tail Rotor Gearbox (90° and 42°) - Condition and oil levels.

2. Antenna - Condition and security.

3. Synchronized Elevator - Condition.

4. Aft Fuselage - Check general condition.

3-24. FUSELAGE - AFT CABIN RIGHT SIDE AREA 8.

1. Oil Cooling Fan Compartment - Check.

2. Baggage Compartment - Check.

3. Engine and Transmission Deck - Check for fuel and oil leaks; secure cowling.

4. Oil Level - Check and cap secure.

(O) 5. Hydraulic Fluid - Check level.

6. Access Doors - Secured for flight.

3-25. FUSELAGE - CABIN RIGHT SIDE AREA 9.

1. Navigation Lights - Condition and security.

(O) 2. Hydraulic Fluid - Check level.

3. Entrance Doors - Condition and security.

4. Landing Gear and Skid Shoes - Condition ground-handling wheels removed.

(O) 5. Pitot-Static Port - Foree of obstruction.

3-26. CABIN TOP - AREA 10.

1. Main Rotor System - Check condition, cleanliness, and security; visually check level of damper fluid, blade grip, and pillow block.

2. Transmission and Hydraulic Filler cap - Secure.

3. Engine Short Shaft - Condition and security.

4. Engine Air Intake - Clean and free from obstruction.

5. Antennas - Condition and Security.

6. Anticollision Light - Security and condition.

7. Engine and Transmission Cowling - Secured.

8. Cabin Top Ventilators - Unobstructed.

3-27. INTERIOR CHECK - CARGO COMPARTMENT.

(N) 1. Battery Switch - ON.

(N) 2. Dome Lights - Check operation.

3. Fire Extinguisher - Check for charge and security.

4. Cargo - Check for proper loading and tiedown.

5. Passenger Seats - Check security.

6. First Aid Kits - Condition and secure.

7. Transmission Sight Gage - Check.

8. Electrical Outlets - Check condition.

10. Rotor Blade Tiedown, Pitot tube cover, and Tailpipe Cover - Stowed.

(N) 11. Dome Lights - OFF.

(N) 12. Battery Switch - OFF.

3-28. BEFORE STARTING ENGINE.

1. Entrance Doors - Secured for flight.

Caution

Cargo doors may be secured in full open position only if appropriate modifications have been made to the doors and airframe. If a cargo door comes open while in flight reduce forward speed below 60 knots and secure door.

2. Seat and Pedals - Adjust.

3. Seat Belt and Shoulder Harness - Fasten and tighten.

4. Shoulder Harness Lock - Check operation and leave unlocked.

5. Cyclic, Collective, and Throttle Friction - OFF.

6. Cyclic, Collective Pitch, and Pedals - Check travel, center cyclic, and pedals. Place collective pitch full down.

7. Landing light and Searchlight - OFF.

8. AC Circuit Breakers - In.

9. All Radio Equipment - OFF; Set on desired frequencies.

10. GOVernor - GOV AUTO.

11. DE-ICE - OFF.

12. INT AUX FUEL boost pump - OFF.

13. LOW RPM AUDIO - OFF or check, spring loaded.

14. MAIN FUEL - OFF.

(O) 15. START FUEL - OFF.

16. HYDraulic CONTROL switch - ON.

17. FORCE TRIM - ON.

18. CHIP DETector Switch - Spring loaded to BOTH.

19. Compass Slaving - IN (MAG HDG if applicable).

20. Instruments - Check static indications, slippage marks, and operating range limit markings.

21. Turn and Slip Indicator - Check race full of fluid.

22. Marker Beacon - OFF.

23. Clock - Wound and running.

24. Magnetic Compass - Check full of fluid and deviation card.

25. VSI's - Note indication.

26. Heading Indicators - Check RNI selector switch in ADF position, calibration card posted.

27. Altimeters - Set to field elevation.

28. Airspeed Indicators - Note Indication.

29. Free-Air Temp Gage - Check reading and condition.

30. STARTER GENerator switch - START.

31. NON-ESSential BUS - NORMAL ON.

32. VM Selector switch - BAT (check 24 volts on DC voltmeter), then to MAIN GEN if APU start.

33. MAIN GENerator switch - ON and cover down.

34. AC PHASE selector - AC phase.

35. INVTR switch - Off.

36. Instrument Lights - OFF (Set as desired for night flights).

37. DC Circuit Breakers - IN, except for armament and special equipment.

38. PITOT HTR - OFF.

39. DOME LT - OFF (except for night flight).

40. EXTernal LTS - off (FLASH for night flights as desired).

41. ANTI COLLision Light - OFF.

42. WIPERS - OFF.

Note

WIPERS must not be operated on dry windshield.

43. CARGO RELease switch - OFF.

44. Cabin Heating switches - OFF.

3-29. STARTING ENGINE.

1. BATtery switch - OFF. (ON for battery start).

2. Copilot's Attitude Indicator - Cage (for APU start only).

3. INVTR switch - SPARE. (OFF for battery start).

4. FIRE DETECTOR Light - TEST (15 seconds maximum).

5. RPM Warning Light - ON.

6. Fuel Filter and Cargo Release Lights - Press to test.

7. Fuel Gage Test Switch - If APU start, depress until fuel quantity drops approximately 200 pounds, then release and check that gage returns to original indication.

8. Caution Panel Warning Lights - TEST and RESET master caution light.

9. MAIN FUEL switch - ON. (Check fuel pressure (APU START).

(O) 10. START FUEL - ON.

11. GOVernor RPM INC-DEC Switch - DEC for 10 seconds.

12. Throttle - Check Full Travel and return to flight idle; check operation of engine idle stop, then move throttle to full closed; position the throttle as near as possible (on decrease side) of the flight idle stop.

(N) 13. DOME LT - OFF.

14. Fireguard - Posted.

15. Rotor Blades - Clear and untied - verbally announce "CLEAR".

16. Start Switch (Trigger) - and Hold; start time; use installed timing device.

Note

During a battery start a minimum of 24 volts should be indicated on the DC voltmeter before attempting start. However, a battery start can be made when voltages less than 24 volts are indicated, provided the indicated battery voltage does not drop below 14 volts with the starter energized.

Caution

Limit starter energize time to 40 seconds. If engine does not start, a 3-minute cooling period is required before beginning another starting cycle. Only three 40-second starting attempts are permissible in any 1-hour period.

(O) 17. Start Fuel - OFF at 400°C.

18. Release starter switch at 40% gas producer rpm or after 40 seconds, whichever occurs first.

Caution

During starting or acceleration, the maximum allowable EGT is 760°C. If EGT exceeds 760°C for any period of time, or 650°C (L-13-675°C) for more than 5 seconds, an entry in the 2408-13 is required. If during starting or acceleration it becomes apparent that EGT will exceed 650°C (L-13-675°) ABORT THE START as follows: throttle full off, fuel system off and continue to motor the starter until EGT decreases.

19. Copilot's Attitude Indicator (Battery Start)-Cage.

20. INVTR Switch (Battery start) - To SPARE.

21. Throttle - Slowly advance past engine idle stop to flight idle position. Manually check flight idle stop by attempting to roll throttle off.

22. Gas Producer - 56% to 58% (70% to 72% - L13).

Note

A slight rise in N_1 may be anticipated after releasing pressure on twist grip.

23. Engine oil pressure - 25 psi minimum.

24. Transmission Oil Pressure - Check normal.

Caution

If no oil pressure is evident at this time, shut engine down immediately and investigate the cause.

(N) 25. All Interior Lights - As desired.

26. Auxiliary Power Unit (APU start) - Disconnect.

Caution

Check external power disconnected prior to turning battery switch on.

27. Batter Switch (APU start) - ON.

28. Fuel Gage Test Switch (Battery Start) - Depress until fuel quantity gage drops approximately 200 pounds, then release and check that gage returns to original indication.

3-30. ENGINE RUNUP.

Caution

Full forward movement of cyclic may result in damage to short shaft.

1. FORCE TRIM switch - Check in ON position; press release button on cyclic stick to insure proper function; place switch in OFF position and check cyclic and anti-torque controls for freedom of movement and tippath plane for correlation with cyclic movement.

2. HYDraulic CONTrol Switch - Place in OFF position. Check controls for freedom of movement, insure that the collective pitch control is FULL DOWN; then place the switch in the ON position and position the FORCE TRIM switch ON.

3. ICS and Radios - ON as desired.

4. Helmet - ON.

5. FUEL SYSTEM AND DE-ICE - CHECK - FUEL TANK SUMP PUMP circuit breaker out; set CABIN HEAT bleed air selector to position No. 2 (ON if appl.). DE-ICE - ON, Note EGT increase, FUEL TANK SUMP PUMP circuit breaker in, air selector off, DE-ICE OFF. Note fuel pressure returns to normal and EGT decreases.

(I) 6. PITOT HTR switch - ON. Note loadmeter increase - then OFF.

7. AC PHASE selector - Check all phases for reading of 115 plus or minus 3V. Leave in BC.

8. INVTR Switch - To OFF position check for caution light indication. Switch to MAIN ON check caution light OFF.

9. AC PHASE SELECTOR - Check all phases for reading of 115 plus or minus 3; leave in the AC position.

10. Voltmeter Selector Switch. Check all positions for indication of 28 to 28.5 volts; (27 to 27.5 volts on standby position); leave in NON-ESSential BUS position.

11. Main Generator - To OFF Position; check caution light indication.

12. STARTER GENerator - To STBY-GEN position. Main generator loadmeter should indicate "zero" and standby generator loadmeter should indicate a load.

13. NON-ESS Bus Switch - Check voltmeter indication of "zero" with nonessential bus switch in NORMAL ON position; NON-ESS BUS switch to MANUAL ON, recheck 27 to 27.5 voltmeter reading; switch to NORMAL ON position.

14. VM selector switch - Check remaining positions for indication of 27 to 27.5 volts (28 to 28.5 on Main Gen); leave in MAIN GEN position.

15. MAIN GENerator - ON and guard closed.

16. Throttle - Slowly increase to full open. Engine rpm (N_2) should stabilize at 6000 plus or minum 50 rpm. Throttle friction as desired.

17. All engine and Transmission Instruments - Check for proper indication.

18. LOW RPM switch - AUDIO.

19. Governor RPM INC - DEC Switch - Actuate through full range 6000 to 6700 plus or minus 50 rpm. Set rpm at 6600. During governor INC-DEC check, observe low rpm audio and warning light OFF at 295 rotor rpm plus or minus 10 rpm.

(I) 20. Communication and Navigation Radios - Perform operational check of all radios and position to ON, as desired; set course selectors as desired.

21. Clock - Set.

(I) 22. Heading Indicator - Indicates plus and 0.

Note

Refer to Chapter 5 for preflight checks and free gyro mode operations.

(I) 23. MAG Compass - Corresponds with heading indicator.

(I) 24. Altimeter - Determine K-factor.

(I) 25. Attitude Indicator - Set as desired.

26. ANTICOLLision Light - As desired.

27. FORCED TRIM Switch - As desired for flight.

28. Collective Pitch Friction - Check; set as desired.

3-31. PRIOR TO INSTRUMENT TAKEOFF.

(I) 1. VSI, Altimeter - Indicates climb, descent.

(I) 2. Turn needles, heading indicator, and magnetic compass indicates a Turn to Right - Left.

(I) 3. Slip Indicator - Ball free in race.

(I) 4. Attitude Indicator - Indicates nose high, nose low, bank left, right.

(I) 5. Airspeed Indicator - Note indicator.

(I) 6. ENGine and TRANSmission Instruments - In green.

(I) 7. ENGine RPM - As desired.

(I) 8. Torque - Note Psi for hover.

(I) 9. Index over takeoff heading - Set heading.

(I) 10. PITOT HEAT - ON, if necessary.

3-32. BEFORE TAKEOFF.

3-33. Immediately prior to takeoff, the following checks will be accomplished and announced orally.

1. Rpm.
2. Fuel Quantity.
3. Instruments.
4. Caution Lights.
5. Low rpm audio warning Switch - AUDIO.

Warning

Suspend operations immediately if engine or transmission oil pressure and temperature are not within operating limits.

6. Bleed air switch - OFF.

Caution

The bleed air heater should be in the OFF position during takeoff and landing and other flight conditions requiring maximum engine power available.

3-34. BEFORE LANDING.

3-35. On downwind or prior to landing if no downwind is established, the following pre-landing checks will be accomplished and announced orally:

1. Rpm.

2. Fuel Quantity.

3. Instruments.

4. Caution lights.

5. Low rpm audio warning switch - AUDIO.

3-36. ENGINE SHUTDOWN.

1. Collective pitch - FULL DOWN.

2. GOVernor RPM - INC-DEC Switch - Decrease to lowest rpm.

3. Throttle - Reduce to Flight Idle. Check N_1 speed 56% to 58%. (70% to 72%, L-13).

4. LOW RPM audio - OFF after checking operation.

5. FORCE TRIM - ON.

6. STARTER-GENerator Switch - START position.

(N) 7. EXTernal Lights - FLASHING.

8. ANTICOLLision Light - OFF.

9. Exhaust Gas Temp - Allow to stabilize (minimum of 2 minutes).

Caution

If a rapid rise in EGT is noted, motor the engine (throttle closed) to allow temperature to stabilize within limits.

10. Throttle - Full Off.

11. Main Fuel Switch - OFF.

12. Radios and ICS - OFF.

13. All Electrical Switches - OFF except main generator and battery.

(N) 14. Navigation Lights - OFF, after rotor is tied down.

15. Battery - OFF, after engine tachometer reads "zero". (Night, after NAV lights are turned OFF.)

16. Main Rotor Blades - Tie down.

17. Conduct a thorough walk around inspection of the aircraft. (Check oil levels and check for visible leaks.)

18. Complete DA form 2408-12 and -13.

3-37. TAKE-OFF AND CLIMB PROCEDURES UH-1D ONLY.

Note

Pre-takeoff check will include determining if power is available for takeoff by utilizing the GO-NO-GO takeoff data placard. (Figure 3-2, and checking the area for other aircraft.)

Note

The basic power instrument is the N_1 tachometer. In addition to the power required to hover at two feet, at 3 percent reserve N_1 is required to climb out of a confined area. Therefore, if the engine maximum is 96.5 percent, takeoff from a confined area should not be attempted when the two-foot hover power requirement is more than 93.5 percent. Maximum N_1 decrease substantially as ambient temperature increases (temperature bias effect).

1. Takeoff From a Confined Area. To determine if sufficient power is available to safely execute a takeoff from a confined area, the following procedures apply:

(a) Check the percent of N_1 required to maintain a stabilized two foot hover.

(b) Check the outside air temperature (OAT)

(c) Relate hover power and OAT to the GO-NO-GO placard.

(d) If the percent N_1 required to hover at two feet does not exceed that listed on the placard for that OAT, the aircraft has sufficient power for exiting a confined area. (NOTE below applies.)

2. Normal Takeoff. To determine if sufficient power is available for a normal takeoff, the procedures are as follows:

(a) Check the percent N_1 required to maintain a stabilized two foot hover.

(b) Check the outside air temperature (OAT).

(c) Relate hover power and OAT to the GO-NO-GO placard.

(d) If the percent N_1 required to hover does not exceed that listed on the placard for the appropriate OAT by more than 1 percent the aircraft has sufficient power to execute a normal takeoff (NOTE below applies).

Note

If the OAT falls between the OAT's listed on the GO-NO-GO placard, read the percent N_1 corresponding to the next higher temperature. DO NOT INTERPOLATE. If the percent N_1 required to hover at two feet does not meet the criteria established in paragraphs 1d and 2d above, the load must be reduced (0.25 percent N_1 equals 100 pounds).

3-38. NORMAL TAKE-OFF TO HOVER.

3-39. The normal vertical take-off is the most common type of take-off, and should be used whenever possible. Normal vertical take-off can be accomplished at moderate altitude and with normal gross weights as shown in the Take-Off Distance Chart, Chapter 14. In this type take-off, the safety factor is high as the helicopter is lifted from ground vertically to a height of approximately three feet where the flight controls and engine may be checked for normal operation before continuing to climb. A normal vertical take-off is made in the following manner. Increase throttle to full open with the collective pitch full down. Select desired rpm with INCrease-DECRease switch. Place cyclic control in the neutral position. Increase collective pitch control slowly and smoothly until hovering altitude of approximately three feet is reached. Apply antitorque pedal to maintain heading as collective is increased. As the helicopter breaks ground, make minor corrections with cyclic control to insure vertical ascent, and apply tail rotor pedals to maintain heading.

3-40. NORMAL TAKE-OFF FROM HOVER.

3-41. Hover briefly to determine if engine and flight controls are operating properly. From a normal hover at approximately three feet altitude, apply forward cyclic pressure to accelerate smooth into effective translational lift; maintain hovering altitude with collective pitch and maintain heading with tail rotor control pedals, until effective translational lift has been obtained and the ascent has begun. Smoothly apply cyclic to attain an attitude that will result in an increase of airspeed to climb speed (60 knots). Adjust power as required to establish the desired rate of climb. Stabilize airspeed and torque pressure as soon as a smooth rate of acceleration will permit.

3-42. NORMAL TAKE-OFF FROM THE GROUND.

3-43. Place cyclic control slightly forward of neutral. Simultaneously increase collective pitch, maintaining directional control with anti-torque pedals. As the aircraft leaves the ground, accelerate forward at the minimum altitude commensurate with terrain and obstacles until effective translational lift is attained. Smoothly apply cyclic to attain an attitude that will result in an increase of airspeed to 60 knots. Adjust power as required to establish the desired rate of climb. Stabilize airspeed and torque pressure as quickly as the smooth rate of acceleration will permit. On the takeoff leg below 50 feet, wind drift correction will be made by slipping the helicopter into the wind; above 50 feet, wind drift correction will be accomplished by crabbing the helicopter into the wind.

3-44. MAXIMUM PERFORMANCE TAKE-OFF.

3-45. Place cyclic-control in neutral position. With throttle full open, increase collective pitch smoothly. As the helicopter leaves the ground, continue increasing power to maximum available torque pressure (not to exceed red line) and assume at least a 40 knot airspeed attitude. As power is increased, maintain heading by smoothly coordinating directional pedals. When sufficient altitude for obstacle clearance is obtained, smoothly increase airspeed and reduce power to establish a normal climb.

