TM 55-1520-210-10

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL
ARMY MODEL UH-1D HELICOPTER

This copy is a reprint which includes current pages from Change No. 1

HEADQUARTERS, DEPARTMENT OF THE ARMY

1965

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *28 December 1965*

TM 55-1520-210-10 is published for the use of all concerned.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON
General, United States Army,
Chief of Staff.

Official:
J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution

To be distributed in accordance with DA Form 12-31 requirements for operator's instructions for UH-1 aircraft.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1966—204443/114

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*This manual supersedes TM 55-1520-210-10, 30 September 1964, including C 1, 25 January 1965, C 2, 2 April 1965, C 3, 30 July 1965, and C 4, 30 July 1965.

CHANGE
No. 8

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *25 April 1967*

Operator's Manual

ARMY MODEL UH-1D HELICOPTER

TM 55-1520-210-10, 28 December 1965, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 2, sections I and II	2-1 and 2-2	2-1 thru 2-2A
section II	2-21 thru 2-24	2-21 thru 2-24A
	2-32A thru 2-34A	2-32A thru 2-34
Chapter 3, section II	3-3 thru 3-6	3-3 thru 3-6
Chapter 6, section II	6-3 and 6-4	6-3 and 6-4
Chapter 9, sections I and II	9-1 and 9-2	9-1 and 9-2
Chapter 10, section III	10-17 and 10-18	10-17 and 10-18

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

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DISTRIBUTION:

To be distributed in accordance with DA Form 12-31 requirements for Operator and Crew Maintenance Instructions for UH-1D aircraft.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1967—254434/2827

CHAPTER 2
DESCRIPTION

Section I — Scope

2-1. Scope. The function of chapter 2 is to describe the helicopter and all its systems and controls which contribute to the physical act of flying the helicopter.

2-2. Included in this chapter is all the emergency equipment that is not part of the auxiliary system. This chapter contains description only. The procedures are covered elsewhere in this manual.

Section II — Aircraft Systems and Controls Description

2-3. General Configuration and Arrangement. The YUH-1D and UH-1D helicopters, manufactured by the Bell Helicopter Company, are military type aircraft of a compact design, featuring a low silhouette and low vulnerability in order to meet combat requirements. A wide cargo-passenger compartment, with large cubic foot volume, permits the helicopter to be used in a variety of services: for transport of personnel, special teams or crews, and equipment and supplies; for medical evacuation and emergency ambulance service between medical installations where fixed-wing aircraft cannot be used; and as an instrument trainer. This helicopter is capable of operating from prepared take-off landing areas, under instrument (IFR) conditions (including light icing), day or night. It can also be used to navigate by dead reckoning or by use of radio aids to navigation. Maximum visibility is afforded the pilot and crew by use of transparent plastic panels at the top, front, bottom, and sides of the cabin.

2-4. Access. Entrance is accomplished by means of four doors. Crew entrance is through the two swing-hinged doors located in the forward cabin next to the pilot's and copilot's stations. Entrance to the cargo-passenger area aft of the pilot's and copilot's stations is accomplished by means of two large sliding doors, one on each side of the aft cabin area. The cargo-passenger area provides seating for a maximum of eleven passengers or troops, in one of two alternate arrangements. One arrangement consists of five seats facing forward across the cabin immediately forward of the transmission support structure and six seats facing outboard, three on either side of the center line of the helicopter, located as follows: one immediately aft of the pilot-copilot station and two immediately aft of the five seats located across the ship. Another seating arrangement is five seats facing outboard on each side of the helicopter approximately in line with the side faces of the transmission support structure and one seat facing forward immediately forward of the transmission support structure and the center line of the helicopter. Removing the passenger seats and the copilot's seat provides an unrestricted loading space for cargo or equipment transportation. For medical evacuation and ambulance service, the area aft of the crew may be utilized to accommodate six litter patients and a medical attendant.

2-5. Propulsion. The propulsion system consists of the engine and drive system and is located aft of the cabin and mounted above the fuselage on a platform which provides footing for maintenance personnel while servicing the helicopter. The engine and drive system are enclosed by cowling that can be quickly opened or removed for easy access. This drive system with its independently mounted units and quick disconnect couplings, allows rapid servicing, and repair or replacement under combat conditions without the use of special tools or ground equipment. Use of this type drive system results in maximum availability of the helicopter for mission accomplishment.

2-6. Airframe. The fuselage consists of two main sections, the forward (cabin) section, and the aft (tail boom) section. The forward fuselage section consists primarily of two longitudinal beams with transverse bulkheads and metal covering. The beams provide the supporting structure for the cabin sections, landing gear, fuel tanks, transmission, engine, and tail boom and are attaching points for the external cargo suspension unit. The aft (tail boom) section is a semimonocoque structure with metal covering and attaches to the forward fuselage section with bolts to allow easy removal for repair or replacement. The rear of the tail boom supports the tail rotor, vertical fin, and synchronized elevator. The landing gear is of the skid type, attached to the fuselage at four points. Ground handling wheels are provided in the loose equipment and are quickly installed for moving the helicopter on the ground or removed to present a clean configuration for flight. The helicopter can be flown with cargo doors full open at 120 knots.

2-7. Crew Configuration. The crew required for operation of the helicopter consists of the pilot alone, pilot and rescue hoist operator, pilot and medical attendant, or pilot and copilot, depending on the mission assigned.

2-8. Principal Dimensions — Maximum. Maximum dimensions of the helicopter are as specified in table 2-1.

2-9. Weights. The helicopter weight empty and gross operating weight will change according to the configuration or equipment installed for the type of mission to be performed. Refer to chapter 12, Weight and Balance Computation.

2-10. Engine. The helicopter is equipped with one of the following engines: T53-L-9, -9A, -11, -11A, -11B, or -13. The engines are similar in design and, except for state differences (table 2-2), will be treated as one engine in the description. The turbine engine and its accessories are located aft of the cabin and mounted on a platform deck to provide maximum accessibility for servicing and maintenance (figure 2-2). The complete engine and power transfer system is enclosed in an easily opened or quickly removable light-weight cowling. This engine is a free turbine type designed for low fuel consumption, minimum size and weight, and maximum performance.

2-11. *Principles of Operation*. The engine consists of a reduction gear section, an axial-centrifugal compressor, a diffuser, a combustion chamber, a gas producer turbine, a power turbine, a power shaft, and an exhaust diffuser. The compressor consists of five axial stages and one centrifugal impeller, which produces a six to one compression ratio. The gas producer turbine drives the compressor and the power turbine drives the power shaft. An acceleration airbleed assembly mounted on the axial compressor section improves engine performance during starts and acceleration. The power shaft extends coaxially through the compressor rotor, and drives the reduction gearing at the forward end of the engine. Power is extracted through an internally-splined output gear shaft driven by the reduction gearing. The through shaft arrangement permits mounting the accessory drives and power takeoffs on the inlet housing, at the cool end of the engine, thus avoiding the problems of a hot end drive.

2-12. The free-power part of the engine eliminates the need for a clutch and provides free, smooth, and trouble-free engagement of the helicopter's rotor. The T53-L-9, -9A, -11 series, and -13 engines are rated at 900 hp at 6600 rpm for maximum continuous power minus installation losses.

2-12A. *Sand and Dust Separator*. The T53-L-9, -9A, -11 series, and -13 engines are equipped with a unit, mounted on the inlet housing, to separate sand and dust particles from the air entering the engine. This reduces erosion of engine parts. Particles removed from inlet air are held in box assemblies containing porous plastic foam inserts. The box assemblies can be easily removed for inspection and cleaning. Other components used with the sand and dust separator are ENG AIR FILTER CONT circuit breaker on overhead console, an engine air differential pressure switch, and an ENGINE INLET AIR warning light on the instrument panel.

Note

> The anti-icing system is inoperative on helicopters with the sand and dust separator unit installed.

2-13. *Differences*. The T53-L-9A engine is the same as the T53-L-9, except for relocation of the bleed air take-off point. On the T53-L-9 engine, the bleed air is taken from the inlet side of the impeller and delivered through a port on the top of the compressor housing. On the

T-53-L-9A, -11 series, and -13 engines, bleed air for driving the oil cooling fan and for heating purposes is taken from the outlet side of the impeller. T53-L-11A and -11B engines incorporate an improved reduction carrier and gear assembly. The T53-L-11A and -11B are identical except for the power output shaft: T53-L-11A shaft has 24 teeth versus 26 teeth on -11B.

2-14. *Engine Fuel Control System*. The engine fuel control system consists of the engine fuel regulator and engine overspeed governor, solenoid valve, starting fuel and main fuel manifolds, igniter nozzles, fuel vaporizers, and igniter plugs. The electrical cable assembly is connected to the fuel system at two points: at the solenoid valve and at the main fuel control assembly. The coil and lead assembly connects to the igniter plugs. From the helicopter fuel tanks, fuel enters and passes through the fuel regulator assembly to the starting and main discharge ports. The starting fuel flows to a solenoid valve which is wired in with the ignition system. Energizing the ignition system actuates the solenoid valve, which allows starting fuel to enter the starting fuel manifold and combustion chamber through five (T53-L-9 and

Note

> The bleed air fuel pump in the left-hand forward cell operates only when the engine is in operation.

2-56. ***Fuel Start Switch.*** The FUEL START ON/OFF switch is located on the pedestal-mounted ENGINE panel (figure 2-3). With this switch positioned to ON, the starting fuel igniter solenoid valve will be energized when the starter-ignition switch is pulled. When the FUEL START switch is positioned to OFF, the igniter solenoid valve circuit is de-energized. Electrical power for circuit operation is supplied by the 28-volt DC essential bus. Circuit protection is provided by the IGNITION SYSTEM-IGNITER SOL circuit breaker on the DC circuit breaker panel (figure 2-12).

Note

> FUEL START switch not applicable on helicopter S/N 66-8574 through 66-8577, 66-16034 and subsequent, and earlier models so modified.

2-57. ***Fuel Transfer Pump Switches.*** The INT FUEL TRANS PUMP LEFT/OFF and RIGHT/OFF switches are located on the pedestal-mounted engine panel (figure 2-3). These switches are used only when the auxiliary fuel equipment has been installed and cables for the two electrically operated transfer pumps and ferry tank fuel level switches are connected. The auxiliary fuel equipment kit description and operating procedure is set forth in Chapter 6, Auxiliary Equipment.

2-58. ***Caution Lights — Right- and Left-Hand Fuel Boost Pumps.*** The right- and left-hand fuel boost pump caution lights are located on the pedestal-mounted CAUTION panel (figure 2-15). These caution lights monitor the operation of their respective pumps. A fuel boost pump failure is sensed by a pressure switch which closes, energizing the caution light circuit for the malfunctioning boost pump. The respective caution lights will illuminate and read LEFT FUEL BOOST or RIGHT FUEL BOOST. The caution lights and pressure switches receive power from the 28-volt DC essential bus.