3-46. CROSSWIND TAKE-OFF.

3-47. In the event a crosswind take-off is required, normal take-off procedures are used. As the helicopter leaves the ground, there will be a definite tendency to drift downwind. This tendency can be corrected by holding cyclic into the wind to prevent downwind drift. When a crosswind take-off is accomplished, turn the helicopter into the wind for climb as soon as obstacles are cleared and terrain permits, if possible.

3-48. AFTER TAKE-OFF.

3-49. As the helicopter accelerates from hovering flight to flight in any direction, it passes through a transitional period. If engine power, rpm, and collective pitch are held constant in calm air, a momentary settling will be noted when the cyclic control stick is moved forward to obtain forward speed. This momentary settling condition is a result of the helicopter's moving from the ground cushion and the tilting of the tip-path plane of rotation of the main rotor blades to obtain forward airspeed. Wind velocity at the time of take-off will partially eliminate this settling due to the increased airflow over the main rotor blades. As wind velocity increases, this settling will be less pronounced. After the helicopter accelerates forward to 10 to 15 knots airspeed, less power is required to sustain flight due to an increase in aerodynamic efficiency as airspeed is increased to best climbing speed. Take-off power should be maintained until a safe autorotative airspeed is attained, then power may be adjusted to establish the desired rate of climb.

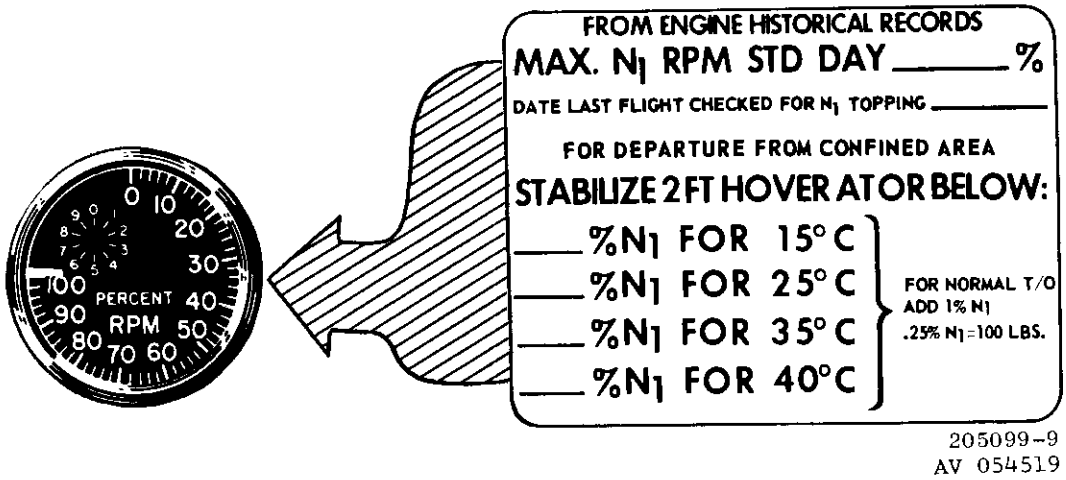


Figure 3-2. Go-No-Go take-off data placard - UH-1D only

3-50. CLIMB.

3-51. During climbs at low altitude, a safe autorotative speed should be maintained so that in event of engine failure, sufficient but not excessive speed is available to accomplish a safe autorotative landing. Airspeeds to avoid at low altitudes are shown in figure 7-4. If necessary to clear ground obstructions after take-off, vertical climb can be accomplished; however, operation within red area of figure 7-4 should be held to a minimum. Airspeed and attitude are controlled with the cyclic. Collective pitch is used to adjust torque pressure to establish the desired rate of climb. Anti-torque pedals are coordinated with power changes to maintain constant heading.

3-52. CRUISE CHECKS.

3-53. Instruments should be monitored constantly, in order to be cognizant of any change in performance or conditions. Normal engine operating range is 6400-6600 rpm.

3-54. FLIGHT CHARACTERISTICS.

3-55. The helicopter is capable of delivering a maximum thrust commensurate with rotor-engine limitations and the density altitude in which it is operating. Maximum thrust can be utilized to obtain maximum airspeed, optimum rate of climb or, at some reduced airspeed, the maximum maneuver potentiality. The capabilities of the helicopter may be employed within maximum limitations and in accordance with the environment under which operated. The capabilities of the helicopter in stabilized flight conditions are clearly and accurately defined in Chapter 8 and Chapter 14.

3-56. APPROACH AND LANDING PROCEDURES.

3-57. Before approach and landing are accomplished, the pilot should evaluate the landing site for suitability of usable area. Evaluate terrain, check wind direction, velocity and consistency. The gross weight of the helicopter must be considered; and the final step in evaluation of a landing is the anticipated helicopter performance during landing and subsequent take-off.

3-57. NORMAL APPROACH.

3-58. Entry airspeed is normally 60 knots. When an 8 to 10 degree approach angle is intercepted, decrease collective pitch as required to establish and maintain the desired angle of descent. Maintain entry airspeed until such time as apparent groundspeed and rate of closure appear to be increasing. From this point, progressively decrease the rate of descent and forward speed to stop both descent and forward movement at a 3-foot hover over the intended landing spot. As forward speed is gradually reduced, apply additional power to compensate for the decrease in translational lift and to maintain the proper angle of descent. To continue to the ground, proceed as above, except that the descent is continued to the ground. Make the touchdown with zero groundspeed. Avoid either hard or excessively tail low touchdown. Smoothly reduce collective pitch to minimum setting. Apply cyclic as necessary to level the rotor system.

3-59. STEEP APPROACH.

3-60. Entry airspeed is normally 60 knots. Initiate the steep approach as in the normal approach, maintaining a 12 to 15 degree angle of descent. (To initiate the descent, a greater reduction of collective pitch is usually required at the beginning of the approach.)

Correct for deviations from the desired line of descent by proper application of collective pitch. Maintain the entry airspeed until such time as apparent groundspeed and rate of closure appear to be increasing. From this point, progressively decrease the rate of descent and forward speed to stop both descent and forward movement at the intended landing spot. As forward speed is gradually reduced, apply additional power to compensate for the decrease in translational lift and to maintain the proper angle of descent. Terminate the steep approach at a hover or to the ground in the same manner as the normal approach.

Note

Due to the time interval between instant when power is requested and when power is available (lag) in turbine engines, acceleration from flight idle to normal operating rpm requires approximately eight to ten seconds. Of the eight to ten seconds, four to five seconds are allowed to compensate for pilot reaction time and effects due to altitude and temperature. The other four to five seconds are due to the inherent turbine engine lag. The total lag could possibly be in excess of ten seconds, depending on how far the pilot as allowed nI and nII speeds to drop.

3-61. NORMAL LANDING FROM A HOVER. (Figure 3-3.)

3-62. With the engine rpm at 6600, decrease collective pitch to effect a constant, smooth rate of descent until touchdown, making necessary corrections with pedals and cyclic control to maintain level attitude and constant heading and to prevent movement over the ground. Upon contact with the ground, continue to decrease collective pitch smoothly and steadily until the entire weight of the helicopter is resting on the ground.

3-63. SLOPE OPERATIONS.

3-64. Make the slope landing by heading the helicopter generally cross-slope. Descend slowly, placing the unslope skid on the ground first. Coordinate reduction of collective pitch with lateral cyclic (into the slope) until the downslope skid touches the ground. Continue coordinating reduction of the collective pitch and application of cyclic into the slope until all the weight of the aircraft is resting firmly on the slope, If the cyclic control contacts the stop before the downslope skid is resting firmly on the ground, return to a hover and select a position where the degree of slope is not so great. After completion of a slope landing and after determining that the aircraft will maintain its position on the slope, place the cyclic in the neutral position.

Note

The cyclic is placed in the neutral position after landing to allow safe "head clearance" on the unslope side of the helicopter.

3-65. The takeoff technique is the reverse of the landing technique. Apply lateral cyclic control into the slope. Apply collective pitch to raise the downslope skid first. Coordinate lateral cyclic control and collective pitch to bring the helicopter to a level attitude with the upslope skid still on the ground. After attaining a level attitude, continue increasing collective pitch to bring the aircraft to a hover. Maintain directional control throughout the maneuver with anti-torque pedals.

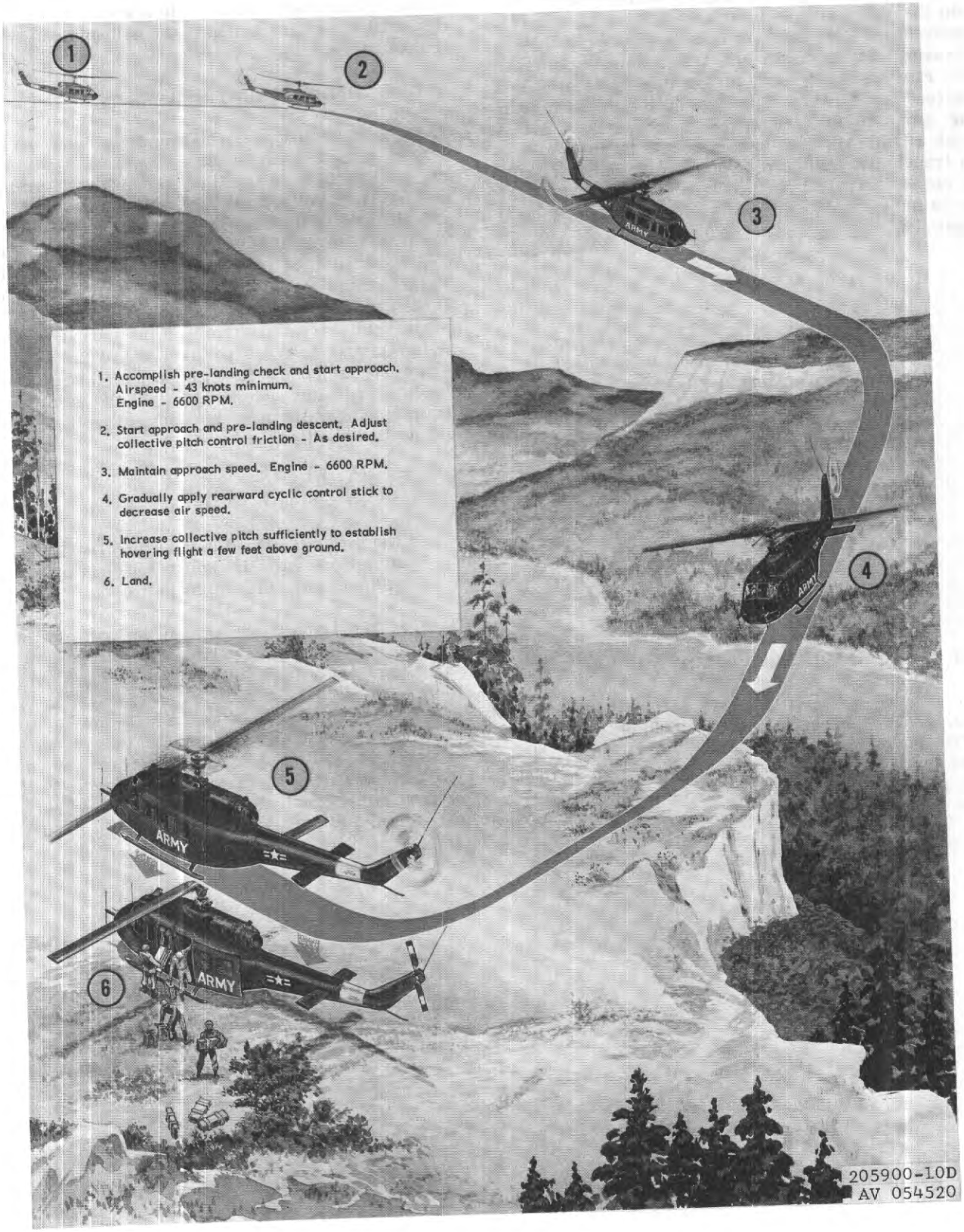


Figure 3-3. Normal approach and landing - power on

CHAPTER 4

EMERGENCY PROCEDURES

SECTION I SCOPE

4-1. GENERAL.

4-2. This chapter sets forth the procedure to be followed in meeting any emergency (except those concerning avionics and auxiliary equipment) that may reasonably be expected to occur.

4-3. Emergency operation of auxiliary equipment is contained in the chapter insofar as its use affects safety of flight. Detailed descriptions of this equipment are given in Chapter 6.

4-4. Emergency procedures are given in checklist form when applicable. A condensed version of these procedures is contained in the condensed checklist Technical Manual TM 55-1520-210CL.

SECTION II ENGINE

4-5. ENGINE FAILURE.

4-6. The two conditions most likely to affect successful autorotational landings in the event of power loss or engine failure are the altitude and airspeed at which the helicopter is operating at the time of failure. The main symptoms of either a partial power loss or complete engine failure are a sudden reduction in engine noise, a sudden drop in engine and rotor rpm, a left yaw resulting from the reduction in engine torque and the total or partial lack of response to throttle movements. When a loss of engine power is detected, it is necessary to decrease the collective pitch and apply right rudder pedal immediately in order to avoid a reduction in rotor rpm and to maintain a constant heading. Under partial power conditions the engine may operate relatively smoothly at reduced power or it may operate roughly and erratically with intermittent surges of power. In instances where a power loss is experienced without accompanying engine roughness or surging, the helicopter may sometimes be flown in a gradual descent at reduced power to a favorable landing area; however, under these conditions the pilot should always be prepared for a complete power failure and an immediate autorotative landing. In the event that a partial power condition is accompanied by engine roughness, erratic operation or power surging, take immediate action by closing the throttle completely and perform an autorotational landing to the nearest possible landing area.

Warning

To prevent a sudden and hazardous yaw in case the engine should recover power, maintain throttle in the fully closed position during the autorotational landing. If conditions permit, the master switch and fuel shut-off valve should be turned OFF prior to the final stages of the autorotative landing.

Warning

Lag in acceleration may cause pilot to overestimate immediate power available for accomplishing a change from one phase to another phase during flight.

Note

Due to the time interval when power is requested and when power is available (lag) in turbine engines, acceleration from flight idle to normal operating rpm requires approximately eight to ten seconds. Of the eight to ten seconds, four to five seconds are allowed to compensate for pilot reaction time and effects due to altitude and temperature. The other four to five seconds are due to the inherent turbine engine lag. The total lag could possibly be in excess of ten seconds, depending on how far the pilot has allowed nI and nII speed to drop.

4-7. ENGINE FAILURE DURING TAKE-OFF.

4-8. The energy stored within the rotor system at normal operating rpm is sufficient to prevent a hard landing and can be utilized by use of the following procedure:

Warning

Reduced engine noise levels in turbine powered helicopter delays detection of, and corrective action for, an engine failure. This results in rapid decay of rotor rpm.

Warning

If collective pitch is increased prematurely when the engine fails, a loss in altitude will be delayed and result in insufficient rotor rpm and control. Without adequate rpm and control, it will be impossible to cushion the landing.

1. Maintain collective pitch as helicopter settles.

2. Adjust cyclic for a vertical descent to the landing point.

3. Maintain heading with anti-torque pedals.

4. Prior to ground contact INCREASE collective pitch to cushion landing.

5. BAT switch - OFF.

6. Main fuel - OFF.

Caution

Do not restart engine until cause of engine failure has been determined and corrected.

4-9. ENGINE FAILURE AT LOW ALTITUDE - LOW AIRSPEED.

Warning

Do not attempt to lower the nose or gain airspeed for reduced rate of descent if failure occurs at low altitude.

1. Reduce collective pitch sufficiently to maintain rotor rpm and establish autorotation.

2. Maintain directional control and desired heading to best available area with cyclic and anti-torque pedals.

3. If altitude permits, turn off switches and fuel.

Note

If airspeed is 45 knots or below at time of engine failure, it will probably be best to maintain the pitch attitude present at the time of failure in order to execute timely deceleration prior to touchdown. If airspeed is above 45 knots, a slightly higher attitude may be used to facilitate deceleration and/or decrease glide distance. It will also assist in maintaining main rotor rpm. If altitude permits, the same procedures outlined in paragraph 4-10 with regard to airspeed ranges and changes are applicable.

4. Allow helicopter to settle to appoximately 10 to 15 feet, then apply sufficient initial pitch to break the descent and further assist in decelerating forward speed.

5. As the helicopter settles, use remaining pitch to cushion touchdown in a level attitude.

6. Battery switch - OFF.

7. Main fuel - OFF.

4-10. ENGINE FAILURE DURING FLIGHT. (See figure 4-1.)

4-11. If engine failure occurs in flight, proceed as follows:

Warning

When high-low warning light illuminates and audio signal buzzes, execute engine failure procedure; cross reference engine instruments. If engine instruments show normal indications, a malfunction other than engine failure is apparent.

Note

Rotor rpm will tend to overspeed in autorotation at high gross weights or when maneuvering. High rotor rpm may be kept within limits by judicial use of collective control.

1. Collective pitch - Reduce as required to maintain rotor rpm within limits.

2. Establish autorotational glide with airspeed 60 knots or as required to make forced landing area.

3. Select forced landing area.

4. If time permits, make radio call. Turn OFF switches and fuel.

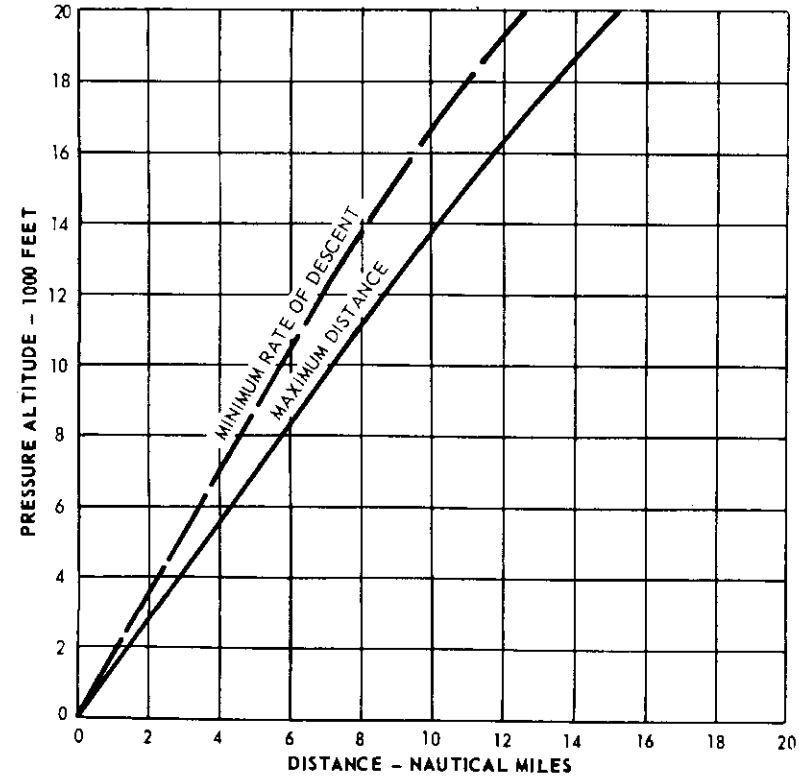
5. Shoulder Harness - Lock.

6. Decelerating attitude - As required to make area and slow rate of descent and forward speed.

7. Collective pitch - Cushion landing.

Caution

After landing, do not restart engine until cause of failure has been determined and corrected.



UH-1D
MAXIMUM GLIDE DISTANCE, POWER OFF

AVERAGE G.W. = 7100 LB.

ROTOR RPM 294

REFERENCE: FTC-TDR-64-27

NOTE

(1.) Autorotational descent performance is a function of airspeed and essentially unaffected by density altitude and gross weight.

(2.) The speed for best glide distance is R-99, N-84 knots IAS.

(3.) The speed for minimum rate of descent is R-64, N-53 knots IAS.

R — Roof-mounted pitot tube
N — Nose-mounted pitot tube

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Figure 4-1. Maximum glide distance - power off

4-12. MINIMUM RATE OF DESCENT.

4-13. The power-off minimum rate of descent is obtained by maintaining an indicated airspeed of approximately 64 (roof-mounted pitot) or 53 (nose-mounted pitot) knots, and rotor rpm of approximately 300.

4-14. MAXIMUM GLIDE.

4-15. Maximum gliding distance is obtained by an indicated airspeed of 99 (roof-mounted) or 84 (nose-mounted pitot) knots and rotor rpm of approximately 300.

4-16. ENGINE RESTART DURING FLIGHT.

4-17. The condition which would warrant an attempt to restart the engine would probably be an engine flame-out caused by a malfunction of the fuel control unit or failure of the boost pump(s). The decision to attempt an engine restart during flight is the pilot's responsibility and is dependent upon pilot's experience and the operating altitude. If an engine restart is to be attempted, proceed as follows:

Caution

When cause of engine failure is obviously mechanical DO NOT attempt an engine restart.

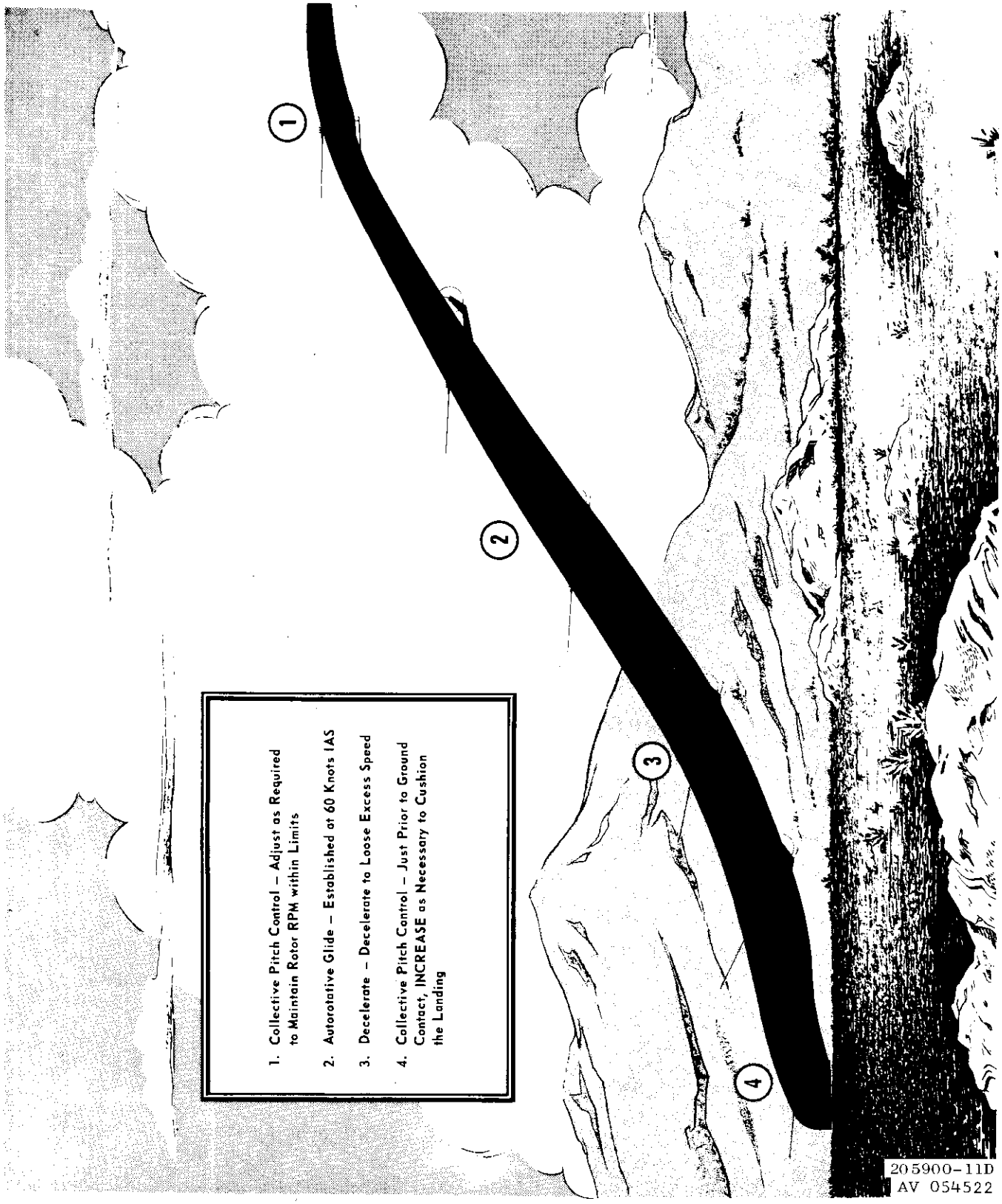


Figure 4-2. Approach and landing - power off

1. Establish autorotational glide.

2. Select forced landing area.

3. Governor switch - EMERGENCY.

4. Attempt start.

5. Throttle - Open slowly to maintain desired rpm.

4-18. EMERGENCY STARTING PROCEDURE.

Caution

If normal starting procedures result in an aborted start due to it becoming apparent that EGT will exceed 650°C (L-13, 675°C), proceed as for a normal start except as follows:

1. Throttle Closed.

2. Engine Fuel Control/Governor switch-EMERgency.

3. Energize starter, start clock (start-fuel flow and ignition occur similtaneously).

Note

Check D.C. voltmeter; if voltage drops below 14 volts, abort start. (Battery start only.)

4. When N_1 speed passes through 8 percent, open throttle slowly and advance to FLIGHT IDLE position as start progresses.

Note

Monitor EGT to avoid exceeding maximum allowable limits.

5. Release starter switch at 40 percent N_1 or after 40 seconds, whichever occurs first.

Note

When operating in emergency fuel control mode, always advance and retard throttle slowly and monitor EGT in order to avoid overtemp or flameout.

6. Engine Fuel Control/Governor Switch - AUTOmatic when N_1 speed is stabilized.

SECTION III ROTORS, TRANSMISSIONS, AND DRIVE SYSTEMS

4-19. TAIL ROTOR MALFUNCTION IN FLIGHT.

Warning

The key to a pilot's successful handling of a tail rotor emergency lies in his ability to quickly analyze and determine the type malfunction that has occurred and to select the proper emergency procedure. Following is a discussion of some types of tail rotor malfunction and their probable effects.

1. General Discussion. A common tendency amoung helicopter pilots is to attempt to lump all types of tail rotor malfunction, and the corrective actions therefor, into a single category with a single solution. This is definitely not correct and any attempt to propose a single solution (emergency procedure) for all types of anti-torque malfunction could prove disastrous.

(a) COMPLETE LOSS OF TAIL ROTOR THRUST. This is a situation involving a break in the drive system, such as severed drive shaft, wherein the tail rotor stops turning and no thrust whatsoever is delivered by the tail rotor. A failure of this type will always result in the nose of the helicopter swinging to the right (left sideslip) and a left roll of the fuselage along the horizontal axis. It is likely that powered flight to a suitable area and execution of an autorotative approach is the proper emergency procedure.

(1) IN POWERED FLIGHT the degree of sideslip and the degree of roll may be varied by changing airspeed and by varying power (throttle or pitch), but neither can be eliminated. Below an airspeed of approximately 30 to 40 knots, the sideslip angle may become uncontrollable and the tail or the aircraft begins to revolve on its vertical axis.

(2) IN POWER-OFF FLIGHT (AUTOROTATION), the sideslip angle and the roll angle can be almost completely eliminated by maintaining an airspeed of 40 to 70 knots. When airspeed is decreased through approximately 20 to 30 knots, streamlining effect is greatly reduced and the sideslip angle may become uncontrollable. Upon pitch application at touchdown, the fuselage will tend to turn in the same direction the main rotor is turning (nose of helicopter swings left, opposite torque effect) due to an increase of friction in the transmission system.

(b) FIXED PITCH SETTING. This is a malfunction involving a loss of control resulting in a fixed pitch setting, such as a severed control cable. Normally under these circumstances the directional pitch

setting that is in the tail rotor at the time the cable is severed will, to some degree, remain in the tail rotor system. Whether the nose of helicopter yaws left or right is dependent upon the amount of pedal (which is related to power) applied at the time the cable is severed. Regardless of pedal setting at the time of malfunction, a varying amount of tail rotor thrust will be delivered at all times during flight.

(1) IF THE TAIL ROTOR PITCH BECOMES FIXED DURING AN APPROACH OR OTHER REDUCED POWER STITUATION (RIGHT PEDAL APPLIED), the nose of helicopter will swing right when power is applied, possibly to an even greater degree than would be experienced with complete loss of tail rotor thrust, and the overall situation may be even more hazardous. The best solution may not be to autorotate immediately. Whether a successful autorotation could be accomplished is not certain, and is dependent upon the amount of pitch applied at the time of malfunction.

(2) IF THE TAIL ROTOR PITCH BECOMES FIXED DURING A TAKEOFF OR OTHER INCREASED POWER SITUATION (LEFT PEDAL APPLIED), the nose of helicopter will swing left when power is reduced (as in leveling off with cruise power). This switch to the left upon power reduction will probably be to a greater degree than the left swing encountered in a lower powered situation. Under these circumstances, it appears that powered flight to an airfield and powered landing could be accomplished with little difficulty since the sideslip angle will probably be corrected when power is applied for touchdown. However, upon decreasing power to initiate the approach at destination the sideslip angle will increase and remain so increased during the approach, but should be corrected when touchdown power is applied. Due to sideslip increase upon reduction of power to initiate the approach, a higher than normal approach speed may be beneficial. In this instance, powered landing may be the best solution; it is likely that autorotation could not be accomplished at all.

(3) IF THE TAIL ROTOR PITCH BECOMES FIXED DURING NORMAL CRUISE POWER SETTINGS, the helicopter reaction should not be so violent as in the previously described situations and, at speeds from 40 to 70 knots, the tail pylon should streamline with very little, if any, sideslip or roll angle. In this instance, autorotation may aggravate the situation because a reduction of power (torque) may then result in a right sideslip. It must be considered, however, that an increase in power at touchdown will result in a left sideslip if powered approach is used, although this sideslip should not be of a hazardous magnitude for touchdown.

(c) Loss of the tail boom or portion thereof. The gravity of this situation is dependent upon the amount of weight lost. If the loss is small, such as "aft of the 90 degree gear box", the situation should be quite similar to "complete loss of tail rotor thrust." If more than that is lost, immediate autorotation may be the only solution of possible value.

2. Emergency Procedure For In-Flight Anti-torque Malfunction.

(a) The pilot should immediately analyze the existing emergency to best of his ability before taking further action.

(b) If the situation (altitude) permits, a change in collective pitch (power) may be attempted as an aid in gaining maximum possible control (trim) of the helicopter under existing circumstances. Rolling off power (throttle) may not be necessary at this time. The courses of action available will normally be:

(1) Autorotate immediately to a secure and improved landing area, if such area is available. This should be accomplished where possible under most circumstances, except as described in paragraph 2(b) (3) below. The autorotative technique to be used is described in paragraph 2 b (2) below.

(2) If a safe landing area is not immediately available, continue powered flight to a suitable landing are by gradually applying power to assume a level powered flight attitude with an airspeed dictated by the limitations of the emergency condition. This airspeed should be that which is most comfortable to the pilot (between 40 and 70 knots) indicated. When the landing area is reached, make a full autorotative landing, securing the engine (SWITCHES OFF) when the landing area is assured. During the descent, an indicated 70 knots airspeed should be maintained and turns kept to an absolute minimum. If the landing area is a level, paved surface, a run-on landing with a touchdown airspeed between 15 and 25 knots should be accomplished. If the field is unprepared, start to flare from about 75 feet altitude, holding so that forward groundspeed is at a minimum when the helicopter reaches 10 to 20 feet; execute the touchdown with a rapid collective pull just prior to touchdown in a level attitude with minimum ground roll (zero, is possible).

(3) If the pilot has destermined that the tail rotor pitch is fixed in a "left pedal applied" position (tail rotor delivering thrust to the left) autorotative landing should not be attempted. The pilot should return to powered level flight at a comfortable airspeed which will be dictated by the degree of sideslip and roll; continue powered flight to the nearest improved landing area, and execute a running landing with power and a touchdown speed between 20 and 30 knots. In this approach, the sideslip angle will be corrected, to some degree, when power is applied to cushion the touchdown. However, upon decreasing power to initiate the approach to the landing area, the sideslip angle will increase for the duration of

the approach, but should be corrected when touchdown power is applied. "Left pedal applied", while at a hover, gradually reduce pitch to accomplish a powered touchdown.

4-20. TAIL ROTOR FAILURE DURING TAKE-OFF.

4-21. Close throttle immediately and accomplish an autorotational landing.

4-22. TAIL ROTOR FAILURE WHILE HOVERING BELOW 10 FEET.

4-23. Close throttle immediately and accomplish an autorotational landing.

4-24. LOSS OF ENGINE/TRANSMISSION OIL PRESSURE OR EXCESSIVE ENGINE/TRANSMISSION OIL TEMPERATURE.

4-25. The loss of engine/transmission oilpressure will be indicated by a drop or loss of pressure on the engine or transmission oil gage and/or the illumination of the caution panel light marked "XMSN OIL PRESS" and/or "ENG OIL PRESS". Excessive transmission oil temperature will be indicated on the transmission oil temperature gage and/or the illumination of the caution panel light marked "XMSN OIL HOT". Excessive engine oil temperature will be indicated on the engine oil temperature gage. Should any of these indications occur, proceed as follows:

1. Accomplish a normal landing at the nearest safe landing area (open field, etc.).

2. Do not continue until the cause has been determined and corrective action taken.

SECTION IV FIRE

4-26. ENGINE FIRE DURING STARTING - INTERNAL.

4-27. Internal fire (hot start) may be caused by overloading of fuel in the combustion chamber. It may be detected by flames emitting from the tailpipe or by excessive EGT readings. To extinguish the fire-proceed as follows:

1. Continue to depress starter switch and roll throttle closed.

2. Throttle - Close.

3. Start fuel - Off.

4. Main fuel - Off.

5. As EGT decreases to normal, complete shutdown and record limit and duration of hot start on DA Form 2408-13.

4-28. ENGINE FIRE DURING STARTING - EXTERNAL.

4-29. External fire can be detected by the fireguard and/or the illumination of the fire detection system. Proceed as follows:

1. Close throttle.

2. Complete shutdown.

3. Exit the aircraft.

4. Use fire extinguisher.

4-30. ENGINE FIRE DURING FLIGHT.

4-31. Immediately on discovery of an engine fire during flight prepare for a power-off landing and accomplish the following:

1. Select forced landing area.

2. Autorotative Glide - ESTABLISH and prepare for a power-off landing. (Make normal landing if possible.)

3. Throttle - Full off.

4. Main fuel - OFF.

5. Battery switch - OFF.

6. Generator switch - OFF, except when power is required to operate lights or avionic equipment.

7. Shoulder harness - LOCK.

8. Landing - Accomplish.

Caution

After landing do not attempt to restart engine until cause of fire has been determined and corrected.

4-32. FUSELAGE FIRE.

1. Airspeed - REDUCE to minimum to lessen possibility of spreading fire.

2. Pilot's sliding windows, cabin, ventilators, and cargo doors - OPEN, if smoke enters cabin.

3. Battery switch - OFF.

4. Generator switch - OFF (ON if lighting or avionic equipment is to be used).

Warning

Fire extinguisher fluid vapors are toxic and its use should be limited to well ventilated areas.

5. Landing - ACCOMPLISH at the nearest available, safe landing area (open field, etc.).

4-33. ELECTRICAL FIRE.

4-34. The electrical circuits are individually protected by circuit breakers which will automatically interrupt power to aid in the prevention of fire when a short circuit or malfunction accurs.

Warning

In the event of any electrical fire or of smoke in the cockpit that cannot be quickly and positively ascertained and eliminated, the pilot should land as soon as possible.

1. Instruments - CHECK for correct reading.

2. Battery and Generator Switches - OFF.

3. Circuit breakers - OUT.

4. Landing - ACCOMPLISH at nearest available, safe landing area.

Note

Flight operation can be maintained without battery and generators; however, most instruments will not function, as they are electrically powered.