2-59. ***Fuel Filter Caution Light.*** The FUEL FILTER caution light (UH-1D Serial No. 63-8739, and on earlier models if so modified) is located on the pedestal-mounted CAUTION panel (figure 2-15). A differential pressure switch is mounted in the fuel line across the filter. When the filter becomes clogged, the pressure switch senses this and closes contacts to energize the caution light circuit. The FUEL FILTER caution light illuminates, alerting the pilot to a clogged fuel filter and fuel contamination. If clogging continues, the fuel bypass line opens to allow fuel to flow around the filter.

Caution

> Within 30 minutes after the FUEL FILTER caution light illuminates, the pilot shall land the helicopter and effect repairs to the fuel filter.

2-60. After the FUEL FILTER caution light illuminates, the pilot has approximately 30 minutes to return to base or locate a substitute landing area. The helicopter shall not be flown until the reason for illumination of the FUEL FILTER caution light has been determined and corrected.

2-60A. ***Sand and Dust Separator Filter Warning Light.*** (See figure 2-5.) An ENGINE INLET AIR warning light is mounted on the upper left area of the instrument panel. When the filter becomes clogged, a differential pressure switch senses this condition and closes contacts to enerize the filter warning light. The ENGINE INLET AIR warning light illuminates, alerting the pilot to a clogged filter and a heavy concentration of dust and sand in the area of operation. As conditions permit the pilot shall proceed to the nearest authorized landing area for cleaning of sand and dust separator filters.

2-61. Electrical Power Supply Systems.

The electrical power supply systems provide 28-volt direct current, 115-volt alternating current power, and 28-volt alternating current as applicable for the electrical equipment installed in the aircraft. See the electrical system schematic diagram, figure 2-10.

2-62. DC Power Supply System. The direct current power supply system is a 28-volt, single-conductor system with the negative leads of the generators grounded in the helicopter fuselage structure. Direct current power is supplied by either the main generator, standby generator (starter-generator), battery, or an external power supply. The system consists of the following: primary bus, essential bus, nonessential bus, auxiliary circuit breaker bus,

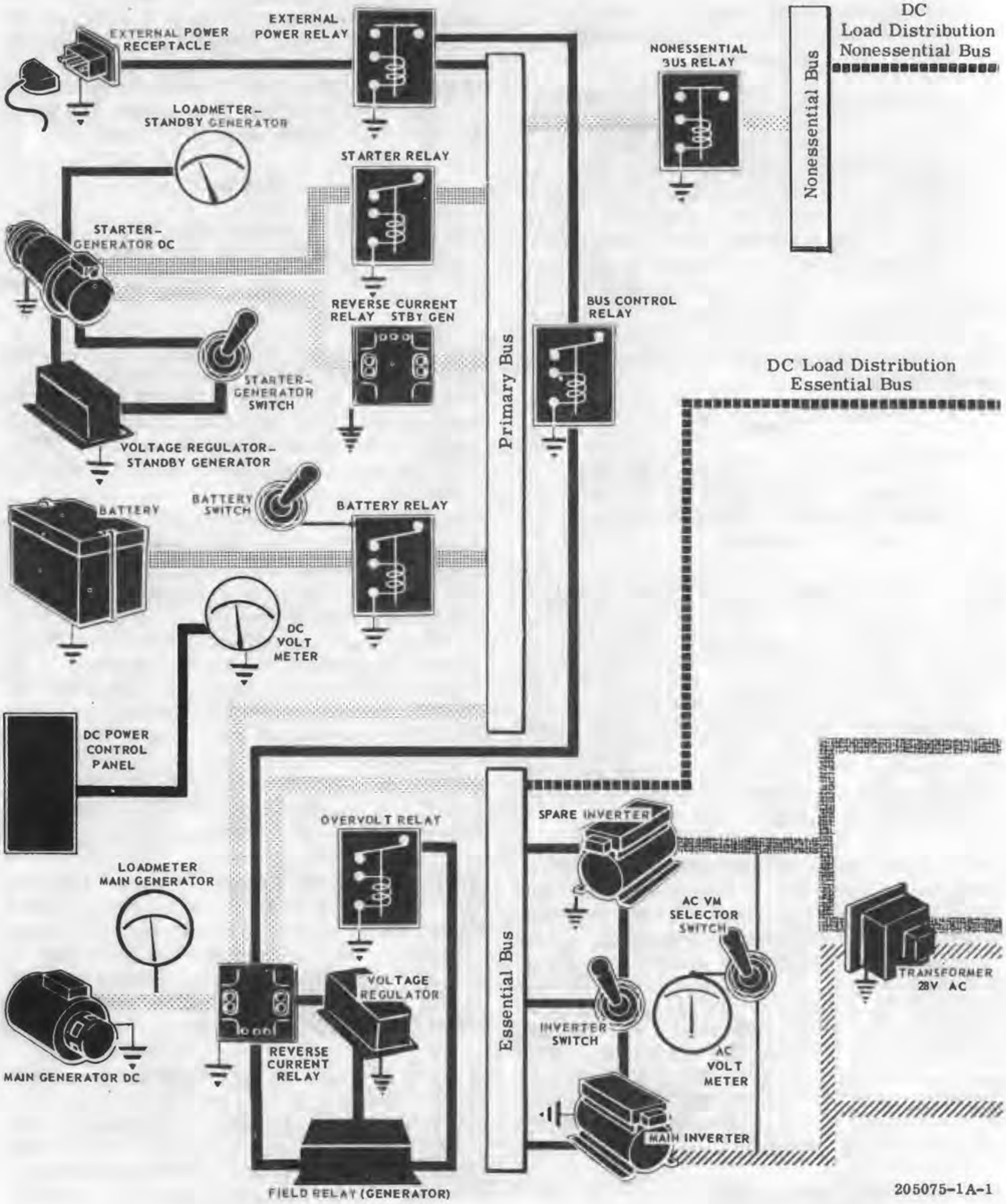

Figure 2–10. Electrical system schematic diagram (Sheet 1 of 2)

28-VOLT DC NONESSENTIAL BUS

Nonessential Bus Voltmeter
Heated Blankets
Auxiliary Circuit Breaker Bus

28-VOLT DC ESSENTIAL BUS

Generator and Bus Reset
Main Inverter Power
Inverter Control
Spare Inverter Power
Starter Relay
Ignition System and Igniter Solenoid
Fuel Valve
Fuel Transfer Pump
Fuel Tank Sump Pump
Idle Stop Release
Governor Control
Cargo Hook Release
Fire Detection
Pilot's Windshield Wiper
Copilot's Windshield Wiper
Engine Anti-Ice (If Installed)
Utility Lights
Engine Air Filter (If Installed)

115-VOLT AC SPARE INVERTER

AC Failure Relay
Fuel Quantity Indicator and Tank Unit
Attitude Indicator - Pilot
Attitude Indicator - Copilot
J-2 Compass (If Installed)
IFF Transponder AN/APX-68

28-VOLT AC

Course Indicator
Torque Pressure Instruments
Transmission Oil Pressure Transmitter and Indicator
Engine Oil Pressure Transmitter and Indicator
Fuel Pressure Transmitter and Indicator

115-VOLT AC MAIN INVERTER
AC Failure Relay
Fuel Quantity Indicator and Tank Unit
Attitude Indicator - Pilot
Attitude Indicator - Copilot
J-2 Compass (If Installed)
IFF Transponder AN/APX-68
AN/ASN-43 Compass (If Installed)

Dome Lights
Force Trim
Armament Circuit
RPM Limit Warning
Hydraulic Control
Instrument Secondary Lights
Turn and Slip Indicator
Instrument Panel Lights
Temperature Indicator-Engine and Transmission
Console and Pedestal Lights
Navigation Lights
Fuselage Lights
Caution Lights
Anti-Collision Light
Landing Light Power
Search Light Power
Landing and Search Light Control
VHF Receiver AN/ARC-73
VHF Transmitter AN/ARC-73
UHF Transceiver AN/ARC-51BX
FM Transceiver AN/ARC-54
J-2 Compass (If Installed)
Heater Control
External Stores Control
Intercom C-1611/AIC Copilot and Crew-L
Intercom C-1611/AIC Pilot and Crew-R
Direction Finder AN/ARN-83
Omni Receiver AN/ARN-82
Marker Beacon Receiver R-1041
HF Transceiver AN/ARC-102
VHF Transmitter T-366/ARC
Pitot Tube Heater
Rescue Hoist Cable Cut
Rescue Hoist Control
Hoist Power
IFF Transponder AN/APX-44
FM Transceiver AN/ARC-44 (If Installed)
Intercom SB-329/AR (If Installed)
UHF Transceiver AN/ARC-55 (If Installed)

▬	D-C Control
░	Power from Battery
░	Power from Generator
▪▪▪	D-C Load Distribution
▨	A-C Load Distribution on Main Inverter
▩	A-C Load Distribution on Spare Inverter

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Figure 2–10. Electrical system schematic diagram (Sheet 2 of 2) main generator voltage regulator, standby generator voltage regulator, main generator overvoltage relay, main generator field relay, main generator reverse current relay, standby generator reverse current relay, bus control relay, battery relay, nonessential bus relay, starter relay, external power relay, and control panel and circuit breakers to furnish protection for the system and equipment operating from the system. In the event of a main generator failure, the nonessential bus is automatically deenergized when circuit is opened by contacts of the bus control relay and the nonessential bus relay actions. The pilot may override the automatic action by positioning the NON-ESS BUS switch on the DC POWER control panel (figure 2-11) to MANUAL ON. The 28-volt main generator is rated at 300 ampere output and is mounted on and driven by the transmission gearing; therefore, generator power is provided and battery drain prevented when autorotational landings are being performed. A standby starter-generator, rated at 200 ampere output and mounted on the helicoper's engine accessory drive section, is provided to furnish 28-volt DC power in the event of a main generator failure.

2-63. ***Direct Current Power Control.*** Direct current power control is accomplished from the DC POWER control panel on the overhead console (see figure 2-11).

2-64 ***DC Power Control Panel.*** The DC POWER control panel (see 8, figure 2-11) is located on the overhead console. The DC POWER control panel consists of the MAIN GEN RESET/OFF/ON switch, BAT ON/OFF switch, STARTER GEN START/STBY GEN switch, DC VM (voltmeter) selector switch, and an NON-ESS BUS MANUAL ON/NORMAL ON switch. Panel illumination is provided by three lights controlled by a switch on the instrument lights control panel (see 6, figure 2-11).

2-65. ***Main Generator Switch.*** The main generator switch is a three-position type equipped with a guard and is located on the left area of the DC POWER control panel (see 8, figure 2-11). This switch is labeled MAIN GEN, RESET in the aft position, OFF in the center position, and ON in the forward position. The RESET position is spring-loaded to return to OFF position when released; therefore, to reset the generator the switch must be held in RESET position momentarily and then moved to the ON position.

2-66. ***Battery Switch.*** The battery switch is located on the lower left area of the DC POWER control panel below the main generator switch. This is a two-position switch labeled BAT OFF in the aft position and ON in the forward position. When the switch is placed in ON position, it closes the circuit to the actuating coil of the battery relay and 24-volt DC is then being delivered from the battery to the primary bus. When the switch is placed in OFF position, it opens the circuit to the actuating coil of the battery relay and no current is delivered from the battery.

2-67. ***Starter-Generator Switch.*** The starter-generator switch is located in the center area of the DC POWER control panel. This switch is a two-position type and is labeled STARTER GEN START in the aft position, and STBY (standby) GEN in the forward position. The START position of the switch actuates the electrical circuits for starter functions of the starter-generator. The STBY GEN position actuates the generator unit of the starter-generator, and 28-volt DC is supplied to the primary bus of the helicopter's electrical system in the event of a main generator failure.

2-68. ***Nonessential Bus Control Switch.*** The nonessential bus control switch is located in the lower area of the DC POWER control panel. This is a two-position switch labeled NON-ESS BUS, MANUAL ON in the aft position and NORMAL ON in the forward position. The function of the switch is to permit the pilot, in the event of a generator failure, to override the automatic action when the nonessential bus is dropped by the electrical system's bus control relay and nonessential bus relay. Moving the switch to MANUAL ON overrides the action of the bus control relay and nonessential bus. Normally the switch will be positioned forward to NORMAL ON.

2-69. ***Direct Current Voltmeter Selector Switch.*** The direct current voltmeter selector switch is located in the upper right-hand area of the DC POWER control panel. The switch can be easily identified by the VM label on panel face. This switch functions to monitor voltage being delivered from any of the following: BAT, MAIN GEN, STBY GEN, ESS BUS, and NON-ESS BUS. The switch is actuated by means of a knob permitting the selection of any one of the five positions. Voltage will be indicated on the DC voltmeter.

2-70. *Direct Current Voltmeter.* The direct current voltmeter (see 29, figure 2-5) is mounted in the center area of the instrument panel and is labeled VOLT DC. Generator voltage output is indicated by this instrument. Voltage indications will not be shown when the generator is not furnishing electrical power because the direct current voltmeter is connected to the generator side of the reverse current relay.

2-71. *Direct Current Loadmeters — Main and Standby.* Two direct current loadmeters are mounted in the lower center area of the instrument panel (see 28 and 35, figure 2-5). One is labeled MAIN GEN and indicates the percentage of total electrical system amperage being used by the helicopter's electrical system when main generator is operating. The other loadmeter is labeled STBY GEN and indicates

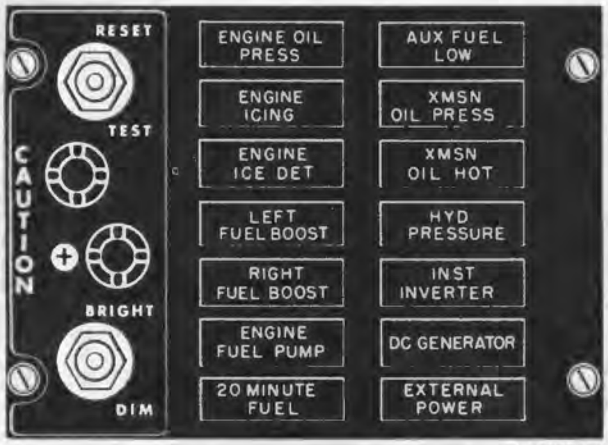
2-96. *Collective Pitch Control Lever.* The collective pitch control lever (see 7, figure 2-4) is located to the left of the pilot's position and controls the vertical mode of flight. When the lever is in full down position, the main rotor is in minimum pitch. When the lever is in full up position, the main rotor is in maximum pitch. The amount of lever movement determines the angle of attack and lift developed by the main rotor, and results in ascent or descent of the helicopter. Desired operating friction can be induced into the control lever by hand tightening the friction adjuster (see 27, figure 2-4). A rotating grip-type throttle and a switch box assembly are located on the upper end of the collective pitch control lever. The switch box assembly contains the starter switch, governor rpm increase-decrease switch, engine idle stop release switch, and landing light and searchlight switches. A springloaded pitch lever down lock (see 9, figure 2-4) is located on the floor at the approximate center and inboard of the pitch control lever. The copilot's collective pitch control lever, when installed, contains only the rotating grip-type throttle, starter switch, and governor rpm increase-decrease switch.

Note

> The collective pitch control system has a built-in friction of eight to ten pounds with manual friction control in full decrease position.

2-97. *Tail Rotor Pitch Control Pedals.* The directional (tail rotor pitch) control pedals (see 14, figure 2-4) are similar to and react in the same manner as fixed-wing aircraft rudder pedals. The pedals (through push-pull tubes, bellcranks, quadrant, cables and pulleys, and chain and sprocket) alter the pitch of the tail rotor blades; and thereby provide the means of directional control. This literally allows the helicopter to be pivoted about its own vertical axis at slow or zero airspeeds. Pedal adjusters are located below the floor aft of the cyclic control sticks and forward of the pilot and copilot positions. Adjuster knobs (see 11, figure 2-4) extend above the floor to enable adjustment of pedal distance for individual comfort. The force trim system is connected to the directional controls and is operated by the force trim switch on the cyclic control stick grip. The copilot's directional control pedals, when installed, are identical to the pilot's pedals.

2-98. *Synchronized Elevator.* The synchronized elevator (see 15, figure 2-1) is located near the aft end of the tail boom and is connected



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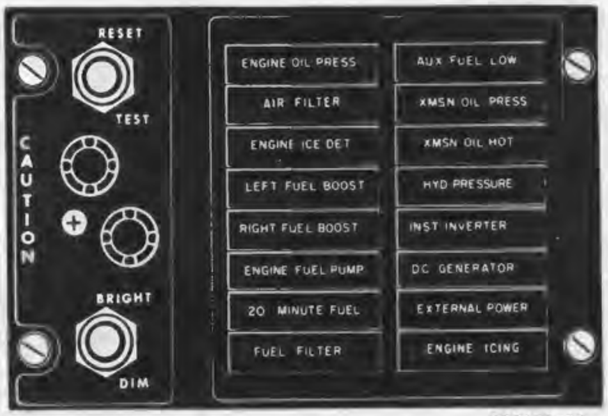

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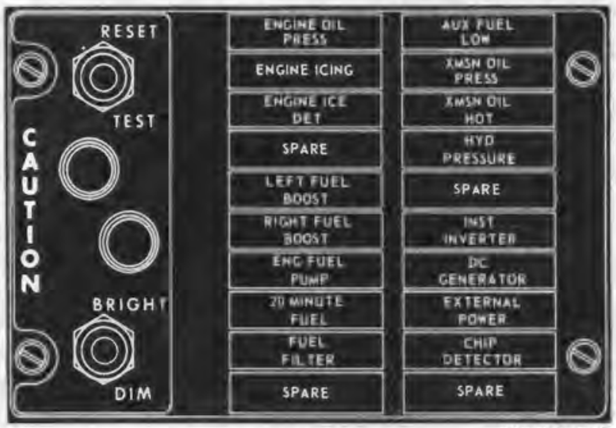

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Figure 2-15. Caution panel — typical

by control tubes and mechanical linkage to the fore and aft cyclic control system. Fore and aft movement of the cyclic control stick produces a change in the synchronized elevator attitude, thus increasing controllability and lengthening cg range.

2-99. Landing Gear System. The helicopter's landing gear system is a skid type consisting of two laterally mounted arched crosstubes attached to two formed longitudinal skid tubes. The landing gear structure members are made from formed aluminum alloy tubing with full length steel skid shoes to minimize skid wear. The gear assembly is attached with clamps at four points of the fuselage structure; therefore, gear removal for maintenance can be easily accomplished. Two manually retractable and quickly removable wheel assemblies have been provided to facilitate helicopter ground handling operations.

2-100. *Tail Skid.* A tubular steel tail skid is attached to the lower aft section of the tail boom assembly and acts as a warning to the pilot upon an inadvertent tail-low landing.

2-101. Flight Instruments. The flight instruments installed in the helicopter consist of the pilot's and copilot's airspeed indicators, turn and slip indicator, vertical velocity indicator, and the pilot's and copilot's attitude indicators.

2-102. *Airspeed Indicators.* Two airspeed indicators (9, figure 2-5) have been provided; one is mounted on the pilot's section of the instrument panel and the other is mounted on the copilot's section of the instrument panel. The single-scale indicators are calibrated in knots and provide an indicated airspeed of the helicopter at any time during flight, by measuring the difference between impact air pressure from the pitot tube and the static vent. The pitot tube is mounted on the left metal nose section of the cabin. Static air pressure for instrument operation is derived from the two static vents located in the side cabin skins near the forward edges of the crew doors.

2-103. *Turn and Slip Indicator.* The turn and slip indicator (4 MIN TURN) (39, figure 2-5) is controlled by an electrically actuated gyro. The instrument has a needle (turn indicator) and a ball (slip indicator). Although the needle and ball are combined in one instrument and are normally read and interpreted together, each has its own specific function and operates independently of the other. The ball indicates when the helicopter is in directional balance, either in a turn or in straight and level flight. In the event of yawing or slipping by the helicopter, the ball will be off center. The needle indicates in which direction and at what rate the helicopter is turning. The electrical circuit is supplied power by the 28-volt DC essential bus and is protected by TURN & SLIP IND circuit breaker on the DC circuit breaker panel (figure 2-12).

2-104. *Vertical Velocity Indicator.* Two vertical velocity (rate of climb) indicators (20, figure 2-5) (one for pilot and one for copilot) are front-mounted on the instrument panel. These indicators register ascent and descent of the helicopter in feet per minute. The instruments are actuated by the rate of atmospheric pressure change and are vented to the static air system.

2-105. *Pilot's Attitude Indicator.* The pilot's attitude indicator is located on the pilot's section of the instrument panel (see 10, figure 2-5). This indicator provides the pilot with a visual indication of the pitch and roll attitude of the helicopter in relation to the earth's horizontal plane. The attitude indicator system is operated by three-phase 115-volt AC electrical power, supplied by the inverter, and is protected by PILOT ATTD circuit breakers on the AC circuit breaker panel (figure 2-13). Integral lighting, operated by 28-volt DC from the essential bus, is incorporated in the indicator. An OFF warning flag in the indicator is exposed when electrical power is removed from the system; however, the OFF flag will not indicate internal system failure which may occur in the control or indicator. The flag disappears approximately two minutes after electrical power is supplied to the control.