4-35. SMOKE AND FUME ELIMINATION.

4-36. Smoke or toxic fumes entering the cabin can be exhausted by the following procedure:

1. Pilot's and copilot's window - Slide OPEN.

2. Cabin ventilators - OPEN.

3. Cargo doors - OPEN.

Note

If smoke or fumes are caused by an electrical fire, isolate the defective circuit as outlined under ELECTRICAL FIRE.

4. Aircraft controls - Sideslip if practical.

SECTION V FUEL SYSTEM

4-37. FUEL BOOST PUMP FAILURE.

4-38. In the event of total helicopter fuel system failure, proceed as follows:

Note

If fuel pressure drops and engine is operating normally, continue flight to the nearest available area and land immediately to determine cause of indication and/or malfunction.

1. If altitude permits, descend to pressure altitude of 4600 feet or less.

Note

The engine fuel pump is capable of supplying engine fuel requirements at pressure altitude of less than 4600 feet.

2. Main Fuel - ON.

3. Main Fuel and Fuel Boost Pump Circuit Breakers - IN.

4-39. ENGINE FUEL CONTROL MALFUNCTION.

4-40. Malfunction or failure of the engine fuel control unit or nII governor will be evidenced by overspeeding nII rpm, compressor stall or flameout.

4-41. OVERSPEEDING NII GOVERNOR (HIGH RPM).

1. Simultaneously increase collective pitch while rolling off twist grip throttle until desired engine operating rpm is established.

2. Maintain desired operating rpm by coordinating throttle and collective.

3. Normal landing at nearest available safe landing area.

4-42. UNDERSPEEDING NII GOVERNOR (LOSS OF RPM).

Warning

When operating on EMERGENCY fuel system, the throttle must be manually adjusted to maintain engine rpm. Throttle move-

ment shall be performed at a slow rate to minimize the possibility of compressor stall or flameout.

1. Collective pitch - DOWN to maintain rotor rpm.

2. Throttle - Retard throttle.

3. Governor Switch - EMERGENCY position.

Caution

When operating on emergency control, it is possible to overspeed the gas producer turbine and the power turbine, and to exceed redline tailpipe temperature.

4. Throttle - Advance slowly and firmly to obtain engine operating rpm.

Note

During extended operation in the EMERGENCY mode, set the Governor INCREASE-DECREASE switch to the minimum position to preclude the possibility of bleed band popping (opening and closing).

4-43. COMPRESSOR STALL.

1. Reduce Power.

2. De-Ice Switch - OFF.

3. Bleed Air - OFF.

4. Normal landing - Accomplish at the nearest available safe area (open field, etc.).

4-44. ENGINE FUEL PUMP.

4-45. The engine fuel system is designed for safety of helicopter operation. The fuel pump is a dual-element unit and either element is capable of supplying engine fuel requirements. Failure of either pump element will cause the MASTER CAUTION light and ENG FUEL PUMP caution light to illuminate. The ENG FUEL PUMP light will remain illuminated until the cause of the malfunction is corrected. Proceed as follows:

1. Land at the nearest available safe landing area (open field, etc.).

2. Do not continue until defect is corrected.

4-46. H INLET GUIDE VANE ACTUATOR FAILURE.

4-47. If failure of the inlet Guide Actuator occurs, the pilot will notice an instantaneous rise in EGT. By reducing collective pitch, the EGT can be maintained in the green arc; however, this will result in the engine producing a MAXIMUM of 500 (SHP) shaft horsepower (approximately 20 to 25 pounds torque).

4-48. CHIP DETECTOR WARNING LIGHT ILLUMINATION.

4-49. Illumination of either the XMSN or TAIL ROTOR warning lights indicates metal particles in the transmission or tail rotor gear boxes. If either warning light illuminates, accomplish a landing at nearest available safe landing area.

SECTION VI ELECTRICAL SYSTEM

4-50. ENGINE SHUTDOWN WITH COMPLETE ELECTRICAL FAILURE.

4-51. In the event of a complete electrical failure, accomplish engine shutdown as follows.

1. Disconnect main fuel quick-disconnect at engine fuel filter.

SECTION VII HYDRAULIC SYSTEM

4-52. HYDRAULIC SYSTEM FAILURE.

4-53. Hydraulic power failure will not be evident in the control system until control movements are executed. When the controls are moved, it will be evident that the forces required for control movement is increased, and moderate feedback forces will be felt. Control motions will result in normal flight reactions in all respects except for the increased force required for control movements. In the event of a hydraulic power failure, proceed as follows:

1. Airspeed - ADJUST as desired to obtain most comfortable control movement level.

2. Hydraulic control circuit breaker - OUT, check for electrical failure of hydraulic control switch.

3. Hydraulic Control Circuit Breaker - IN, if electrical failure of hydraulic control switch has been eliminated and actual hydraulic control failure has been confirmed.

4. Hydraulic Control Switch - Recycle, ON (OFF if power is not restored). Reset MASTER CAUTION LIGHT.

5. Landing - ACCOMPLISH landing at nearest available safe landing area (open field, etc.).

Warning

"Under certain conditions, rapid operation of the cyclic controls can cause a check valve in the irreversible valve to become unseated, allowing fluid to bypass the actuating cylinder. This simulates a boost-off condition. Should this occur, immediately place the hydraulic switch in the Off position and then back to the On position. This will allow the check valve to reseat."

SECTION VIII LANDING AND DITCHING

4-54. EMERGENCY LANDING

4-55. Emergency landings can be performed without undue difficulty, as they are accomplished in nearly the same manner as power-on landings. During final touchdown, reduce forward speed to desired touchdown speed for existing conditions.

4-56. LANDING IN TREES.

4-57. The following described emergency procedures are oriented toward maneuvering the helicopter into the best possible position for effecting a forced landing into trees prior to main rotor blade contact with the trees. A decision to fully apply collective pitch before making contact with the trees or to retain some collective pitch for later application during the descent through the trees will be dependent on an evaluation of the situation under the existing circumstances. Proceed as follows:

1. Enter normal autorotation from altitude or low level.

2. Select the forced landing area which contains the least number of trees of minimum height.

3. If time permits, lock shoulder harness, turn off switches and fuel valve.

4. Execute a deceleration sufficient to attain ZERO ground speed at tree top level, and allow the helicopter to descend vertically.

5. Prior to main rotor blade contact with the trees, apply sufficient collective pitch to attain the minimum rate of descent.

6. As helicopter settles into the trees, continue to increase collective pitch to maximum.

4-58. EMERGENCY ENTRANCE.

4-59. To gain entrance to the cabin in the event of an emergency, slide open or break the pilot's or copilot's movable windows; reach forward and PULL the jettisonable door release; if door will not jettison or cargo door will not open, break door windows or windshield to gain entrance.

4-60. DITCHING - POWER ON

1. Execute a normal descent and pre-landing to hovering altitude over water.

2. Passengers - ALERTED.

3. Helicopter Position - RADIO position to aid in search and rescue.

4. Pilot's and copilot's door - JETTISON while hovering a few feet above the water; slide cargo doors full open.

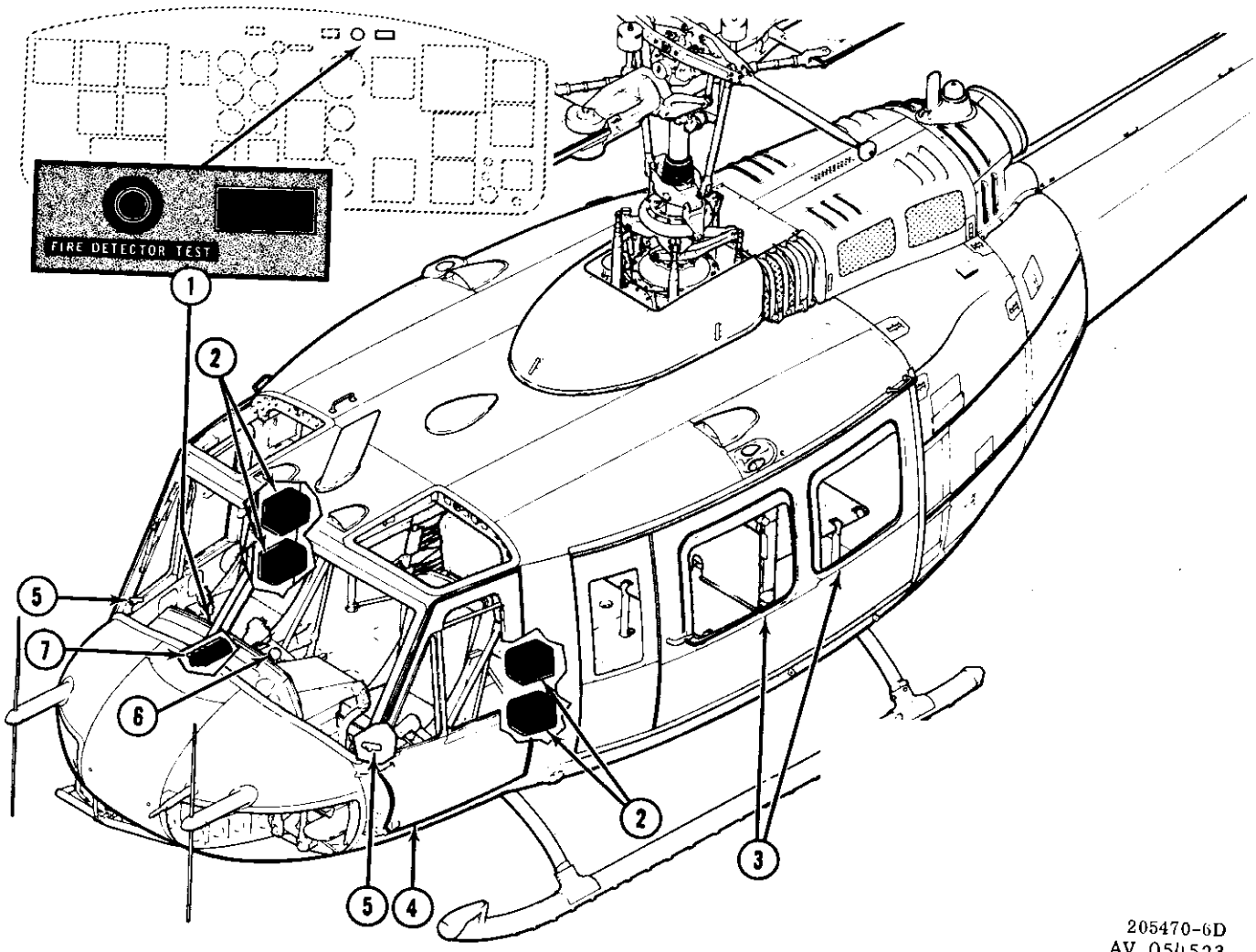
5. Instruct passengers and copilot to exit helicopter.

6. Fly a Safe Distance - AVOID possible passenger injury.

7. Battery Switch - OFF.

8. Main fuel switch - OFF. Close throttle. Allow aircraft to settle in a level attitude, apply full collective, when aircraft begins to roll apply full cyclic in the direction of roll.

9. Shoulder Harness and Safety Belt - RELEASE and CLEAR helicopter when main rotor has stopped.



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1. Fire Detector Test Switch and Indicator Light
2. First Aid Kit (4)
3. Passenger Exit (4)
4. Crew Exit (2)
5. Jettisonable Door Release (2)
6. External Stores Jettison Release Lever
7. Fire Extinguisher

Figure 4-3. Emergency exits and equipment

Note

Applying full right lateral cyclic control will cause the helicopter to slip sidways into the water, using resistance to stop the main rotor blade. Rolling the helicopter on the right side with right-hand doors and windows closed will provide the maximum floatation and escape period.

4-61. DITCHING - POWER OFF.

1. Collective Pitch - ADJUST as required to maintain rotor rpm within limits.

2. Autorotative Glide - ESTABLISH an autorotative glide into the wind at minimum airspeed of 55 knots for less than 7500 pounds gross weight, or to 60 knots for gross weight exceeding 7500 pounds.

3. Passengers - ALERTED.

4. Helicopter Position - RADIO position to aid in search and rescue.

5. Battery Switch and Main Fuel Switch - OFF.

6. Pilot's and Copilot's Doors - JETTISON, at low altitude slide both cargo doors full open.

7. Shoulder Harness - LOCK.

8. Execute deceleration sufficient to attain ZERO ground speed near water surface.

9. Apply collective pitch sufficient to attain minimum rate of descent.

10. Allow aircraft to settle in a level attitude, apply full collective when aircraft begins to roll, apply full cyclic in the direction of roll.

11. Shoulder Harness and Safety Belt - RELEASE and CLEAR helicopter when main rotor blades have stopped.

SECTION IX FLIGHT CONTROLS

4-62. FLIGHT CONTROL SYSTEM FAILURE

4-63. The flight control system is a mechanical type with hydraulic servo cylinders connected into the fore and aft and lateral cyclic controls, and into the collective control and the directional control systems. The servo cylinders are installed solely to reduce control forces and lessen pilot fatigue. The design of the control system mechanical linkage is sturdy; control movements are positive and the possibility of failure is remote; therefore, an emergency system has not been provided.

4-64. SIMULATED SERVO FAILURE.

4-65. A safety of flight condition could exist if the servo valve malfunctions during a "Surprised" or "Unannounced" simulated servo failure. If the servo is turned off and the irreversible valve becomes lodged in the open position the cyclic control may move abruptly to the rear either left or right depending on which servo failed with a force greater than 30 pounds. This force if suddenly applied without warning is likely to render the aircraft uncontrollable. When a simulated servo failure is to be practiced, the pilot turning off the servo should not remove his hand from the servo switch until he is sure the servo is functioning properly. If there is any abrupt movement of the cylic experienced, he should immediately turn the servo switch back on "Surprise" or "Unannounced" simulated servo failures in the UH-1D/H aircraft should not be conducted.

4-66. MAST BUMPING.

4-67. This condition occurs when the main rotor static stops contact the mast. It is most likely to occur when conducting slope operations and on rotor coast down in high wind conditions (natural or induced by other aircraft). It may be encountered in flight only if the aircraft flight envelope is exceeded.

4-68. COLLECTIVE BOUNCE.

4-69. Collective bounce is a pilot induced vertical oscillation of the collective control system when an absolute friction (either pilot applied or control rigged) is less than seven pounds. Collective bounce may be encountered in any flight condition by a rapid buildup of vertical bounce at approximately three cycles per second. The severity of the oscillation is such that effective control of the aircraft may become difficult to maintain. The pilot should insure that adequate collective friction is applied, and maintained in all flight conditions. Should collective bounce be encountered accomplish the following:

1. Relax pressure on collective pitch control. (Do not "stiff arm" the collective.)

2. Hydraulic control switch - OFF.

3. Collective friction - Increase.

4. Collective pitch - Positive application either up or down.

5. Hydraulic control switch - ON after oscillation has subsided.

Note

Record duration and severity of collective bounce on 2408-13.

SECTION X BAIL OUT

4-70. BAIL OUT

4-71. Helicopter design, flight characteristics and autorotation qualities virtually eliminate the necessity for leaving the helicopter in flight (bail-out); however, if a decision is made to bail-out, accomplish as follows:

1. Passengers - ALERTED.

2. Helicopter position - RADIO position.

3. Doors - RELEASE jettisonable doors. OPEN cargo doors as required.

4. Controls - SET to establish CRUISE forward speed with flight attitude slightly nose down.

5. When Ready - BAIL OUT through nearest exit.

CHAPTER 5

AVIONICS

Section I - General

5-1. SCOPE.

5-2. This chapter covers the electronic equipment configuration in Army Models YUH-1D and UH-1D/H helicopters. It includes a brief description of the electronic equipments, their technical characteristics, capabilities, and location. The chapter also contains complete operating instructions for all signal equipment installed in the helicopter.

5-3. NOMENCLATURE AND COMMON NAMES.

5-4. A list of the avionic equipment installed in the helicopter, with a common name assignment for each piece of equipment, is presented in table 5-1.

5-5. DESCRIPTION OF CONFIGURATION.

5-6. The avionic configuration consists of the following installed communications equipment: An FM radio set including the FM homing facility, a signal distribution and interphone system, a UHF command set, with complete provisions for installing a VHF radio set as an alternate. Complete provisions are made for installing an HF radio set and a VHF emergency transmitter. Complete provisions are also provided for installing an IFF transponder set.

TABLE 5-1. NOMENCLATURE AND COMMON NAMES

NOMENCLATURE	COMMON NAME
Radio Signal Distribution Panel SB-329-AR	Signal distribution panel
Control Intercommunications Set C-1611/AIC	Signal distribution panel
*Radio Set AN/ARC-44 Receiver-Transmitter RT-294/ARC-44 Control Panel SB-327/ARC-44 Antenna AT-454/ARC Antenna Group AN/ARA-31	FM Liaison set FM receiver-transmitter FM control panel FM antenna FM homing antenna
*Radio Set AN/ARC-54 Receiver-Transmission RT-348/ARC-54 Control Radio Set C-3835/ARC-54 Antenna AT-765/ARC-54 Coupler, Antenna CU-943/ARC-54 Antenna Assembly 637A-2 Course Indicator ID-453/ARN-30	FM Liaison Set Receiver-transmitter Control panel FM antenna Coupler FM homing antenna Course indicator
*Radio Set AN/ARC-55 Receiver-Transmitter RT-349/ARC-55 Control Radio Set C-1827/ARC-55 Antenna AT-1108/ARC	UHF command set UHF receiver-transmitter UHF control panel UHF/VHF antenna
*Radio Set AN/ARC-51X Receiver-Transmitter RT-702/ARC-51X Control Radio Set C-4677/ARC-51X	UHF radio set Receiver-transmitter Control panel
*Radio Set AN/ARC-51BX Receiver-Transmitter RT-742/ARC-51BX Control Radio Set C-6287/ARC-51BX	UHF radio set Receiver-transmitter Control panel

TABLE 5-1. NOMENCLATURE AND COMMON NAMES (CONT)

NOMENCLATURE	COMMON NAME
Radio Set AN/ARC-73 Radio Receiver R-1123( )/ARC-73 Radio Transmitter T-879( )/ARC-73 Remote Control Unit 614U-6	VHF command set VHF receiver VHF transmitter VHF control panel
Radio Set AN/ARC-134 Receiver-Transmitter RT-857/ARC-134 Control Panel C-7197/ARC-134	VHF command set Receiver-transmitter VHF control panel
Transmitter T-366( )/ARC Control Panel ARC Type C-80B	Emergency VHF transmitter Emergency VHF control panel
Radio Set AN/ARC-102 Receiver-Transmitter RT-698/ARC-102 Control Radio Set C-3940/ARC-94 Network Impedance Matching CU-991/AR Antenna 204-079-609 or 205-706-027	HF ssb/am set HF receiver-transmitter HF control panel Antenna coupler HF longwire antenna
Receiving Set AN/ARN-30E Receiver R-1021/ARN-30D Signal Data Converter CV-265A/ARN-30A Antenna AS-1304/ARN-30 Control Panel C-3436/ARN-30D Radio Set Indicator, Course ID-453/ARN-30	VHF navigation set VHF receiver Converter Omni antenna VHF navigation control panel Course indicator
Direction Finder Set AN/ARN-59 Radio Receiver R-836/ARN Receiver Control C-2275/ARN-59 Indicator ID-998/ASN Antenna AT-780/ARN Antenna 205-075-325	Direction finder set ADF receiver ADF control panel Radio magnetic indicator (RMI) Loop antenna Sense antenna
Aircraft Magnetic Compass Type J-2 Induction Compass Transmitter T-611/ASN Electronic Control Amplifier Type A-2 Magnetic Flux Compensator CN-405/ASN Electrically Driven Gyro Control Type S-3A Radio Magnetic Compass Indicator ID-998/ASN	Gyro magnetic compass Flux valve Amplifier Compensator Gyro Radio magnetic indicator (RMI)
Gyromagnetic Compass Set AN/ASN-43 Induction Compass Transmitter T-611/ASN Electronic Control Amplifier AM3209/ASN Magnetic Flux Compensator CN-405/ASN Directional Gyro CN-988/ASN-43 Radio Magnetic Compass Indicator ID-998/ASN	Gyro magnetic compass Flux valve Amplifier Compensator Directional gyro Radio magnetic indicator (RMI)
Transponder Set AN/APX-44 Receiver-Transmitter, Radar RT-494/APX-44 Transponder Set Control C-2714/APX-44 Antenna AT-884/APX-44	Transponder set Receiver-transmitter Control panel Antenna
Radio Receiver R-1041( )/ARN	Marker beacon receiver

TABLE 5-1. NOMENCLATURE AND COMMON NAMES (CONT)

NOMENCLATURE	COMMON NAME
Navigation Set, Position Fixing AN/ASN-72	Navigation set
Amplifier, Radio Frequency AM-4740/ASN-72	Preamplifier
Receiver, Position Fixing R-1453/ASN-72	Receiver
Control, Receiver C-7152/ASN-72	Receiver control box
Indicator, Hyperbolic Grid Lane, Red ID-1426/ASN-72	Red decometer
Indicator, Hyperbolic Grid Lane, Green ID-1425/ASN-72	Green decometer
Indicator, Hyperbolic Grid Lane, Purple ID-1424/ASN-72	Purple decometer
Indicator, Lane Identification ID-1427/ASN-72	Lane identification meter
Computer, Flight Log CP-880/ASN-72	Computer
Control Programmer C-7153/ASN-72	Flight log control
Recorder - Viewer, Flight Log RO-323/ASN-72	Flight log display
Radio Receiving Set AN/ARN-82	VHF navigation set
Radio Receiver R1388/ARN-82	VHF receiver
DMN 4-4 Antenna	Omni antenna
Control Radio Set C-6873/ARN-82	NAV-COMM control panel
Course Indicator ID-1347/ARN-82	Course indicator
Direction Finder Set AN/ARN-83	Direction finder set
Radio Receiver R-1391/ARN-83	ADF receiver
Control Direction Finder C6899/ARN-83	ADF control panel
Indicator ID-998/ASN	Radio Magnetic Indicator (RMI)
Antenna AS-1863/ARN-83	Loop antenna
Antenna 205-075-325	Sense antenna
Transponder Set AN/APX-72	Transponder set
Receiver-Transmitter RT-859/APX-72	Receiver-transmitter
Transponder Set Control C-6280/APX-72	Control panel
Antenna AT-884( )/APX	Antenna
Radio Set AN/ARC-131	Radio Set
Receiver-Transmitter RT-823/ARC-131	Receiver-transmitter
Control, Radio Set C-7088/ARC-131	Control panel unit
AS-1703/AR	FM antenna
AS-1922/ARC	Homing antenna

*Only one FM and one UHF radio set will be installed in each helicopter.

5-7. The installed navigation equipment consists of: a direction finder set, a marker beacon receiver, a VHF navigation receiver, and a gyro magnetic compass system.

5-8. The avionic equipment installed may vary with respect to model of equipment installed. Also equipment for which provisions are made may or may not be installed. Therefore, no attempt is made to specify the exact combinations of equipment installed in any particular helicopter. All equipment installed or equipment for which provisions are made for installing, has been described and operating procedures are outlined.

5-9. PURPOSE AND USE.

5-10. The purpose and use of the communication and navigation equipment installed in the UH-1D/H helicopter is described in the following paragraphs:

5-11. FM LIAISON SET AN/ARC-44.

5-12. The FM Liaison Radio Set provides two-way communication within the frequency range of 24 to 51.9 megahertz (mhz) on 280 preset channels. The distance range is limited to line of sight up to distances of approximately 50 miles.

5-13. When used with Antenna Group AN/ARA-31, Radio Set ARC-44 provides a homing facility which allows the pilot to home on any keyed unmodulated signal transmitted within the frequency range of 24 to 49 mhz.

5-14. SIGNAL DISTRIBUTION PANEL - SB-329/AR.

5-15. Signal Distribution Panel SB-329/AR amplifies and controls the distribution of audio signals applied to or from each headset-microphone, to or from communication receivers and transmitters and from navigation receivers. The SB-329/AR Panel is used for intercommunication between crew members and is also used for monitoring the communication and navigation receivers singly or in combination.

5-16. SIGNAL DISTRIBUTION PANEL C-1611A/AIC.

5-17. Signal Distribution Panel C-1611/AIC is a transistorized unit which provides the same functions that are provided by the SB-329/AR Panel. (Refer to paragraph 5-15.) In addition the C-1611A/AIC panel permits the operator to control four receiver-transmitters. A private interphone line is also provided. When the selector switch is in the PVT position it provides a hot line (no external switch is used) to any station in the helicopter. A HOT MIC switch is also provided on the C-1611A/AIC control panel at the medical attendant's station.

5-18. Beginning with ship No. 64-13662 and subsequent helicopters, four C-1611A/AIC units are installed. One each of the units are installed for the pilot and copilot, and two are installed in the crew/passenger compartment for the crew. All four of the C-1611A/AIC units are wired to provide interphone operations for the crew, and full transmit and receive facilities for all communication and navigation equipment. Refer to paragraph 5-117 for description of the operating controls on the panel and paragraph 5-176 for operation.

5-19. UHF COMMAND SET AN/ARC-55B.

5-20. The ARC-55B Command Set provides two-way amplitude-modulated communication on any one of 1750 channels, in the band of 225.0 to 399.9 megahertz. Channel selection is manual and the guard frequency may be monitored.

5-21. UHF COMMAND SET AN/ARC-51( )X.

5-22. Radio Sets AN/ARC-51X and AN/ARC-51BX both serve the same purpose and both operate within the ultra high frequency (UHF) band of 225.0 to 399.9 megahertz (mhz). The ARC-51X provides 1750 channels and tunes in 0.9 mhz increments. The ARC-51BX tunes in 0.05 mhz increments and provides 3500 channels. The ARC-51BX also permits selection of 20 preset channels. Both radio sets permit monitoring of the guard channel and provide two-way radio communications. Transmission and reception are conducted on the same frequency with the use of a common antenna.

5-23. FM RADIO AN/ARC-54.

5-24. Radio Set AN/ARC-54 is an FM radio that provides the aircraft crew with two-way voice communications within the frequency range of 30 to 69.9 megahertz. In addition to voice communication the ARC-54 permits selective calling (TONE) operation and when used with the homing antenna group and course indicator the pilot is provided with a homing facility.

5-25. VHF COMMAND SET.

5-26. The VHF Command Set AN/ARC-73 is an alternate set for the UHF radio. The set provides transmission and reception of AM radio signals in the VHF range. The receiver may be tuned within its frequency range of 116.00 to 151.95 mhz in 50 khz increments to any one of the 720 available channels. The transmitter may be tuned within its frequency range of 116.00 to 149.95 mhz in 50 khz increments to any one of its 680 available channels. The distance range is limited to line of sight or a distance of approximately 50 miles.

5-27. VHF COMMAND SET AN/ARC-134.

5-28. The VHF Command Set AN/ARC-134 is installed in helicopters Serial Nos. 66-8574 through 66-8577 and 66-16307 and subsequent. The set provides voice communications in a very high-frequency (VHF) range of 116.000 through 149.975 megahertz. This provides 1360 channels spaced 25 khz apart. The set transmits and receives amplitude modulated signals on the same frequency with the use of a common antenna.

5-29. EMERGENCY VHF TRANSMITTER.

5-30. The emergency VHF transmitter provides emergency VHF transmission on five crystal controlled channels. The equipment can also provide emergency two-way voice communication when used in conjunction with the VHF navigation receiver.

5-31. HF AM/SSB RADIO SET.

5-32. The AN/ARC-102 is a long range High Frequency (HF) Single Side Band (SSB) transceiver which transmits and receives in the 20 to 30 megahertz frequency range. The set tunes in one khz stops to any one of 28,000 manually selected frequencies. The primary mode of operation is SSB, however the ARC-102 can also transmit and receive a compatible AM signal.

5-33. VHF NAVIGATION RECEIVER.

5-34. The VHF navigation receiver provides for reception of 190 VHF channels whose frequencies are all the 0.1 mhz steps between 108.00 mhz and 129.90 mhz. This permits reception and interpretation of VHF omni-directional radio range (VOR) signals and of localizer signals broadcasted by ground station. The line-of-sight distance range for the navigation set varies from 12 nautical miles at 100 feet altitude to 160 nautical miles at 20,000 feet altitude. This navigational data permits the operator to perform the following:

a. Fly a desired course to or from a VOR station.

b. Fly to an objective other than a VOR station.

c. Make approximate ground speed checks.

d. Fly to the intersection of a localizer and VOR signal.

e. Approach a runway associated with either a VOR or a localizer station.

f. Determine the bearing of the aircraft with respect to a VOR station.

5-35. NAVIGATION RECEIVER - AN/ARN-82.

5-36. The AN/ARN-82 Navigation Receiver is installed in helicopter Serial No. 66-746 and subsequent helicopters. The receiver provides for reception of 200 channels with 50 khz spacing. This permits reception and interpretation of VMF omnidirectional radio range (VOR) signals, localizer signals and standard broadcast AM signals. Localizer frequencies are all the odd tenth - mhz frequencies between 108.00 mhz and 112.0 mhz. The localizer function is energized when these frequencies are selected. Localizer, VOR and standard broadcast signals are presented aurally through the intercom system. Localizer signals are also presented visually via the vertical needle or CDI of the course indicator, and VOR signals are presented visually via the course indicator and the No. 2 pointer of the bearing heading indicator. Navigational data provided by this system permits the operator to perform the same functions provided by the AN/ARN-30E as listed in steps a. through f. of paragraph 5-34. (refer to paragraph 5-34).

5-37. DIRECTION FINDER SET - AN/ARN-59.

5-38. The direction finder set is a radio compass system designed to provide automatically, a visual indication of the direction from which an incoming radio-freqeuncy (RF) signal is received. It provides for aural reception of AM signals in the 190 to 1,750 khz frequency range. It may also be used for homing and position fixing or as a manually operated direction finder.

5-39. DIRECTION FINDER SET - AN/ARN-83.

5-40. The AN/ARN-83 Direction Finder System is installed in helicopter No. 66-746 and subsequent helicopters. The system provides radio aid to navigation and operates in the frequency range of 190 to 1750 khz.

5-41. When operating as an automatic direction finder, the ARN-83 system presents a continuous indication of the bearing to any selected radio station and simultaneously provides aural reception of audio transmission from the station. When the manual mode of operation is selected the system enables the operator to find the bearing to any selected radio station by manually controlling the null direction of directional antenna. The system also operates as a radio range receiver and a conventional low-frequency aural receiver to receive voice and unmodulated transmission.

5-42. GYRO MAGNETIC COMPASS.

5-43. The gyro magnetic compass is a direction sensing system which provides a visual indication of the magnetic heading of an aircraft. The system may also be used as a free gyro in areas where the magnetic reference is unreliable.

5-44. GYRO MAGNETIC COMPASS AN/ASN-43.

5-45. The Gyro Magnetic Compass AN/ASN-43 is installed in helicopters Serial Nos. 66-8574 through 66-8577 and 66-16449 through 66-17144. This system provides navigational data and permits the pilot to perform the same functions provided by the J-2 Gyro Magnetic Compass System. (Refer to paragraph 5-42.)

5-46. MARKER BEACON RECEIVER.

5-47. The marker beacon receiver is a radio navigational aid for receiving marker beacon signals from a ground transmitter. The pilot is provided with aural and visual presentations of the received marker beacon signals. This aids in determining the exact location of the aircraft for navigational and instrument landing purposes.

5-48. TRANSPONDER SET.

5-49. Transponder Set AN/APX-44 receives, decodes and responds to interrogations of the Mark X Identification Friend or Foe (IFF) System, to the exterrogations of Mark X (IFF) system supplemented by Selected Identification Features (SIF) and to the interrogation of civil secondary ground radar systems. The transponder set can also be used to transmit specially coded emergency signals or position-identifying signals, even though the set is not being interrogated by a ground based IFF system.

5-50. Interrogating signals, consisting of pairs of pulses spaced to form a code, are transmitted to the AN/APX-44, which decodes the interrogation and transmits a coded reply to the question source. The form of coded reply, which can be preset by the transponder set controls, presents positive identification of the nationality and position of the helicopter.

5-51. The operational facilities of the transponder set are divided into five categories, each of which may be selected by the pilot. These categories are as follows:

Normal Operation
Modified (SIF) Operation
Civil Operation
Position Identification
Emergency Operation

5-52. Three independent coding modes, or combinations of the three, are available to the pilot. Mode 1 provides 32 possible code combinations, any one of which may be selected while in flight. Mode 2 provides one code combination which is preset prior to flight and may consist of any one of 4,096 possible code combinations. Mode 3 provides 64 additional code combinations, any one of which may be selected by the pilot while in flight.

5-53. NAVIGATION SET AN/ASN-72.

5-54. The Navigation Set, Position Fixing AN/ASN-72 is installed in helicopters Serial No. 64-13492 and subsequent. The navigation set receives low-frequency, unmodulated, continuous-wave signals from four ground stations and provides the pilot with helicopter present-position data. The navigation set provides the following visual displays of present position.

a. Three decometers designated as red, green, and purple, are calibrated in the lane and zone units into which the area covered by the ground stations is divided by the hyperbolic system of grids. The readings obtained from any two of the decomenters are referenced to maps of charts on which are imprinted the lane and zone units. When plotted on the chart, the point at which the readings intersect will indicate helicopter present position.

b. A flight log map display with moving chart and pen that provide continuous indication of present position of helicopter.

5-55. TRANSPONDER SET AN/APX-72.

5-56. Transponder set AN/APX-72 provides automatic radar identification of aircraft or surface vessel, to all suitably equipped challenging aircraft, and ground facilities within the operational range of the system. The set receives, decodes, and responds to the characteristic interrogations of operational modes 1, 2, 3A, C and 4. The receiver section operates on a frequency of 1030 megacycles and the transmitter section operates on a frequency of 1090 megacycles. Specially codes identification of position (IP) and emergency signals may be transmitted to interrogating stations when conditions warrant.

5-57. INTERROGATION SIGNALS.

5-58. Interrogation signals consisting of pairs of pulses spaced to form a code, are transmitted to the APX-72 which receives the coded signal and transfers it to the decoder. The decoder checks the incoming signal for valid code and proper mode (except for mode 4 interrogations which are sent directly to mode 4 board). If valid the decoder signal is sent to the decoder board which prepares the coded reply. The coder reply is sent through the transmitter and antenna to interrogating source.

5-59. OPERATIONAL FACILITIES.

5-60. The operational facilities of the APX-72 set are divided into four categories, each of which may be selected by the pilot. These categories are as follows:

a. Low (sensitivity) operation.

b. Normal (sensitivity) operation.

c. Identification of position (IDENT-MIC).

d. Emergency.

5-61. Five independent coding modes are available to the pilot. The first three modes may be used independently or in combination. Mode 1 provides 32

possible code combinations, any one of which may be selected in flight. Mode 2 provides 4096 possible code combinations but only one is available since the selection dial is not available in flight and must be preset before flight. Mode 3/A provides 4096 possible codes, any one of which may be selected in flight. Mode C in this installation is not utilized. Mode 4, which is connected to an external computer, can be selected to display any one of many classified operational codes for security identification.

5-62. The range of the APX-72 is limited to line-of-sight transmission since its frequency of operation is in the UHF band making range dependent on altitude of aircraft.

5-63. RADIO SET AN/ARC-131.

5-64. The radio set AN/ARC-131 consists of a receiver-transmitter, control panel unit, mounting, and a connector plate. The set is a FM communications set that provides 920 channels spaced at 50 kc (50 khz) intervals in the frequency range of 30 to 75.95 mc (mhz). Circuits are included in the design of this set to provide sidetone monitoring of the transmitter output. Power to operate the receiver-transmitter is from the helicopter 28-volt DC electrical power supply system.

5-65. DESCRIPTION OF COMPONENTS.

5-66. The components of the radio sets and electronic equipment installed in the helicopter are described in the following paragraphs:

5-67. FM LIAISON SET AN/ARC-44.