2-106. The attitude indicator has been specifically designed for the flight characteristics of helicopters by incorporating an electrical trim in the roll axis in addition to the standard pitch trim. Degrees of pitch and roll are indicated by a universally mounted sphere. The horizon is represented as a white bar on the sphere; horizontal markings indicate the degree of dive or climb; while bank (roll) angles are read from the semicircular scale located on the upper half of the indicator face.

2-107. The pitch trim knob, located on the lower right corner of the indicator, is adjusted

e. Antennas — CONDITION.

f. Walkway — CLEAN.

g. Air Intake — CLEAN.

h. Navigation Lights — CONDITION.

i. Rotor Head Oil Reservoirs — Visually CHECK oil level.

3-14. ***Fuselage — Aft Of Cabin Right Side, Area 3.*** a. Engine and Transmission Cowling — SECURED for flight.

b. Fuel Filler Cap — Visually CHECK fuel level, SECURE CAP.

c. Oil Filler Cap — VISUALLY CHECK oil level, SECURE CAP.

d. Access Doors — SECURED for flight.

e. Fuel and Oil Leaks — Visually CHECK external surfaces and ground beneath engine compartment.

f. Right-Hand Sump and Pump — DRAIN.

3-15. ***Aft Fuselage — Right Side, Area 4.*** a. Aft Fuselage — CLEAN, general CONDITION.

b. Synchronized Elevator — CONDITION.

c. Omni Antenna — CONDITION.

d. 42° Tail Rotor Gear Box — CONDITION, OIL LEVEL, FAIRING SECURED for flight.

e. Main Rotor Blade — Visually CHECK CONDITION, CLEANLINESS, TIE - DOWN REMOVED.

3-16. ***Fuselage — Full Aft, Area 5.*** a. Aft Fuselage Extension Covers — SECURED for flight.

b. Aft Antenna — SECURITY and CONDITION.

c. Tail Rotor — CONDITION, TIE-DOWN REMOVED, free movement on flapping axis.

d. 90° Tail Rotor Gear Box — Visually CHECK oil level.

e. Navigation Light — CONDITION.

3-17. ***Aft Fuselage — Left Side, Area 6.*** a. Tail Rotor Drive Shaft Covers — SECURED for flight.

b. Synchronized Elevator — CONDITION.

c. Antennas—CONDITION and SECURITY.

d. Aft Fuselage — CLEAN, general CONDITION.

3-18. ***Fuselage — Aft Of Cabin Left Side, Area 7.*** a. Engine and Transmission Cowling — SECURED for flight.

b. Electrical Compartment — CONDITION, circuit breakers IN.

c. Vent and Drain Lines — CLEAN and UNOBSTRUCTED.

d. Fuel Filter — DRAIN and CHECK.

e. Left Hand Fuel Pump and Sump — DRAIN.

f. Access Doors — SECURED for flight.

3-19. ***Forward Fuselage — Cabin Left Side, Area 8.*** a. Landing Gear — CONDITION, HANDLING WHEELS REMOVED.

b. Landing Light — STOWED (underside of cabin).

c. Navigation Lights — CONDITION.

d. Access Doors — SECURED for flight.

e. Entrance Doors — CONDITION, CLEAN GLASS, OPERATION.

Warning

> Inspect quick-disconnect fitting on main fuel line at fuel filter for security by insuring that a positive lock has been accomplished. Inspect security by noting lock-pin indicators, disconnect flange flush with coupling, and no fuel leak under pressure.

3-20. ***Exterior Check (Night Flights).*** In addition to the normal exterior checks remove or COVER the cargo mirror.

3-21. ***Interior Check.*** After completing the exterior inspection and upon entering the helicopter perform the following checks:

a. Entrance Doors — SECURED for flight.

b. Main Rotor Tie Down, Pitot Cover, Intake Cowl and Tailpipe Covers — STOWED.

c. Transmission Oil Level — CHECK.

d. Seats and Pedals — ADJUST.

e. Safety Belts and Shoulder Harness — FASTENED.

f. Operation of Shoulder Harness Lock — CHECK.

g. Cyclic Collective Pitch, and Pedals — Actuate through full travel and center.

h. All AC Circuit Breakers — IN.

i. All Radios and Transponder (if installed) OFF.

j. INTernal AUXiliary FUEL (LEFT and RIGHT) — OFF.

k. DE-ICE — OFF. (Not applicable if sand and dust separator unit installed.)

l. GOVernor — AUTOmatic.

m. START FUEL — ON.

n. MAIN FUEL — ON.

o. LOW RPM Switch — OFF.

p. FORCE TRIM — ON.

q. HYDraulic CONTROL — ON.

r. COMPASS SLAVING — IN.

s. Instruments — CHECK static indications, slippage marks and operating range limits.

t. Altimeters — SET.

u. Clock — WIND and SET.

v. MARKER BEACON — OFF.

w. Magnetic Compass — CHECK.

x. CABIN HEATING Control Panel — HEATER and BLEED AIR-OFF.

y. Windshield WIPERS — OFF.

z. CARGO RELease Switch — OFF.

aa. POSITION LIGHTS — OFF (Except for night operations).

bb. ANTI-COLLision Light — OFF.

cc. DOME LighTs — OFF.

dd. PITOT HeaTer — OFF.

ee. DC Circuit Breakers — IN (Except Armament and Special Equipment if not to be used).

ff. INSTrument Lights — OFF (Except for night operations).

gg. AC POWER VoltMeter — AC PHASE.

hh. INVerTeR — OFF.

Note

> Operation of the inverter imposes a considerable drain on the battery. If the battery is weak, operation of the inverter during the start attempt may produce a hot start or even prevent the start altogether in extreme cases. The Engine and Transmission Oil Pressure warning lights in the Caution Panel are DC powered and they are available to monitor the presence of oil pressures until the start is completed and the inverter is turned on to provide AC current to the oil pressure transmitters.

ii. MAIN GENerator — ON.

jj. DC VoltMeter — BATtery (24 volts is normal).

Caution

> Low Battery voltage may result in a hot start.

kk. NON-ESSential BUS-NORMAL ON.

ll. STARTER-GENerator — START.

mm. BATtery — ON (OFF for APU starts).

nn. FIRE DETECTOR Light — TEST (15 Seconds MAXIMUM).

oo. MARKER BEACON Light — TEST.

pp. CARGO RELEASE ARMED Warning Light — TEST.

qq. CAUTION Panel and MASTER CAUTION — TEST.

rr. GOVernor R P M INCRease DECRease Switch — Decrease 8 to 10 seconds.

ss. Search Light Switch — STOW.

tt. LanDinG Light Switches — OFF and RETRact.

uu. Throttle — Position the throttle just below the ENGINE IDLE Stop Release (for abort start purposes).

3-22. Starting Engine. a. Fire Guard Posted.

b. Check Rotor Blades Clear.

c. Energize Starter and Start Clock. (Start fuel flow and ignition occur simultaneously.)

Caution

> Check DC Voltmeter, if voltage drops below 14 volts, abort start.

d. Start Fuel Switch — OFF at 400°C.*

***Note**

> The start fuel switch is removed on helicopter S/N 66-16034 and subsequent (including 66-8574 through 66-8577). With the L-11 or L-13 engine the start fuel switch has no effect on total fuel flow to the engine.

Caution

> Monitor EGT to avoid a hot start. If uneven or intermittent acceleration is accompanied by a rapid rise in EGT, shut down engine and immediately investigate. During starting or acceleration, the MAXIMUM allowable EGT is 760°C. If this limit is exceeded, perform a hot end inspection. If during the start operation of T53-L-9 or T53-L-9A engines, EGT exceeds 620°C for more than five seconds, record a hot start on DA Form 2408-13, and three such hot starts shall require a hot end inspection. If during the start operation of the T53-L-11 and T53-L-13 engines, EGT exceeds 650°C for more than five seconds, perform a hot end inspection.

e. Release Starter Switch at 40 percent nI speed, 42 percent for L-13 engine.

Caution

> Limit starter energize time to 40 seconds. If engine does not start, a three minute cooling period is recommended after which a second starting cycle may be attempted. Only three forty-second starting attempts are permissible in any one hour period.

f. Slowly advance the throttle over the ENGINE IDLE stop.

g. INVERTER — Spare ON.

h. ENGINE and TRANSMISSION OIL PRESSURES — CHECK.

Caution

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

i. Start Fuel Switch — ON.

j. Radios and headsets — ON.

3-23. Engine Run-Up. Retard the throttle to the ENGINE IDLE Stop and check the following:

a. GAS PRODUCER, 56 percent to 58 percent RPM (70 to 72 percent for the L-13 engine).

b. ENGINE and TRANSmission OIL PRESSures — in the green.

c. FUEL PRESSURE — in the green.

d. CAUTION Panel and MASTER CAUTION — all lights OFF.

e. LOW RPM Switch — AUDIO then OFF.

f. Co-Pilot's Attitude Indicator — CAGE.

g. FUEL (QUANTITY) GAGE TEST SWITCH — TEST.

h. PITOT HeaTeR — ON — note LOADmeter increase — then OFF.

i. AC POWER VoltMeter — CHECK all PHASES for 115 (plus or minus 3) VOLTS (on SPARE INVerTeR).

j. INVerTeR — MAIN ON.

k. AC POWER VoltMeter — CHECK all PHASES for 115 (plus or minus 3) VOLTS.

l. DC POWER VoltMeter — CHECK all positions and leave in NON-ESSential BUS position.

m. STARTER GENerator—STandBY GENerator.

n. MAIN GENerator — OFF — note that MAIN GENerator LOADmeter zeros and STandBY GENerator LOAD meter registers.

o. DC POWER VoltMeter — CHECK voltage zero (with NON-ESSential BUS power off).

p. NON-ESSential BUS — MANUAL ON (Note voltage restored).

q. NON-ESSential BUS — NORMAL ON.

r. DC POWER VoltMeter — MAIN GENerator.

s. MAIN GENerator — ON — note that MAIN GENerator LOADmeter registers and STandBY GENerator LOADmeter zeroes.

t. STandBY GENerator — START.

u. Pilot's Attitude Indicator — SET.

v. All engine and transmission instruments — Normal or in the green.

Note

Steps w. and x. not applicable if sand and dust separator unit is installed.

w. DE-ICE Switch — ON — note EGT rise.

x. DE-ICE Switch — OFF — note EGT decrease.

y. GOVernor RPM INCRease — DECRease Switch — Actuate thru full range (6000 to 6700 plus or minus 50 RPM) and leave at 6600 RPM. Check that light goes out.

z. LOW RPM Switch — AUDIO.

aa. FORCE TRIM — OFF — Check control freedom — then ON (if to be used).

bb. HYDraulic CONTROL — OFF — CAREFULLY check for control freedom then ON.

cc. ANTI-COLLision Light — ON.

aft to CLOSED DEFROST to actuate the system.

b. Rotate AIR switch on overhead console CABIN HEATING control panel clockwise to increase defrost air to under-seat outlet and defrost outlet.

c. Rotate DEFROST switch on control panel clockwise to:

(1) DEFROST OFF position — 100 percent to under-seat registers.

(2) No. 1 position — 33 percent to defrost nozzles and 67 percent to under-seat registers.

(3) No. 2 position — 67 percent to defrost nozzles and 33 percent to under-seat registers.

(4) No. 3 position — 100 percent to defrost nozzles.

d. To turn off the system, rotate AIR switch to OFF and position inner right-hand lever adjacent to pedestal fully forward.

6-12A. ***Normal Operation — Cabin Heater and Defrosting System Numbers (65-9565 through 66-16860).*** See cabin heater controls, figure 6-1A.

a. BLEED AIR rotating switch — Rotate clockwise from OFF position to actuate the system. Set to 1, 2, 3, or 4 position as required for amount of heat desired.

b. AFT OUTLET rotating switch — position to distribute the desired amount of heated air to aft cabin through door post outlets.

Note

> When the AFT OUTLET switch is in the OFF position the door post outlets are closed and all of the air is directed to the center pedestal outlet.

c. Lever on pedestal — Position as required.

(1) Full forward position — all heated air is directed to the defrost nozzles.

(2) Full aft position — all heated air is directed to the cockpit and cabin area.

(3) Intermediate positions — may be selected for partial defrost and partial cockpit and cabin heat.

d. To turn off the system — Rotate BLEED AIR switch counterclockwise to OFF position.

6-13. ***Emergency Operation.*** There is no emergency operation of the bleed air heating and defrosting system. If engine temperature surge occurs during flight, the bleed air system shall be turned off.

6-14. Combustion Heating and Defrosting System. The 100,000 BTU combustion type heating and defrosting system (see figure 6-1) equips the helicopter with a sufficient heat supply to maintain a plus 40 degrees Fahrenheit cabin temperature with an outside temperature to minus 60 degree Fahrenheit. With the combustion heater installed, a combination of bleed air heat and combustion heat is available for heating, or bleed air for defrosting and combustion heat for heating, or combustion heat for defrosting only. Bleed air is OFF for the last condition. The combustion heater consists of a fuel system, cycling switch, temperature control, and distribution system. The heater fuel system consists of a fuel pressure regulator, fuel filter, fuel pump, and a fuel shutoff valve.

Note

> The helicopter's fuel pump must be operating before fuel is available for heater combustion.

6-15. The safety devices are: purge switch, overheat switch, and air pressure switch. The purge switch keeps the blowers operating after shutdown to prevent overheating of the system due to residual heat. The overheat switch automatically turns the heater off if a malfunction occurs, and the starting cycle has to be repeated to start the heater. The combustion air blower and the ventilation blower are the axivane type, operated by 28-volt DC. Both of these blowers operate when the heater switch is ON and continue operation until the switch is OFF. The cycling switch, located on the heater plenum, operates in conjunction with the temperature control system and is set at 25 degrees Fahrenheit. It turns the fuel on and off, cycling the heater at approximately this temperature. The temperature control systems are the automatic or the duct sensing control. The automatic system is a three-temperature pickup system; outside temperature, cabin temperature, and duct temperature controlled from the overhead console. The duct sensing control system controls only the duct temperature from a control located on the right-hand door post.

6-16. *Combustion Cabin Heater Controls.* The aft section of the dual purpose cabin heating panel (see figure 6-1) located on the overhead console, controls the combustion heater when installed. Electric power to the panel is supplied by the 28-volt DC essential bus of the electrical system.

6-17. *Pedestal Mounted Heater Controls — Combustion.* Manual controls are secured to the forward outer edges of the pedestal installation (see figures 2-3 and 6-1). The outboard levers control valves to admit hot air to the pilot's and copilot's foot area ducts. The inner right-hand lever is used to control the bleed air-combustion air separator valve.

6-18. *Normal Operation — Combustion.* a. External power — Connected or battery switch to BAT-ON.

b. Fuel MAIN switch — ON.

c. HEATER ON/OFF switch — ON.

d. VIBRATOR switch — NORMAL.

e. PRESS TO START switch — DEPRESS and hold in for three to four seconds, then release.

f. Heater air control knobs — Regulate as desired.

g. HEATER ON/OFF switch — OFF to stop heater operation.

6-19. *Emergency Operation – Combustion.* There is no emergency operation of the combustion heating and defrosting system.

Section III — Anti-Icing, De-Icing, and Defrosting System

6-20. Engine Anti-Icing System. The engine anti-icing system prevents icing of the air inlet areas when the engine is operating at low ambient temperatures. Hot air under pressure, from the annular manifold within the air diffuser housing, flows forward through the airflow shutoff anti-icing valve into the hollow annulus on top of the air inlet housing. This hot air is then directed through five of the six hollow inlet housing support struts to de-ice the air inlet area. Hot scavenge oil, draining through the lower strut into the accessory drive gear box, de-ices the bottom of the air inlet area. Hot air also flows into the inlet guide vane area and is directed through an annulus around the region of the temperature sensing element of the main fuel control to prevent ice formation in the area of the ambient temperature sensing bulb. Small openings in the bottom of the inlet guide vanes allow hot air to bleed back into the compressor area. The shutoff anti-icing valve is spring-loaded in the open or ON position. The pilot can close the valve by positioning DE-ICE switch on ENGINE panel to OFF. (See figure 2-3.) This energizes a solenoid, causing the valve to shift to the closed or OFF position. If an electrical power failure occurs, the solenoid is de-energized, allowing the spring-loaded valve to open and anti-icing becomes continuous. With anti-icing ON, full power will be limited due to increased exhaust gas temperature (egt.). Pilot shall closely monitor egt when anti-icing is ON.

Note

> Engine anti-icing system is inoperative on helicopters with sand and dust separator system installed. (Refer to Chapter 2.)

6-21. *Indicator Lights — Engine Anti-Icing System.* Two indicator lights are located on the pedestal-mounted CAUTION panel (figure 2-15). These lights provide visual information as to the system status. The ENGINE ICING indicator light illuminates to denote engine icing conditions and the operation of the detector proportional to the engine ice accumulation. The ENGINE ICE DET disarmed light will be illuminated when the circuit breaker is out (de-actuated), or the probe is clogged, or when there is an electrical malfunction in the system.

6-22. Pitot Heater. The pitot heater is installed in the pitot head and functions to prevent ice forming in the pitot tube. Electric power for pitot heater operation is supplied by the 28-volt DC electrical system. Circuit protection is provided by PITOT TUBE HTR circuit breaker on the DC circuit breaker panel (see figure 2-12).

6-23. Pitot Heater Switch. The PITOT HTR switch is on the DOME LT panel on the overhead console (see figure 2-11). This is a two-position switch marked OFF in aft position and ON in the fwd position.

CHAPTER 9

SYSTEMS OPERATION

Section I — Scope

9-1. Scope. This chapter provides additional material, to that already presented in other chapters, on the operation of the free wheeling unit, the stabilizer system, engine anti-icing system, and droop compensator.

9-2. These items have been presented here to avoid interrupting continuity of thought and overcrowding other chapters. Use of this information will result in more efficient operation and increase flight safety.

Section II — Systems

9-3. Freewheeling Unit. The freewheeling unit provides a positive disconnect from the engine in case of power failure and allows the main rotor and the tail rotor to rotate in order to accomplish safe autorotational landings.

9-4. Stabilizer System. The stability of the helicopter is the result of the action of the stabilizer bar. This unit is mounted horizontally, above and at 90 degrees to the main rotor blades. The stabilizer bar and control linkage are designed to take advantage of the inertia effect of the bar and thus provide stability which materially lessens pilot fatigue. For example: If the helicopter, while hovering in a level attitude, is tilted to the left, the bar, due to its inertia effect, will tend to remain in a horizontal or level plane. This inertia effect will cause the rotor blades, by means of the mixing lever arrangement, to feather so as to return the helicopter to a near level attitude. If the bar were unrestrained and remained in its original plane of rotation, it would make the helicopter stable to the point of greatly reducing control by the pilot. However, due to restraint or damping in the see-saw attachment to the mast, the bar possesses a mast-following characteristic. This following-time is regulated by two hydraulic dampers, which are connected to the bar, outboard of the mast, one on each side. By means of these dampers, the following-time may be regulated to give the helicopter the desired amount of stability and still leave the pilot with complete and responsive control of the helicopter.

9-5. Engine Anti-icing System. The engine is equipped with an anti-icing system consisting of a detection system, anti-icing valve, DE-ICE switch, and caution indicator lights. The anti-icing syste msupplies hot air under, pressure, to the inlet housing areas to prevent icing when the engine is operating under icing conditions. The detector unit, through a probe mounted in the engine air inlet, senses inlet total pressure on the forward side and a value less than static pressure on the aft side. These two pressures are applied to opposite sides of a diaphragm in the detector head. Operational engine airflow induces a pressure differential across the diaphragm. The diaphragm mechanically displaces a set of electrical contacts. When ice blocks the forward probe openings, a bleed hole in the diaphragm equalizes the pressure on both sides, causing the diaphragm to move. Repositioning of the electrical contacts transmits an electrical signal to the detector unit interpreter, where switching and relay action energizes an electrical heater in the probe and causes intermittent illumination of the ENGINE ICING caution light. The heater melts the ice, allowing a pressure differential to develop across the diaphragm. Movement of the diaphragm returns the electrical contacts to

the no-ice position, de-energizing the electrical heater and ENGINE ICING caution light. The detector unit is again capable of sensing an icing condition.

9-6. Pressurized hot air from the annular manifold within the centrifugal compressor housing flows forward through the shutoff anti-icing valve into the hollow annulus on top of the air inlet housing. Hot air is directed through five or six hollow inlet housing support struts to de-ice the air inlet area. Hot scavenge oil, draining through the lower strut in the accessory drive gear box, de-ices the bottom of the air inlet area. Hot air flows into the inlet guide vane area. Small openings in the bottom of the inlet guide vane allow air to bleed back into the compressor area. The shutoff anti-icing valve is spring-loaded in the open or ON position. The pilot can close the valve by positioning the DE-ICE switch on the ENGINE panel to OFF. This energizes a solenoid, causing the valve to shift to the closed or OFF position. If an electrical power failure occurs, the solenoid is de-energized, allowing the spring-loaded valve to open, and anti-icing becomes continuous. With anti-icing ON, full power will be limited due to a rise in exhaust gas temperature (egt). Pilot shall closely monitor egt when anti-icing is ON.