5-68. The FM liaison set includes an FM receiver-transmitter and mounting, three INT signal distribution panels, an FM control panel, a dynamotor and mounting, a switch panel, an antenna system and interconnecting cabling.

a. The FM receiver-transmitter is mounted in the nose radio rack and is controlled from the pedestal mounted remote control panel. For a description of the control panels refer to paragraphs 5-111 and 5-115.

b. The dynamotor is mounted in the nose radio rack adjacent to the receiver-transmitter. Primary power from the helicopter power supply is applied to the dynamotor, which transforms the primary power into operating voltages for operation of the FM liaison set.

c. The FM antenna consists of a whip, a base and coupler. The whip and base are mounted on the aft tail boom section and are connected to the coupler by coaxial cable.

d. The following are provided for the homing operation of the FM liaison set: Four antenna elements and two impedance matching networks, installed forward of the nose section, a keyer installed in the nose radio compartment, and a switch panel installed in the pedestal. For description of the switch panel refer to paragraph 5-115 and see figure 5-4.

5-69. FM LIAISON SET AN/ARC-54.

5-70. The ARC-54 Radio Set Includes an FM receiver-transmitter, FM control panel, FM communications antenna, a homing antenna system and a homing indicator.

a. The FM receiver-transmitter is installed in the nose radio compartment and is controlled from the pedestal mounted remote control panel, for description of the control panel refer to paragraph 5-121 and see figure 5-7. Primary power to the receiver-transmitter is supplied from the helicopter 28-volt power supply system. A transistorized power supply is contained within the receiver-transmitter.

b. The communications antenna consists of a whip mounted base, and 40-position antenna coupler, which are mounted on the aft tail boom section. The antenna coupler is positioned automatically from the control panel when the frequency channel is selected.

c. The homing antenna (3, figure 5-1) is a one-piece unit resembling a towel rack and is installed on the roof of the helicopter. Data provided by the homing facility is displayed visually on the course indicator, which is mounted on the instrument panel.

5-71. UHF COMMAND SET AN/ARC-55B.

5-72. UHF Command Set ARC-55B consists of a receiver-transmitter and mount, a pedestal mounted remote control unit, and a UHF antenna mounted on the cabin roof.

a. The receiver-transmitter consists of ten separate subassemblies and a dynamotor mounted on a main chassis. The complete unit is installed in the nose radio compartment. Primary power is supplied from the helicopter 38-volt DC power supply system. The receiver-transmitter is controlled from the UHF control panel mounted on the pedestal, for description of the panel refer to paragraph 5-119 and see figure 5-6.

b. The UHF antenna (see 1, figure 5-1) is an airfoil shaped antenna. It is used for both reception and transmission. The antenna has a VHF connector and element which permits it to be used for both UHF and VHF radio sets.

TABLE 5-2. COMMUNICATIONS AND ASSOCIATED ELECTRONIC EQUIPMENT

FACILITY	NOMENCLATURE	USE	RANGE	LOCATION OF CONTROLS	REMARKS
UHF command communications	Radio Set AN/ARC-55B AN/ARC-51X or AN/ARC-51BX	Two-way voice communications in the frequency range of 225 to 399.9 mhz	*Line of sight	Pedestal	
FM liaison communications	Radio Set AN/ARC-44 or AN/ARC-54	Two-way voice communications in the frequency range of 24.0 to 51.9 mhz	*Line of sight or 50 miles average conditions	Pedestal	AN/ARC-44 dynamotor supplies power for operation of signal distribution panel SB-329-AR
Intercommunication	Radio Set SB-329/AR or C-1611A/AIC	Intercommunication between crew members	Stations with helicopter	Pedestal and cabin overhead	Press-to-talk switches located on cyclic sticks, foot switch on floor in cockpit area, and crew members control panel
VHF command communications	Radio Set AN/ARC-73	Two-way voice communications in the frequency range of 116.00 to 149.95 mhz	*Line of sight or 50 miles average conditions	Pedestal	The AN/ARC-73 is used as an alternate for the UHF Command Set
VHF command communications	Radio Set AN/ARC-134	Two-way voice communications in the frequency range of 116.000 mhz	*Line of sight or 50 miles average conditions	Pedestal	The AN/ARC-134 is used as a alternate for the UHF Command Set
HF SSB/AM communications	Radio Set AN/ARC-102	Two-way voice communications in the frequency range of 2.0 to 29.999 mhz	*Up to 2000 miles	Pedestal	Minimum pilot weight is 260 pounds with AN/ARC-102 installed
VHF emergency transmitter	Transmitter T-366/ARC	VHF emergency transmitter	*Line of sight	Pedestal	The VHF navigation receiver used in conjunction with T-366/ARC standby transmitter
FM homing	Antenna Group AN/ARA-31 used with AN/ARC-44 or Antenna 637A-2 used with AN/ARC-54	Homing on FM transmission within frequency range of 24 to 49 mhz	*Line of sight or 50 miles average conditions	Pedestal	The FM liaison set must be operated while homing

TABLE 5-2. COMMUNICATIONS AND ASSOCIATED ELECTRONIC EQUIPMENT (CONT)

FACILITY	NOMENCLATURE	USE	RANGE	LOCATION OF CONTROLS	REMARKS
VHF navigation (VOR, VAR, LOCALIZER)	Radio Receiving Set AN/ARN-30E or AN/ARN-82	VHF navigational aid and VHF audio reception in the frequency range of 108 to 126 mhz	*Line of sight	Pedestal	Information is presented aurally in headset, and visually on course indicator and bearing-heading indicators
Automatic direction finding	Direction Finder Set AN/ARN-59 or AN/ARN-83	Radio range and broadcast reception; automatic direction finding and homing in the frequency range of 190 to 1750 khz	*50 to 100 miles range signals 100 to 150 miles broadcase	Pedestal	
Magnetic heading indications	Gyro Magnetic Compass J-2 or AN/ASN-43	Navigational Aid		Instrument Panel	
Marker beacon reception	MB Receiver R-1041/ARN	Navigational Aid	Vertical to 50,000 feet	Instrument Panel	
Identification	Transponder Set AN/APX-44	Transmits a specially coded reply to a ground-based IFF radar interrogator system	*Line of sight	Pedestal	
Position fixing	Navigation Set AN/ASN-72	Receives low frequency (cw) signals 70-135 khz from ground station displaying helicopter present position	*250 miles	Pedestal	Displays present position on four display meters and flight log display head
FM liaison communications	Radio Set AN/ARC-131	Two-way voice communications and FM and continuous-wave homing	*Line of sight or 50 miles average conditions	Pedestal	

*Range of transmission and reception is dependent upon a number of variables including weather conditions, time of day, operating frequency, power of transmitter, and altitude of helicopter.

5-73. RADIO SET AN/ARC-51X.

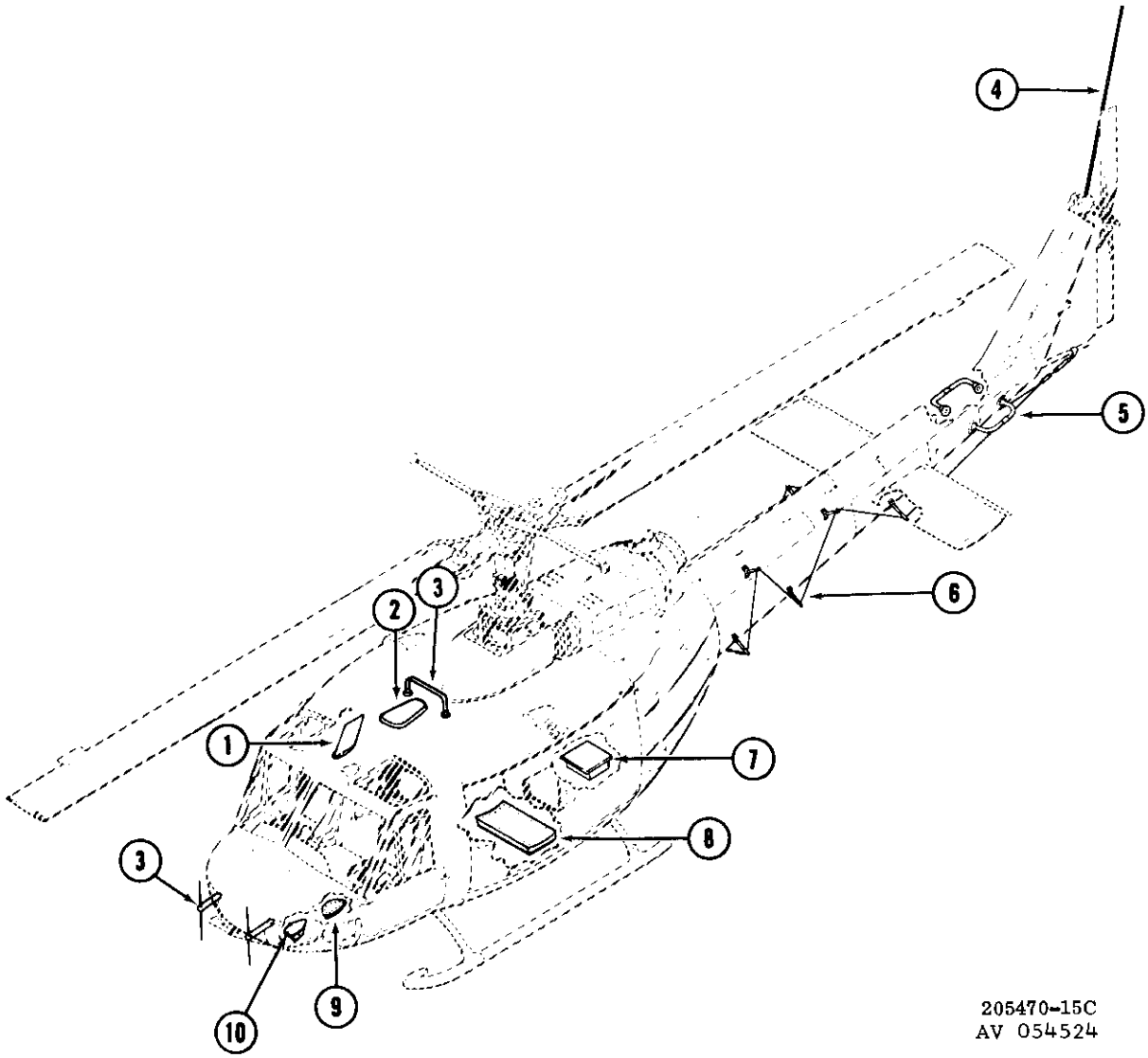
5-74. The ARC-51X Radio Set includes a receiver-transmitter and mount installed in the nose, a remote control panel installed on the pedestal and the UHF antenna installed on the cabin roof.

a. The receiver-transmitter is a pressurized unit. The internal air is cooled by heat exchangers and an externally mounted blower. The blower operates only when the internal temperature of the receiver-transmitter exceeds 95°F. Primary power to operate the ARC-51X equipment is supplied from the helicopter 28-volt DC power supply. The receiver-transmitter is controlled from the UHF remote control panel installed in the pedestal. For description of the control panel refer to paragraph 5-123 and see figure 5-8.

b. The UHF antenna used with the ARC-51X for reception and transmission is installed on the cabin roof, refer to paragraph 5-71 for description.

5-75. RADIO SET AN/ARC-51BX.

5-76. The ARC-51BX is similar to the ARC-51X (refer to paragraph 5-73) in purpose, operation and appearance. The receiver-transmitters differ in internal electrical circuitry only. The control panels differ as follows:



1. VHF/UHF Antenna
2. Loop (ADF) Antenna System
3. FM Homing Antenna
4. FM Radio Set Antenna
5. Omni Antenna System
6. HF Radio Set Antenna
7. Decca Antenna
8. Sense (ADF) Antenna
9. Marker Beacon Antenna
10. IFF Antenna

Figure 5-1. Antenna Installation - typical

a. Control Panel C-4677/ARC-51X tunes in 0.1 mc increments has a four-numbered frequency indicator, and contains a SENS control.

b. Control Panel C-6287/ARC-51BX tunes in 0.05 mc increments, has a five numbered frequency indicator, and does not have a sens control. The C-6287/ARC-51BX permits selection of 20 perset channels, and has a mode selector which permits preset channel selection, manual channel selection, and automatic switching of RT-742/ARC-51BX to the guard channel frequency. Refer to paragraphs 5-123 and 5-125 for description of the panels also see figures 5-8 and 5-9.

5-77. RADIO SET AN/ARC-73.

5-78. The VHF Radio Set AN/ARC-73 consists of a receiver-transmitter, dual mount, remote control panel, VHF antenna, and inter-connecting cable assemblies. The receiver and transmitter are contained in separate metal cases and mounted on a dual shock mount. The ARC-73 is an alternate for the UHF command set and when installed is mounted in the nose radio compartment where the UHF command set is normally installed. The receiver and transmitter are controlled from a single control panel mounted in the pedestal, for a description of the panel, refer to paragraph 5-127 and see figure 5-10. The VHF antenna and UHF antenna are contained in the same housing.

5-79. RADIO SET AN/ARC-134.

5-80. The VHF Radio Set AN/ARC-134 consists of a receiver-transmitter, mount, remote control panel, VHF antenna, and interconnecting cable assemblies. The AN/ARC-134 is an alternate for the UHF command set and when installed, the receiver-transmitter is mounted in the heater compartment. The receiver-transmitter is controlled from a remote control panel mounted in the pedestal. For a description of the panel, refer to paragraph 5-129 and see figure 5-11. The VHF antenna and UHF antenna are contained in the same housing. (Refer to paragraph 5-71.) Primary power to operate the receiver-transmitter is from the helicopter 28-volt DC power supply system.

5-81. RADIO SET AN/ARC-102.

5-82. The AN/ARC-102 Radio Set consists of a receiver-transmitter installed in the aft radio compartment; an antenna coupler and impedance matching network installed in the forward section of the tail boom; a long wire type antenna installed on each side of the tail boom; remote control panel installed in the pedestal; and interconnecting cable assemblies. Complete provisions are provided for installation of the ARC-102.

a. The receiver-transmitter is composed of eleven plug-in modules, which includes an interchangeable internal power supply. The complete unit is contained in a metal case and weighs 50 pounds. The receiver-transmitter is controlled from the control panel installed in the pedestal. For description of the panel refer to paragraph 5-135; also see figure 5-14. Primary power to operate the receiver-transmitter is supplied from the helicopter 28-volt DC power supply.

b. The ARC-102 antenna coupler is mounted in the forward section of the tail boom. The coupler automatically matches the impedance of the long wire antenna (see 6, figure 5-1) to the channel frequency selected on the remote control unit. Power to operate the antenna coupler is supplied from the receiver-transmitter.

5-83. VHF NAVIGATION RECEIVER - AN/ARN-30.

5-84. The VHF navigation set consists of a receiver and converter, which are contained in separate metal housings and installed on a dual mount in the aft radio compartment; a power supply unit is mounted externally on the receiver housing. Other equipment includes: an omni antenna with one element mounted on each side of the aft section of the tail boom; (see 5, figure 5-1) and remote control panel mounted in the pedestal, (refer to paragraph 5-137) and see figure 5-15) and a course indicator mounted on the instrument panel (refer to paragraph 5-141 and see figure 5-17).

5-85. NAVIGATION RECEIVER - AN/APN-82 VHF.

5-86. The AN/ARN-82 navigation system consists of a receiver and mount, a remote control panel, an omni antenna, course indicator and interconnecting cable assemblies. The receiver is a transistorized unit and is mounted in the nose section of the helicopter. Primary power to operate the set is supplied from the helicopter electrical system. The essential bus supplies 28-volts DC and the 28-volt transformer supplies 400 cycle 28-volt AC. Operating voltages are supplied by a transistorized power unit within the receiver housing. The antenna used with the system is the DMS4-4 antenna installed on the aft tail boom. (See 5, figure 5-1.)

a. The navigation receiver is controlled by the use of remote control panel C-6873/ARN-82. For a description of the control panel and the functions of the individual controls refer to paragraph 5-139, and see figure 5-16.

b. Navigational data received via the ARN-82 navigation receiver is presented aurally through the intercom system and visually on the ID-1347/ARN-82 Course Indicator, and the bearing-heading indicators. For description of the ID-1347/ARN-82 course indicator refer to paragraph 5-143. For description of the bearing-heading indicators refer to paragraph 5-149, and see figure 5-21.

5-87. DIRECTION FINDER SET.

5-88. The direction finder set consists of a receiver, a control unit, a power unit, loop and sense antennas and two indicators.

a. The receiver is a three-band unit mounted in the nose radio compartment. Frequency band selection is accomplished from the remote control panel, by a band switching DC motor and a 4000-to-1 speed reduction gear train. Turning the receiver is accomplished through a flexible mechanical linkage that connects the receiver and remote control unit. For a description of the control unit, refer to paragraph 5-145 and see figure 5-19.

b. The power unit consists of a dynamotor and alternator. Primary power from the helicopter 28-volt DC system is supplied to the power unit. The power unit then supplies the operating voltages for the direction finder equipment. The power unit is mounted in the nose radio compartment.

c. The loop antenna (see 2, figure 5-1) is enclosed in a streamlined housing and is installed on top of the cabin roof. The sense antenna (8, figure 5-1) is also part of the direction finder equipment. It is installed beneath the cargo area.

d. Information received via the direction finder set is presented on the pilot's bearing-heading indicator (figure 5-21) and the copilot's bearing-heading indicator. For further description of the bearing-heading indicators refer to paragraph 5-149.

5-89. DIRECTION FINDER SET - AN/ARC-83.

5-90. The AN/ARN-83 Direction Finder Set consists of a receiver, a control unit, a loop antenna, a sense antenna, and two indicators.

a. The receiver is a three-band transistorized unit, mounted in the aft radio compartment. Primary power to operate the receiver is supplied from the 28-volt DC essential bus. The receiver is controlled by the use of a remote control unit mounted in the pedestal. For description of the control unit refer to paragraph 5-147 and see figure 5-20.

b. The loop antenna and sense antenna are used with the ARN-83 direction finder system. The loop antenna (see 2, figure 5-1) is installed on top of the cabin roof. The sense antenna (see 8, figure 5-1) is installed on the fuselage beneath the cargo area.

c. Information received via the direction finder set is presented visually on the pilot's and copilot's radio magnetic indicators and aurally through the intercom system.