Caution

> When the ENGINE ICE DET light is illuminated, the anti-icing detector and interpreter units are inoperative. The shut-off anti-icing valve allows continuous flow of hot air. Pilot shall closely monitor egt.

Note

> Engine anti-icing system is inoperative on helicopters with the sand and dust separator system installed. (Refer to Chapter 2.)

9-7. Power for the detection system is supplied by the 28-volt DC essential bus. Circuit protection is provided by the CAUTION LIGHTS and ANTI-ICE ENG circuit breakers. When an engine icing condition occurs, the MASTER CAUTION and ENGINE ICING lights will illuminate. Operation of the ENGINE ICING caution light will be intermittent. The ENGINE ICE DET light only illuminates to indicate a malfunction of the detection system components.

9-8. Droop Compensator. Droop is defined as the speed change in engine rpm (nII) as power is increased from a no-load condition. It is an inherent characteristic designed into the governor system. In the absence of any droop in the governor system instability would develop as engine output power was increased, resulting in nI speed overshooting or hunting the value necessary to satisfy the new power condition. Design droop of the engine governor system is as much as 300 to 400 rpm (flat pitch to full power). If nII power were allowed to droop, other than momentarily, the reduction in rotor speed could become critical; therefore, a droop compensator is installed on the governor control to raise nII speed, as power is increased, to the rpm value selected by the pilot. The compensator is a direct mechanical linkage between the collective control stick and the speed selector lever on the nII governor. Properly rigged, the droop compensator will hold nII to ± 50 rpm of selected value from flat pitch to climb-out power.

Caution

> A shear pin is incorporated in the droop compensator linkage to permit collective control in the event of a bind occurring in the droop compensator linkage. When the pin is sheared, the droop compensator is inoperative and care must be taken to maneuver within power adjustment capabilities of the governor. Sheared pin shall be replaced before new flight.

Note

> An improperly rigged droop compensator can result in the engine not developing rated power. Always check droop compensator rigging prior to checking full power.

9-9. Engine Characteristics (T53-L-13). With the phasing in of the T53-L-13 engine, there are certain different operating characteristics that should be observed. These characteristics are set forth in the following paragraphs.

9-10. ***Power.*** The L-13 engine is rated at 1400 hp (military) for standard sea level conditions as compared to 1100 hp (take-off) for the L-11. Therefore, a much greater potential for drive system over-torque exists, even during warm, ambient conditions.

9-11. ***Acceleration.*** Since the L-13 engine (for the UH-1D installation) is considerably de-rated and engine acceleration is very good, an acceleration check is not considered necessary.

engine acceleration characteristics, high rotor blade angle of attack, and accompanying high rate of descent. The presence of these factors makes a quick power recovery impossible. The altitude at which safe power recovery should be initiated increases with helicopter gross weight and/or field elevation.

10-62. Ice and Rain. In heavy rain, a properly adjusted wiper can be expected to adequately clear the windshield throughout the entire speed range. However, when poor visibility is encountered while cruising in rain, it is recommended that the pilot fly by reference to the flight instruments and the copilot attempt to maintain visual reference. Rain has no noticeable effect on handling or performance of the helicopter.

Note

If the windshield wiper does not start in LOW or MED position, turn the control to HIGH. After the wiper starts, the control may be set at the desired position.

Warning

This helicopter is restricted from flight in moderate to heavy icing conditions under provisions of AR 95-2.

10-63. Before entering icing conditions (visible moisture and below-freezing temperatures), the pilot should actuate the pitot heat, windshield defrosters and de-icing system.

Caution

To preclude the possibility of icing, it is recommended that the engine inlet air filters be removed when it is anticipated that the aircraft will be flown under atmospheric conditions conducive to icing.

Caution

Continuous flight in light icing conditions is not recommended because the ice shedding induces rotor blade vibrations, adding greatly to the pilot's work load.

10-64. During flight in icing conditions, the pilot can expect one or all of the following to occur.

a. At any temperature below freezing, a low frequency main blade vibration, caused by asymmetric self-shedding ice.

b. To maintain airspeed, the torque will have to be increased.

c. An increase in engine egt.

Warning

If the ENGINE ICING light fails to illuminate in known icing conditions, or if for any other reason, the engine ice detector system is suspected to be inoperative, pull the ANTI-ICE ENG circuit breaker and check the ENGINE ICE DET light. Ensure DE-ICE switch is ON. If this light does not illuminate, the pilot can be reasonably certain the engine ice detector system is inoperative.

Note

Engine anti-icing system is inoperative on helicopters with the sand and dust separator system installed. (Refer to Chapter 2.)

d. Illumination of the ENGINE ICING light.

Note

If the windshield defrosters fail to keep the windshield clear of ice, the side windows may be opened for clear visibility in landing.

Section IV — Desert and Hot Weather Operation

10-65. Hot Weather Operation. Operations, when outside air temperatures are above standard day temperatures require closer monitoring of oil temperatures and EGT.

Note

At very high ambient temperatures, the helicopter loses efficiency with high gross weights.

Section V — Turbulence and Thunderstorm Operation

10-66. Turbulence. The helicopter instrument handling qualities are very poor in turbulence. If moderate to severe turbulence is unavoidably encountered, the pilot should not attempt to maintain a definite altitude. All attention should be directed to maintaining track and level attitude indication. The helicopter should be set up for normal instrument cruise conditions. Do not make a collective pitch change unless the airspeed varies ±10 knots IAS.

Warning

The pilot is not to intentionally encounter moderate to severe turbulence while on instruments.

Note

The turbulence penetration speed is 80 knots IAS.

CHANGE }
No. 7 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 9 March 1967

Operator's Manual

ARMY MODEL UH-1D HELICOPTER

TM 55-1520-210-10, 28 December 1965, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 6, section X	6-18A thru 6-18G	6-18A thru 6-18H
Chapter 11, sections I and II	11-1/11-2	11-1/11-2

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31 requirements for Operator and Crew Instructions for UH-1D aircraft.

pushbutton switch is on the cyclic control stick. Before the electrical release switch on the cyclic control stick can be actuated, the CARGO RELEASE switch on the overhead panel must be positioned to ARM. When not in use, the cargo suspension unit need not be removed, nor does it require stowing. Three cable and spring attachments keep the unit centralized, and the hook protrudes only slightly below the lower surface of the helicopter. A rear view mirror enables the pilot to visually check operation of the external cargo suspension hook.

6-64A. Internal Rescue Hoist. Provisions have been made for the installation of an internal rescue hoist. (See figure 6-15A.) The hoist may be installed in any one of four positions in the helicopter's cabin as shown in figure 6-15B. The hoist installation consists of a vertical column extending from the floor structure to the cabin roof, a boom, and an electrically operated winch. Two electrical control stations for the operation of the rescue hoist are provided, one for the pilot, and one for the hoist operator. The pilot's control switch is located on the cyclic control stick (figure 2-4) and provides up and down operation of the hoist as well as positioning the boom. A four position hoist switch, located on the hoist control pendant (figure 6-15C), is provided for the hoist operator. The pilot's control can override the hoist operator's control. An electrically operated ballistic charge type cable cutter is provided with two guarded type cable cutter switches. The pilot's cable cutter switch is mounted on the pedestal (figure 6-15D) and the hoist operator's cable cutter switch is mounted on the top of the hoist control box (figure 6-15E). The hoist has a usable capacity of 256 feet of cable. Two limiting switches provide automatic stoppage to control reel-in and reel-out limits of usable cable. An intercom headset, wired to the hoist and controlled by a switch on the pendant, gives the hoist operator interphone communications with the flight crew.

Note

The hoist cable is color coded as follows: The first 25 feet is yellow, the next 175 feet is unpainted. The next 40 feet is yellow and the last 16 feet is red.

6-64B. Rescue Hoist Operations. The rescue hoist is used to accomplish the lifting of personnel or cargo when a landing cannot normally be made. The types of lifts usually required in the use of the rescue hoist are:

a. Pickups from wooded or obstructed areas.

b. Pickups from water.

c. Pickups from boats or ships where landings could not be accomplished.

Caution

The hoist should normally be operated in the full speed condition as slow speed operation will cause the motor to heat excessively.

Note

The hoist operator has variable speed control for raising or lowering the cable. The further the down/up toggle is pushed from its spring loaded neutral position, the faster the hoist will run. See Hoist Cable Speed Versus Load Chart, 6-1.

Caution

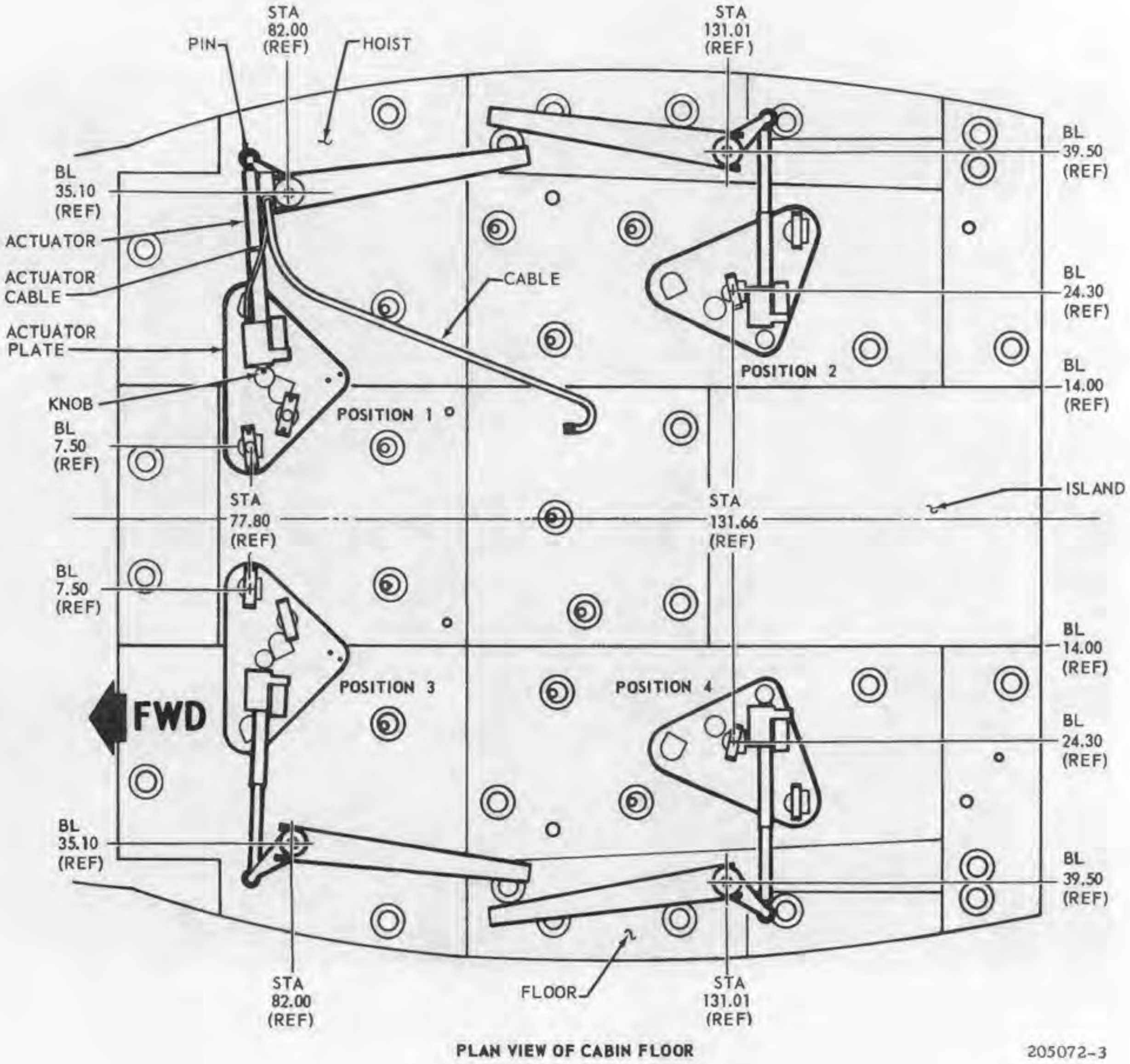
A minimum of 5 pounds tension must be applied to the cable for a reel-out (cable down) at all times. The hook and handwheel provide this weight. DO NOT PERMIT cable to become slack.