5-91. TRANSPONDER SET AN/APX-44.

5-92. Transponder Set AN/APX-44 consists of a receiver-transmitter and mounting, a remote control panel, antenna and interconnecting cable assemblies.

a. The receiver-transmitter when installed is located on a mounting in the aft radio compartment. The equipment is controlled from the pedestal mounted control panel. For description of the control panel refer to paragraph 5-153 and see figure 5-22. Power to operate the transponder set is supplied from the helicopter 28-volt DC power supply system.

b. The antenna (10, figure 5-1) used with the transponder set is a lightweight blade type. It is installed beneath the nose section of the helicopter.

5-93. MARKER BEACON RECEIVER.

5-94. The marker beacon equipment consists of a receiver and mount, indicator lamp, remote volume control, sensitivity switch and antenna.

a. The marker beacon receiver is contained in a metal case and mounted on a bracket in the nose radio compartment. Power to operate the receiver is supplied from the helicopter 28-volt DC power supply system.

b. The indicator light, sensitivity switch, and combination on-off switch and volume control are mounted on the lower right corner of the instrument panel. The volume-control-on-off switch applied power to the receiver and adjusts the audio level. The sensitivity switch control internal circuits in the receiver to increase the gain for weak signals. The indicator light illuminates when the aircraft is over a marker beacon transmitter.

c. The marker beacon antenna (9, figure 5-1) is installed on the fuselage below the cabin area. The antenna is a 50-ohm impedance antenna, which is used to receive the 75-megacycle signal transmitter by ground transmitter.

5-95. GYRO MAGNETIC COMPASS.

5-96. The J-2 Gyro Magnetic Compass System consists of a remote compass transmitter, directional gyro control, slaved gyro magnetic compass amplifier, two heading indicators, slaving switch and interconnecting cable assemblies.

a. The compass transmitter is installed in the tail boom. It is the direction sensing unit of the gyro magnetic compass system. The compass transmitter consists of a hemispherical bowl, which houses the functioning assemblies, and is attached to a mounting flange and compensator.

b. The directional gyro control is installed in the aft radio compartment. The gyro is slaved to the earth's magnetic meridian by the compass transmitter (in the free mode of operation the gyro operates as a free gyro). The heading of the aircraft is indicated on the pilot's and copilot's heading indicators, when the system is operating in the slaved mode. For description of the heading indicator refer to paragraph 5-149, and see figure 5-21.

c. The compass amplifier is installed in the aft radio compartment near the directional gyro. The amplifier controls and amplifies voltages from the transmitter to the directional gyro. Operating voltages for the gyro magnetic compass system are supplied from the 28-volt DC bus, the 26-volt AC bus and the 115 volt AC bus. An AC-DC Interlock Relay insures that AC and DC operating voltages are applied simultaneously to prevent damage to the system.

5-97. GYRO MAGNETIC COMPASS SET AN/ASN-43.

5-98. The gyro magnetic compass set consists of a remote compass transmitter, directional gyro, magnetic flux compensator, electronic control amplifier, COMPASS SLAVING switch, and two bearing-heading indicators.

a. The remote compass transmitter is installed in the tail boom. It is the direction sensing unit of the compass set. The unit consists of a hemispherical bowl, which houses the functioning assemblies, and is attached to a mounting flange and to the magnetic flux compensator.

b. A sealed directional gyroscope and electronic amplifier are mounted on the same base and installed in the aft radio compartment. The gyro contains automatic leveling circuits and precission coils for slaving the gyro to the magnetic reference in the slaved mode. The precession coils are used in the free gyro mode to provide latitude corrected drift. Primary power 115-volt AC power is supplied from the AC circuit breaker panel to a power supply in the base of the directional gyro. This power supply furnishes voltage to operate the gyro and amplifier and to excite the remote compass transmitter. The base also contains a relay operated by the COMPASS SLAVING switch to change operation from the free gyro mode by the slaved mode.

c. The electronic control amplifier is required to amplify error signals for the radio magnetic indicator and to supply power to drive a heading card in the radio magnetic indicator. It is mounted on a bracket in the nose radio compartment. For description of the bearing heading indicator, refer to paragraph 5-149 and figure 5-21.

d. The compass controls, except the COMPASS SLAVING switch. are incorporated in the radio magnetic indicator. (Refer to paragraph 5-149.) The COMPASS SLAVING switch (figure 2-5) is located in the center of the instrument panel. When the switch is in the MAG HDG position, the set is operating in the slaved gyro mode. When the switch is in the GYRO HDG position the set is operating in the free gyro mode.

5-99. EMERGENCY VHF TRANSMITTER.

5-100. The T-366 Emergency Transmitter is installed on a mount in the nose radio compartment. The transmitter is controlled from a control panel mounted in the pedestal, for description of the panel refer to paragraph 5-131, and see figure 5-12. Power to operate the transmitter is supplied from the helicopter 28-volt DC system.

5-101. RADIO TRANSMIT, ICS TRIGGER SWITCH.

5-102. The pilot and copilot are each provided with a trigger switch for keying intercom and transmitting circuits. The switch is located on the forward section of the cyclic stick grip (see 17, figure 2-4). The switches are two position switches, depressing the switch to the first detent keys the intercom circuit; depressing the switch to the second detent keys the transmitting circuit.

5-103. RADIO TRANSMIT FOOT OPERATED SWITCH.

5-104. A foot operated switch (12, figure 2-4) is also provided for the pilot and copilot. The switches are located on the floor just forward of the pilot's and copilot's station. The switches have only one position; when pressed they key the transmitter or (INT) interphone, whichever is selected with the transmit-interphone selector switch on the singla distribution panel.

5-105. NAVIGATION SET AN/ASN-72.

5-106. The Navigation Set AN/ASN-72 consists of a receiver, computer, antenna, preamplifier, two control panels, flight log display, decometer box with three decometers, and a lane identification meter.

a. The receiver and computer are mounted in the tail boom. Primary power to operate the navigation set is supplied from the helicopter 28-volt DC power supply system. The receiver is controlled by a remote control panel mounted in the pedestal. For description of the control panel, refer to paragraph 5-155 and figure 5-23. The computer is controlled by a remote control panel mounted in the pedestal. For description of the control panel, refer to paragraph 5-157 and figure 5-24.

b. The antenna for the navigation set is installed on the fuselage beneath the aft access door. (See 7, figure 5-1.) The preamplifier is mounted on top of the antenna.

c. Navigational data received via the navigation set is displayed on a flight log display and three decometers and lane identification meter. The three decometers and lane identification meter are mounted in a box on the left side of the pedestal.

5-107. TRANSPONDER SET - AN/APX-72.

5-108. The transponder set consists of a receiver-transmitter and mounting, remote control panel and antenna.

a. The receiver-transmitter is installed in the tail boom. The set is controlled from the AN/APX-72 control panel which is mounted in the pedestal. For description of the control refer to Section III, Operating Controls. Primary power to operate the set is supplied from the helicopter 28-volt DC electrical system.

b. The set is encased in a two-sectional housing suitable for pressurizing. A silicon rubber packing serves as a pressure seal between the two sections which are joined together by an encircling flange coupler with clamp. The upper section of the housing contains a chassis with compartments for seven digital circuitry printed circuit board and a plug-in power supply. A frontal panel, containing these fuse holders, an elapsed time meter, a MODE 2 switch assembly, the power control connector and a folding handle, is fastened to the upper section of the case. The lower section of the housing contains the rf and video circuit components, the antenna connector and pressurization valve.

5-109. RADIO SET - AN/ARC-131.

5-110. Radio Set AN/ARC-131 consists of a receiver-transmitter, remote control panel unit, communication antenna and a homing antenna.

a. The receiver-transmitter is installed in the nose radio compartment and secured to the mounting by a locking handle. The receiver-transmitter contains the receive and transmit circuits of the radio set. Three coaxial connectors and a multiple-pin connector, at the rear of the receiver-transmitter, mates with connectors on the connector plate for required antenna and electrical connections. Power to the receiver-transmitter is supplied from the helicopter 28-volt DC electrical system.

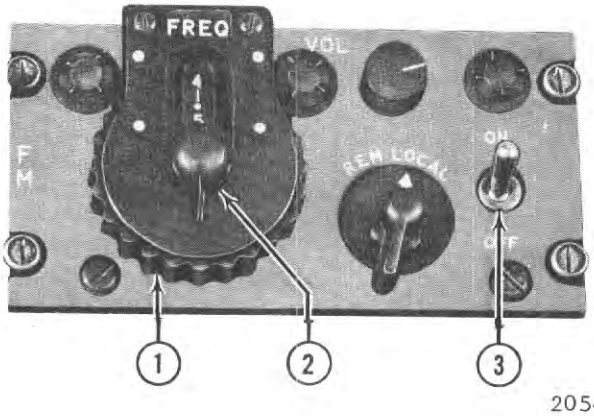
b. The communications antenna is a whip type mounted on the helicopters aft tail boom section.

c. The homing antenna is a one-piece unit installed on the forward area of the helicopter roof. Data provided by the homing facility is displayed visually on the course indicator which is mounted on the instrument panel.

Section III - Operating Controls

5-111. FM CONTROL PANEL SB-327/ARC-44.

5-112. Control Panel SB-327/ARC-44 (see figure 5-2) is marked FM. The panel is mounted on the pedestal and is used to control the FM receiver-transmitter. The controls located on the panel and their functions are as follows:



205475-36
AV 054525

1. Whole Megacycle Selector
2. 1/10 Megacycle Selector
3. Power Switch

Figure 5-2. FM control panel SB-327/ARC-44

CONTROL	FUNCTION
Power ON-OFF switch	Turns primary power to radio set ON or OFF.
REM LOCAL switch	Must always be in the LOCAL position. REMote used only when two or more panels are used.
One tenth and whole megacycle selector switch	Selects the receiving and transmitting frequency of the FM receiver-transmitter as indicated in the FREQ window. Outside knurled knob selects the first two numbers of whole number. Inside knob selects the third number or one tenth megacycle number of the desired frequency.
Receiver VOL control	Adjusts FM receiver audio volume.

5-113. SIGNAL DISTRIBUTION PANEL SB-329/AR.

5-114. The SB-329/AR Signal Distribution Panel (see figure 5-3) is marked INT. Two of the panels are installed in the pedestal for pilot and copilot and one is installed in the cabin roof, aft of the overhead console. The signal distribution panel provides interphone circuits and microphone and headset amplifiers for the radio equipment. Switching circuits enables the crew to monitor as many as five receivers. The pilot and copilot may supply audio to any one of three transmitters that may be installed in the aircraft. Power to operate the signal distribution panels is supplied through a switch marked ICS on the ARC-44 switch panel (see figure 5-4 and refer to paragraph 5-115). The controls located on the signal distribution panel and their functions are as follows:

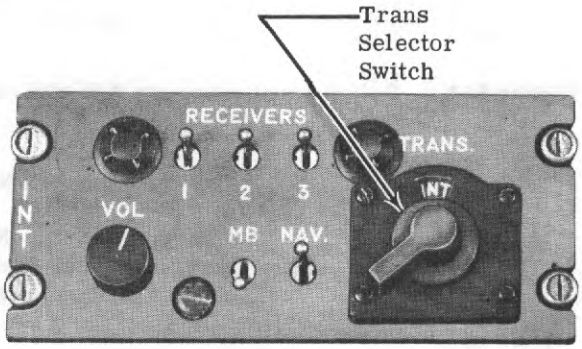


Figure 5-3. Signal distribution panel SB-329/AR

CONTROL	FUNCTION
Receive switches	The switches marked 1, 2, 3 MB and NAV are for connecting or disconnecting receiver audio signals to the associated headset. The up position is on and connects the receiver. The down position is off and disconnects the receiver. The number 1 switch is for the FM receiver, number 2 switch is for the UHF receiver and switch numbers 3 is for the VHF receiver when installed. The switch marked MB connects audio from the marker beacon receiver, and the switch marked NAV connects audio from the ADF or VHF navigation receivers.
TRANS selector switch	This is a rotary type switch with indicator window at the top. The switch has four positions, INT, 1 (FM), 2(UHF), and 3 (VHF). Positions 1, 2, and 3 select the receiver-transmitter to be used to receive or transmit regardless of the position

CONTROL	FUNCTION
	of the RECEIVERS 1, 2, 3 switches. The INT position connects signal distribution panels for interphone operation. The operator will hear side tone when transmitting. The other crew-member will hear the interphone message regardless of the position of their TRANS selector switch.
VOL control	Adjusts the volume level of the audio applied to the headset associated with the INT signal distribution panel.

5-115. FM SWITCH PANEL AN/ARC-44.

5-116. The switch panel assembly (see figure 5-4) is mounted in the pedestal and contains five toggle switches. The switches are numbered 1, 2, 3, 4 and 5 and their functions are as follows:

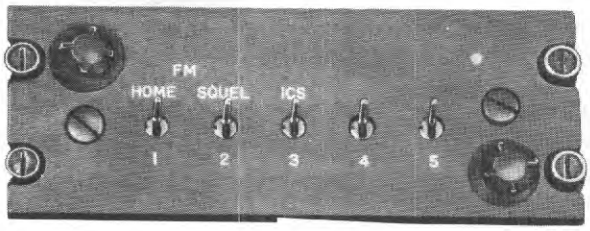


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Figure 5-4. Switch panel assembly AN/ARC-44

CONTROL	FUNCTION
No. 1 HOME switch	In the up position the No. 1 HOME switch energizes the homing circuits and disables FM transmitter. When the switch is in the down position, the homing operation is disabled, allowing radio set to return to normal operation.
No. 2 SEQ switch	In the up position, the FM receiver output is sequelched. In the down position the receiver is unsquelched, allowing back-ground noises to be heard.
No. 3 ICS switch	In the up position the ICS circuit is energized. In the down position, ICS circuit is disabled.
No. 4 switch	The No. 4 switch is used for auxiliary FM receiver squelch when auxiliary FM receiver is installed.
No. 5 switch	Not used.

5-117. SIGNAL DISTRIBUTION PANEL C-1611/AIC.

5-118. Signal Distribution Panel C-1611/AIC (see figure 5-5) is marked INT. Two of the panels are installed in the pedestal, one each for the pilot and co-pilot. Another panel is installed in the cabin roof aft of the overhead console for the medical attendant. The C-1611/AIC panels are used as an intercommunication and radio control system. The panels may be

used in any one of three different modes as determined by the setting of the switches and controls on the panel. The three modes of operation are two-way (air-to-air or air-to-ground) radio communication between the crew members. The switches and controls located on the C-1611/AIC panel and their functions are as follows:

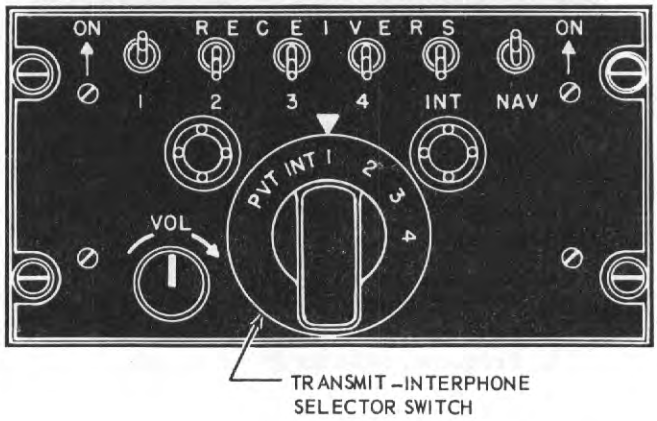

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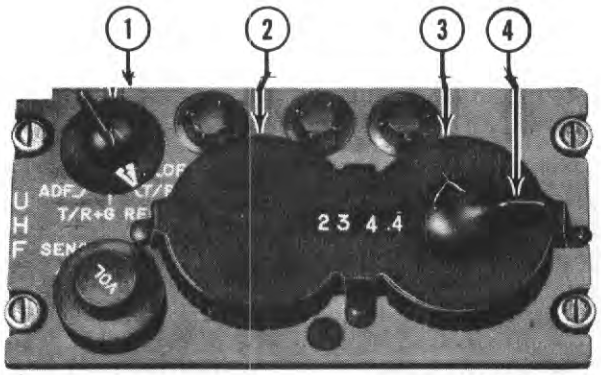
Figure 5-5. Signal distribution panel C-1611A/AIC

CONTROL	FUNCTION
RECEIVERS switches 1, 2, 3 and 4	The switches marked 1(FM), 2 (UHF), 3(VHF) and 4(HF) are for connecting or disconnecting audio to the headset.
RECEIVERS INT switch	Up position connects audio from the VHF navigation receiver, the ADF, and marker beacon to the earphones of the associated headset. Down position disconnects the audio from the headset.
VOL control	Adjusts the earphone volume of all radio receivers except NAV receivers. Maximum obtainable volume on all receivers depends on the setting of the volume control on each receiver.
Transmit-interphone selector switch	Positions 1(FM), 2(UHF), 3(VHF) and 4(HF) connect the receiver-transmitter to the associated headset for voice communication; cyclic stick trigger switch or foot switch must be depressed to transmit. Position INT connects the headset microphone to the interphone system. Position PVT energizes the interphone system for hot mic operation; no external key is needed.

5-119. UHF CONTROL PANEL C-1827/ARC-55B.