6-64C. Operating Data. The following general information is provided for use when operating rescue hoist.

a. Maximum Load	600 pounds for raising or lowering
b. Usable Cable Length	256 feet
c. Limits:	
Boom In and Boom Out	Preset limit switches in the actuator
Up Limit	Trigger at end of boom (contacted by rubber bumper on the hook handwheel)
Down Limit	Switch (actuated when three wraps of cable remain on storage drum)
d. Override	The pilot's control will override the operator's control

Figure 6-15A. Hoist installation (Sheet 1 of 2)

Figure 6-15A. Hoist installation (Sheet 2 of 2)



PLAN VIEW OF CABIN FLOOR

205072-3

Figure 6-15B. Four positions hoist may occupy in cabin

Figure 6-15C. Pendant control — rescue hoist

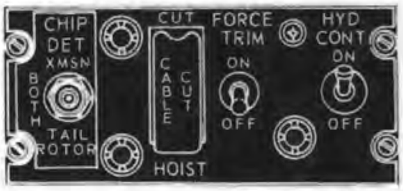


Figure 6-15D. Hoist cable cutter switch — pilot

Figure 6-15E. Hoist cable cutter switch — hoist operator

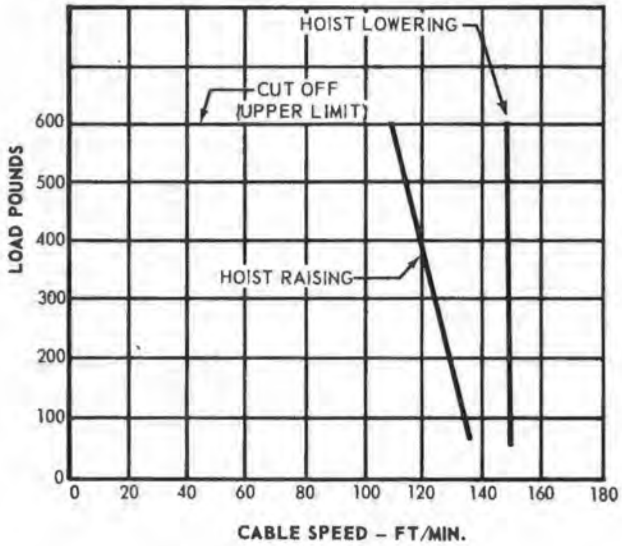


Chart 6-1. Hoist cable speed versus load plus or minus 15 percent

6-64D. *Weight and Balance Information.* Weight and balance information, resulting from installation of the internal rescue hoist, is as follows:

a. Forward position (hoist arm inside).

(1) Change in basic weight .... Plus 151.3 pounds

(2) Moment arm .... 87.3 inches

(3) Change in basic moment . 11.211 inch-pounds

(4) Chart "A" entry ..... Not applicable

(5) Chart "C" entry ..... Weight change, plus 151.3 pounds

Moment Arm, 87.3 inches

Moment/100, plus 132.1 inch-pounds

b. Aft position (hoist arm inside).

(1) Change in basic weight .... Plus 151.3 pounds

(2) Moment arm .... 125.1 inches

(3) Change ...... 18.927 inch-pounds

(4) Chart "A" entry .... Not applicable

(5) Chart "C" entry .... Weight change, plus 151.3 pounds

Moment Arm, 125.1 inches

Moment/100, plus 189.2 inch-pounds

c. Possible seating and hoist load locations. (See chart 6-2.)

6-64E. *Operating Procedure — Pilot.* The pilot's hoist control switch is located on the cyclic control stick (figure 2-4).

a. Check rescue hoist cable cutter, rescue hoist control, and rescue hoist power circuit breakers are "IN".

b. Establish zero ground speed over pick-up location.

c. Move hoist control, on cyclic stick, to right to swing boom outboard.

Note

Pilot's controls will override the hoist operator's control inputs; however, the pilot has only a single speed capability.

d. Move hoist control switch down to lower cable hook.

Note

Hoist cable is painted at each end to provide visual indication of cable footage that is extended. The hoist cable is lowered approximately 150 feet per minute and is retracted approximately 120 feet per minute (table 6-3).

Caution

With a load attached on the hoist hook (and if conditions permit) it is advisable not to make abrupt changes in helicopter attitude until load is aboard or raised as close as possible. G-forces on hoist could become excessive if hoist load is being raised during abrupt movements of helicopter.

e. Move hoist control switch aft to raise hoist load.

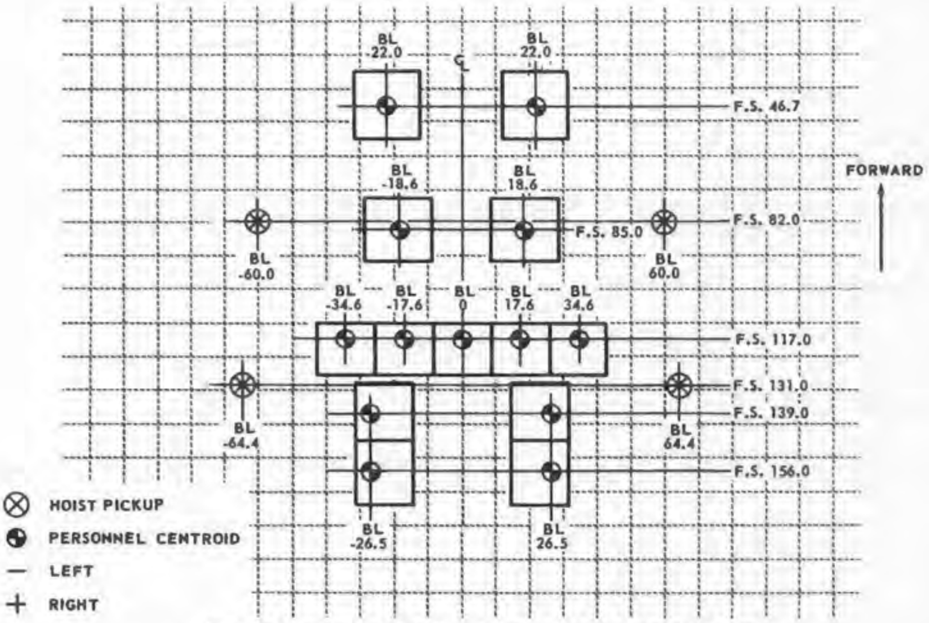
Note

In case the extended portion of the hoist cable has to be jettisoned, a cable cut switch is provided on the instrument pedestal. (See figure 6-15D.) The cable cutter is an electrically initiated ballistic charge type.

f. Move hoist control switch to left to swing hoist boom inboard.

g. Bring hoist load into cabin and hoist to stowed position (fully inboard).

6-64F. *Operating Procedure — Hoist Operator.* The hoist operator's operating procedure is set forth in Chapter 11.



POSSIBLE SEATING & HOIST LOAD LOCATIONS

C. G. Limits	Longitudinal	F. S. 130 to F. S. 144
	Lateral	B. L. -7. 5 to B. L. +7. 5

Sample Balance Calculations:

		HORIZONTAL		LATERAL	
	WEIGHT	ARM	MOMENT	ARM	MOMENT
1) Basic Wt (Incl, Hoist, Fwd, Rt)	5407	141. 8	766878	+ 1. 5	8202
Pilot	200	46. 7	9340	+22. 0	4400
Hoist Attendant	200	117. 0	23400	+34. 6	6920
Troopers (2) - Aft R. H.	440	147. 5	59000	+26. 5	11660
Hoist Load	600	82. 0	49200	+60. 0	36000
Fuel (Min. with Load on Hoist)	1000	144. 0	144000	0	0
	7847	134. 0	1051818	+ 8. 6	67182

Lateral C. G. of +8. 6 exceeds limit stated above. Troopers should be moved to left side of helicopter.

2) Basic Wt (Incl. Hoist, Aft Left)	5407	143. 1	773623	- 0. 5	-2699
Pilot	200	46. 7	9340	+22. 0	4400
Copilot	200	46. 7	9340	-22. 0	-4400
Hoist Attendant	200	82. 0	16400	-18. 6	-3720
Fuel (Min. with Load on Hoist)	550	127. 1	69905	0	0
Hoist Load	600	131. 0	78600	-64. 4	-38640
	7157	133. 7	957208	- 6. 3	-45059

Seating satisfactory. Additional Personnel should be seated on the right side of the helicopter.

Chart 6-2. Possible seating and hoist load locations

Table 6-3. Operating limitations

250 Foot Cable:

Lower 250 lbs.
Raise 250 lbs.
Lower 0 lbs.
Raise 250 lbs.
9 Cycles

The above is equivalent to lowering a medical attendant and then raising nine patients with the attendant. Use 30-second rest period at end of each raise or lower cycle. Use 30-minute rest period at completion of nine cycles.

250 Foot Cable: Lower 0 lb. Raise 600 lb. 3 Cycles Thirty-second rest period at end of each raise or lower cycle. A 30-minute rest period at completion of above listed cycles.	250 Foot Cable: Lower 0 lb. Raise 400 lb. 5 Cycles Thirty-second rest period at end of each raise. A 30-minute rest period at the end of five cycles.
250 Foot Cable: Lower 600 lb. Raise 0 lb. 3 Cycles A 30-second rest period at end of each raise or lower cycle. A 30-minute rest period at completion of above listed cycles.	250 Foot Cable: Lower 400 lb. Raise 0 lb. 5 Cycles A 20-second rest period at end of each raise or lower cycle. A 30-minute rest period at completion of above listed cycles.