5-120. UHF Control Panel C-1827/ARC-55B (see figure 5-6) is marked UHF. The panel is mounted in the pedestal and is used to control the ARC-55B receiver-transmitter. The controls located on the panel and their functions are as follows:



205475-32
AV 054529

1. Function Selector Switch
2. Frequency Selector (First Two Digits)
3. Frequency Selector (Third Digit)
4. Frequency Selector (Fourth Digit)

Figure 5-6. UHF control panel C-1827/ARC-55B

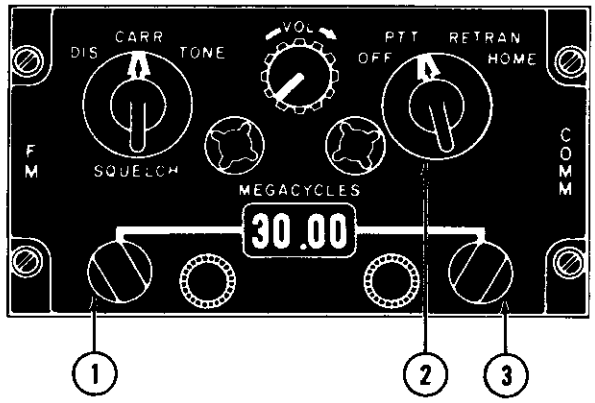
CONTROL	FUNCTION
Selector switch	Applies power to the radio set and selects the mode of operation. OFF position - turns off primary power. T/R position - transmitter and main receiver are on. T/R + G REC position - transmitter, main receiver and guard receiver are on. ADF position - Note used.
Volumn sensitivity control	This is a dual purpose rotary control. The larger or outer knob is marked SENS, and controls receiver sensitivity. The smaller or inner knob is marked VOL, and controls receiver volume.
Tuning controls	The tuning controls consist of two large control knobs, an inner control knob, and an indicator window. The large knob on the left side selects the first two digits (or ten megahertz number). The large knob on the right side selects the third digit (or one megahertz number). The inner knob selects the fractional (or tenth megahertz number).

5-121. CONTROL PANEL C-3835/ARC-54.

5-122. Control Panel C-3835 (see figure 5-7) is marked FM COMM and is mounted in the pedestal. The control panel is used to control the AN/ARC-54 Radio Set. The controls located on the panel and their functions are as follows:

CONTROL	FUNCTION
Mode selector switch	Applies power to the set and selects the mode of operation. OFF position - Turns off primary power PTT (push-to-talk) applies power. Radio set operates in normal communication mode. (Radio cyclic stick switch or foot switch must be pressed to transmit.) RETRAN (retransmit) - applies power. Radio set operates as a two-way relay station. (Two radio sets are required) HOME position - Applies power and radio set operates with 637A-2 Homing Antenna and Course indicator as a homing facility. Voice capability is provided in all three operating positions.

CONTROL	FUNCTION
VOL control	Controls the receiver audio volume.
SQUELCH control	Selects one of three squelch modes as follows: DIS (disable) position - squelch circuits are disabled. CAR (carrier) position - squelch circuits operate normally. TONE position - squelch opens (unsquelches) only on signals containing a 150-cps tone modulation.
Frequency control whole-megahertz digit	Selects the whole megahertz digits
Frequency control decimal-megahertz digit	Selects the decimal-megahertz digits.
MEGAcycles display window	Displays the selected operating frequency.



205475-33
AV 054530

1. Frequency Control Whole - Megacycle
2. Mode Selector Switch
3. Frequency Control Decimal - Megacycle

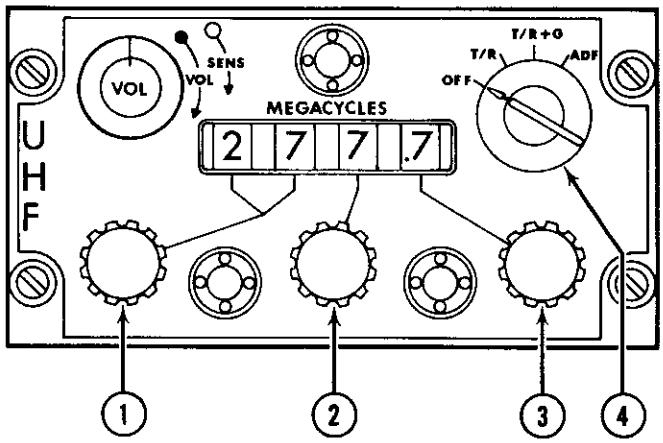
Figure 5-7. FM control panel C-3835/ARC-54

5-123. CONTROL PANEL C-4677/ARC-51X.

5-124. Control Panel C-4677 (figure 5-8) is marked UHF and is mounted in the instrument panel. The control panel is used to control the AN/ARC-51X Radio Set. The controls located on the panel and their functions are as follows:

CONTROL	FUNCTION
Function select switch	Applies power to the radio and selects type of operation as follows: OFF position - removes operating power from radio set. T/R position - applies power to the set and permits transmission and reception; guard receiver is not operative. T/R + G position - Permits transmission and reception; guard receiver is operative. ADF position - Not used.
VOL control	Controls the receiver audio volume.
SENS control	Adjusts main receiver sensitivity. When rotated fully clockwise the control disables the squelch.

CONTROL	FUNCTION
Ten-megacycles control	Selects the first two digits (or ten-megahertz number).
One-megahertz control	Selects the third digit (or one-megahertz number).
One-tenth megahertz control	Selects the fourth digit (or tenth-megahertz number).



205475-13A
AV 054531

1. Frequency Selector (First Two Digits)
2. Frequency Selector (Third Digit)
3. Frequency Selector (Fourth Digit)
4. Function Selector Switch

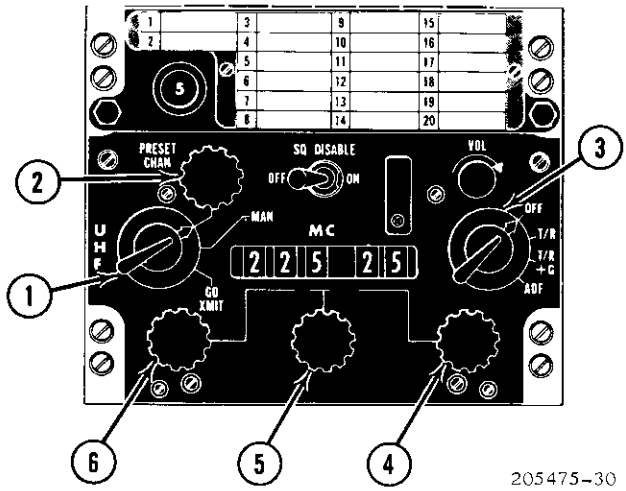
Figure 5-8. UHF control panel C-4677/ARC-51X

5-125. CONTROL PANEL C-6287/ARC-51BX.

5-126. Control Panel C-6287 (see figure 5-9) is marked UHF and is mounted in the pedestal. The control panel is used to control the AN/ARC-51BX Radio Set. The controls located on the panel and their functions are as follows:

CONTROL	FUNCTION
Function select switch	Applies power to radio set and selects type of operation as follows: OFF position - Removes operating power from the set. T/R position - Transmitter and main receiver ON. T/R + G position - Transmitter, main receiver and guard receiver ON. ADF position - Not used.
VOL control	Controls the receiver audio volume.
SQ DISABLE switch	In the ON position squelch is disabled. In the OFF position, the squelch is operative.
Mode selector	Determines the manner in which the frequencies are selected as follows:

CONTROL	FUNCTION
	PRESET CHAN position - permits selection of one of 20 preset channels by means of preset channel control.
	MAN position - Permits frequency selection by means of megacycle controls.
	GD XMIT position - Receiver-transmitter automatically tunes to guard channel frequency.
PRESET CHANnel	Permits selection of any one of 20 preset channels.
Preset channel indicator	Indicates the preset channel selected by the preset channel control.
Ten megacycle control	Selects the first two digits (or ten-megahertz number).
One megacycle control	Sslects the third digit (or 1 megahertz number).
Five-hundredths megahertz control	Selects the fourth and fifth digits (or 0.05 megahertz number).



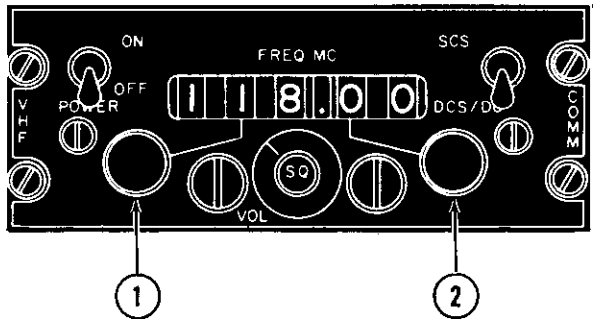
205475-30
AV 054532

1. Mode Selector
2. Preset Channel Control
3. Function Select Switch
4. 0.05 Megacycle Control
5. 1 Megacycle Control
6. 10 Megacycle Control

Figure 5-9. UHF control panel C-6287/ARC-51BX

5-127. CONTROL PANEL 614U-6.

5-128. Control Panel 614U-6 (figure 5-10) is marked VHF COMM. The panel is installed in the pedestal and is used to control the AN/ARC-73 Radio Set. The controls located on the panel and their functions are as follows:



205475-29
AV 054533

1. Megacycle Control Knob
2. Kilocycle Control Knob

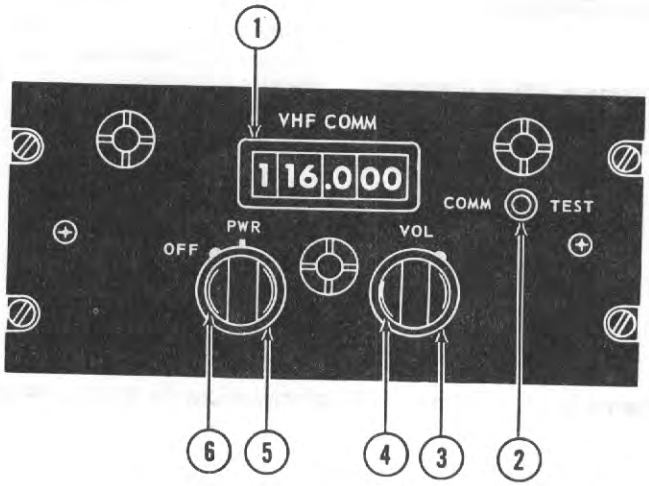
Figure 5-10. VHF control panel 614U-6/ARC-73

CONTROL	FUNCTION
POWER Switch	Turns primary power to the radio set ON or OFF.
VOL control knob	Controls the receiver audio volume.
SQ control knob	Adjusts the squelch threshold level of the receiver output.
Megacycle control knob	Selects receiver and transmitter frequency in 1-mhz steps.
Kilocycle control knob	Selects receiver and transmitter frequency in 50-khz steps.
FREQ MC indicator window	Indicates receiver and transmitter frequency selected.
SCS-DCS/DCD switch	Not used.

5-129. CONTROL PANEL C-7197/ARC-134.

5-130. Control Panel C-7197/ARC-134 (figure 5-11) is marked VHF COMM. The panel is installed in the pedestal and is used to control the AN/ARC-134. Radio Set. The control located on the panel and their functions are as follows:

CONTROL	FUNCTION
OFF-PWR switch	Turns power to the set ON-OFF.
VOL control	Controls the receiver audio volume.
COMM-TEST switch	Turns squelch on or off.
Megahertz control	Selects whole number part of operating frequency.
Kilohertz control	Selects the decimal number part of the operating frequency.



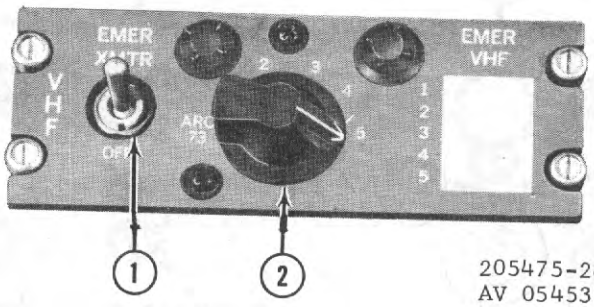
209078-17A
AV 054534

1. Frequency Indicator
2. Communication Test Switch
3. Volume Control
4. Kilocycle Selector
5. Off/Power Switch
6. Megacycle Selector

Figure 5-11. VHF control panel C-7197/ARC-134

5-131. VHF EMERGENCY TRANSMITTER CONTROL PANEL.

5-132. The Emergency Transmitter Control Panel (figure 5-12) is marked VHF and is installed in the pedestal. The controls located on the panel and their functions are as follows:



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AV 054535

1. Power Switch
2. Channel Selector

Figure 5-12. VHF emergency transmitter control panel

CONTROL	FUNCTION
Power switch	Turns power on and off.
Channel selector switch	Selects the desired crystal controlled operating frequency. The first position selects the ARC73 Radio Set. The frequencies selected at positions 2, 3, 4 and 5 are listed on the placard on the panel.

5-133. EMERGENCY COMMUNICATIONS SWITCH PANEL.

5-134. A switch panel (see figure 5-13) is provided for emergency operation. It is installed in the pedestal and permits operation of all remaining equipment should the AN/ARC-44 system fail. The panel contains two switches, their functions are as follows:

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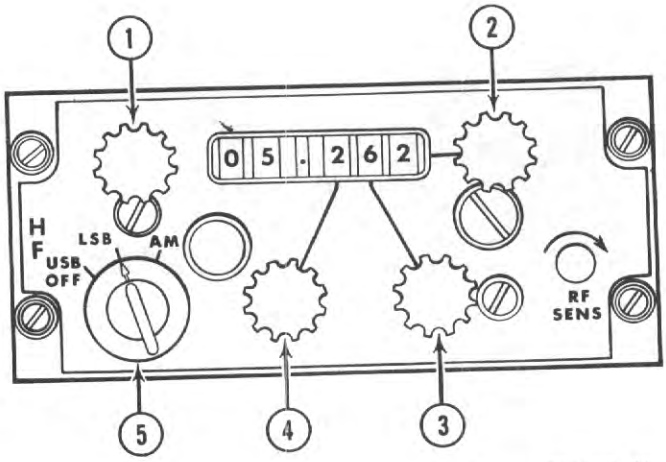
Figure 5-13. Emergency communication switch panel

CONTROL	FUNCTION
Pilot and copilot switches	Up position permits normal operation of UHF, VHF and interphone equipment. Down position permits operation of the standby transmitter.

5-135. HF CONTROL PANEL.

5-136. The HF control panel (see figure 5-14) is marked HF and is installed in the pedestal. It provides remote control of the AN/ARC-102 Radio Set. The operating controls and their functions are as follows:



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1. Frequency Selector (First Two Digits)
2. Frequency Selector (Fifth Digit)
3. Frequency Selector (Fourth Digit)
4. Frequency Selector (Third Digit)
5. Function Selector Switch

Figure 5-14. HF radio control panel

CONTROL	FUNCTION
Function selector switch (4-position rotary switch)	OFF position - Turns off primary power to the radio set. USB position - Energizes radio set for upper sideband mode of operation. LSB position - Energizes radio set for lower sideband mode of operation. AM position - Energizes radio set for amplitude modulation mode of operation.
Megahertz select knobs	Four knobs used to select the desired frequency as follows: Upper left knob selects the first two digits of the desired frequency. Left center knob selects the third digit. Right center knob selects the fourth digit. Upper right knob selects the last digit of the operating frequency.
RF SENS knob	Controls the receiver audio volume.

5-137. VHF NAVIGATION CONTROL PANEL.

5-138. The VHF navigation control panel (see figure 5-15) is marked VOR ILS and is installed in the pedestal. It provides control of the AN/ARN-30E Navigation (omni) Receiver. The controls located on the panel and their functions are as follows:

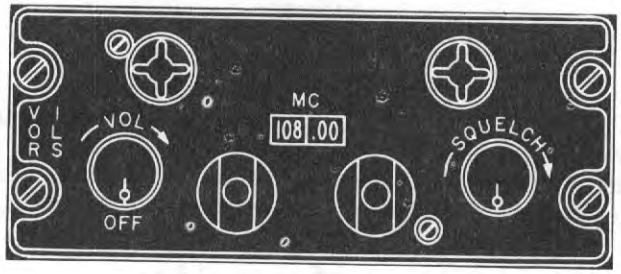

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Figure 5-15. VHF navigation receiver control panel

CONTROL	FUNCTION
VOL-OFF switch	Turns primary power to the radio set ON or OFF and controls the receiver audio volume.
SQUELCH control	Controls receiver squelch circuit.
Whole megacycle control	Selects receiver and transmitter frequency in 1 mhz steps.
Fractional megacycle control	Selects receiver and transmitter frequency in 0.1 mhz steps.

5-139. NAVIGATION CONTROL PANEL C-6873/ARN-82.

5-140. The C-6873/ARN-82 Control Panel (see figure 5-16) is marked NAV-COMM and is installed in the pedestal. It provides remote control of the AN/ARN-82 Receiver. The controls located on the panel and their functions are as follows:

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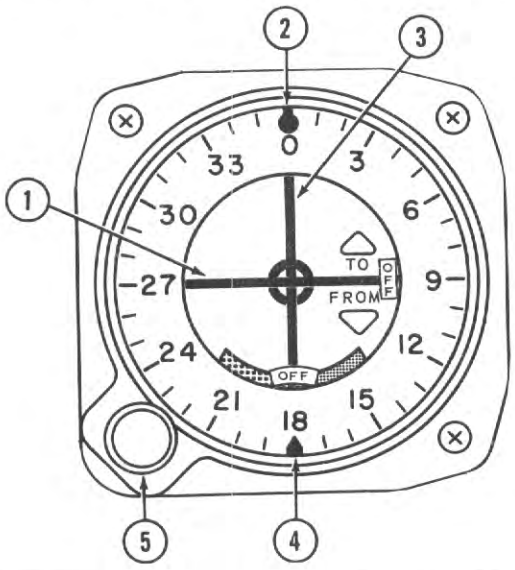
AV 054539

Figure 5-16. Navigation control panel C-6873/ARN-82

CONTROL	FUNCTION
VOL control	Controls receiver audio volume.
Power switch	Turns primary power to the radio set ON or OFF and allows for test of accuracy of Course Deviation Indicator in the TEST position.
Whole megahertz channel selector knob	This is the control knob on the left side. It is used to select the whole megahertz number of the desired frequency.
Fractional megahertz channel selector knob	This is the control knob on the right side. It is used to select the fractional megahertz number of the desired frequency.

5-141. COURSE INDICATOR.

5-142. The course indicator (see figure 5-17) is installed in the instrument panel. The purpose of the indicator is to present a visual indication of the position of the helicopter relative to the station being received. Information presented on the course indicator is received via the VHF navigation receiver and converter, and from the AN/ARC-54 when it is operating in the homing mode.



1. Horizontal Pointer
2. Reciprocal Pointer
3. Vertical Pointer
4. Course Pointer
5. Course Selector Knob

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AV 054540

Figure 5-17. Course Indicator