CHAPTER 11

CREW DUTIES

Section I — Scope

11-1. Scope. This chapter covers the responsibilities of each crew member and the primary and alternate functions of each.

11-2. The purpose of this chapter is to provide a compact collection of material and the procedure that must be followed wherein each crew member can readily determine his complete duties.

Section II — Responsibilities

11-3. Rescue Hoist Operating Procedure — Hoist Operator. The following sets forth the necessary steps for the hoist operator to actuate the hoist boom outboard, lower cable, retract cable, and return hoist boom to the stowed position. The pilot's hoist controls have priority over the hoist operator's controls.

Note

The hoist cable is color coded as follows: The first 25 feet is yellow, the next 175 feet is unpainted, the next 40 feet is yellow and the last 16 feet is red.

a. Check with the pilot (use intercom) that rescue hoist cable cutter, rescue hoist control, and rescue hoist power circuit breakers are in.

b. After pilot has established zero airspeed over the desired location, move boom toggle switch to OUT position to swing hoist boom outboard.

c. Move variable speed control (labeled DOWN/UP) on the hoist control pendant to DOWN to lower the hoist cable. The speed control must be moved to the right then forward.

Note

The further the DOWN/UP speed control is moved from its spring-loaded neutral position, the faster the hoist will run. Hoist cable is painted at each end to provide visual indication of cable footage that is extended.

Caution

The hoist should normally be operated at full speed, as slow speed operation will cause the motor to heat excessively.

d. Move DOWN/UP speed control to UP to raise the hoist load. The speed control must be moved to the left then aft.

Note

In case the extended portion of the hoist cable has to be jettisoned, a CABLE CUT switch is provided on the control box. The cable cutter is an electrically initiated ballistic charge type.

e. Move boom toggle switch to IN position to swing hoist boom inboard.

f. Bring hoist load into cabin and swing hoist boom to stowed position (fully inboard).

TM 55-1520-210-10
C6

CHANGE
No. 6

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 21 December 1966

Operator's Manual

ARMY MODEL UH-1D HELICOPTER

TM 55-1520-210-10, 28 December 1965, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Table of Contents	i and ii	i and ii
Chapter 2, Section II	2-5 and 2-6	2-5 and 2-6
	2-12A and 2-12B	2-12A and 2-12B
	2-19 and 2-20	2-19 and 2-20
	2-25 and 2-26	2-25 and 2-26
	2-37 and 2-38	2-37 and 2-38
Chapter 3, Section II	3-5 and 3-6	3-5 and 3-6
	3-11 thru 3-14	3-11 thru 3-14
Chapter 4, Sections II, III, and IV	4-3 thru 4-4B	4-3 thru 4-4B
Chapter 5, Section III	5-25 and 5-26	5-25 and 5-26
Chapter 6, Section VII	6-11 and 6-12	6-11 and 6-12
Section X	6-18A thru 6-18F	6-18A thru 6-18F
Chapter 7, Sections I, II	7-1 thru 7-4	7-1 thru 7-4
Chapter 9, Sections I, II	9-1 and 9-2	9-1 thru 9-2A
Chapter 10, Section III	10-11 and 10-12	10-11 and 10-12
Chapter 11, Sections I, II	11-1/11-2	11-1/11-2
Chapter 12, Sections IV, V	12-37 and 12-38	12-37 thru 12-38E
Chapter 14, Sections I, II	14-1 and 14-2	14-1 and 14-2
	14-7 and 14-8	14-7 and 14-8
	14-10A	14-10A
	14-11 and 14-12	14-11 and 14-12
	14-73 and 14-74	14-73 and 14-74
		14-134A
		14-156A thru 14-156G
Index	1 thru 6	1 thru 6
	9 and 10	9 and 10

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
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	14-11 and 14-12	14-11 and 14-12
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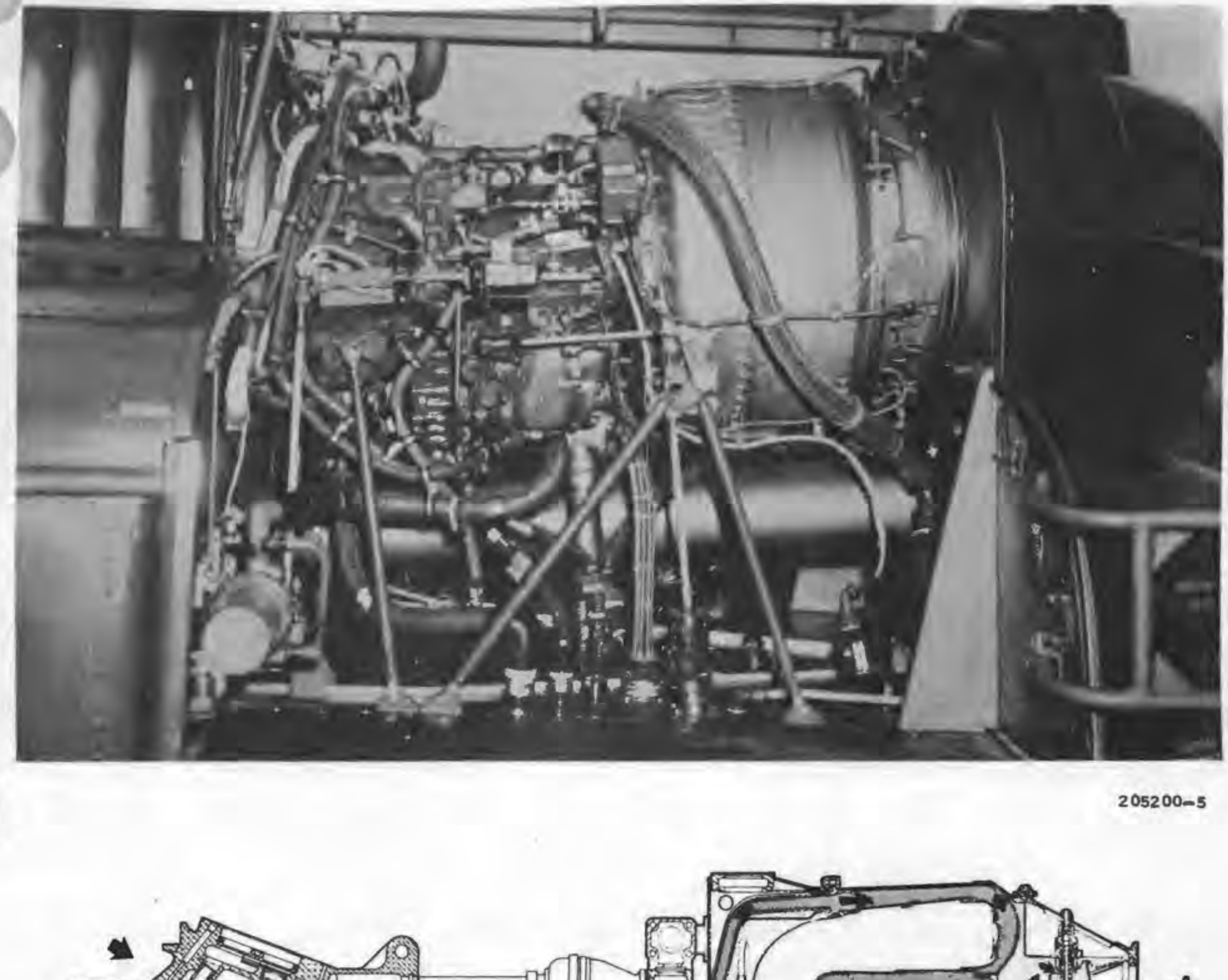


Figure 2-2. Engine installation and engine airflow

Table 2–2. Comparison of T53-L-9, -9A, -11 and -13 engines

	T53-L-9	T53-L-9A	T53-L-11	T53-L-13
*Power Rating in Shaft hp (min)				
Take-off	1100	1100	1100	1100
Military	1000	1000	1000	1000
Normal	900	900	900	900
75% Normal	675	675	675	675
*Fuel Consumption in lbs/hr				
Take-off	750.2	750.2	750.2	750.2
Military	690	690	690	690
Normal	631.8	631.8	631.8	631.8
75% Normal	514.4	514.4	514.4	514.4
JP-5 Fuel Use	***Emergency	***Emergency	Alternate	JP-4 or JP-5 Primary Fuels
Dry Weight	485 lbs	490 lbs	505 lbs	549 lbs.
Ignition Nozzles	5	5	2	4
Combustor	Scoops Coated	Scoops Coated	Scoopless Uncoated	Scoopless Uncoated
Bleed Air Extraction Point	Compressor	Diffuser	Diffuser	Diffuser
Fuel Control Assembly (connection to interstage airbleed assembly)	No	No	Yes	Yes
Interstage Airbleed System (Acceleration)	Yes	Yes	**Yes	**Yes
Acceleration — 60 to 90% nI	5 sec (max)	5 sec (max)	4 sec (max)	4 sec (max)

*Horsepower and Fuel Consumption ratings are based on sea level standard day conditions (plus 59°F, 29.92 inches Hg).

**Also responds to transient speed changes in operating range.

***Grade JP-5 as alternate only after incorporation of the Scoopless Combustor.

-9A engines or two L-11 engines and four L-13 engines) igniter nozzle assemblies. The igniter plugs initiate the flame. After combustion occurs and the ignition system is de-energized, the solenoid valve shuts off the starting fuel flow. Main fuel is delivered to the main fuel system when the engine rpm is great enough to deliver minimum fuel pressure. Main fuel flow is maintained as the engine flame is propagated. After an engine shutdown, a pressure-actuated valve automatically drains any remaining unburned fuel from the combustion chamber. Engine fuel control is accomplished by a hydro-mechanical type fuel control system consisting of a fuel regulator assembly and overspeed governor assembly. An emergency fuel metering system is also provided as an integral part of illuminating the caution light. When illuminated, the caution light segment wording will read ENGINE FUEL PUMP providing visual indication of an engine driven fuel pump failure. The caution light and pressure switch are supplied power by the 28-volt DC essential bus.

2-35A. *Chip Detector Warning Light.* Magnetic inserts are installed in the drain plugs of the transmission sump, the intermediate (42°) tail rotor gear box and the tail rotor (90°) gear box. These plugs provide a means of inspection for metal particles. Indication of particles present is given by the illumination of the CHIP DETECTOR caution light. These plugs can be removed without loss of oil by means of a self-closing spring loaded valve in the drain plug which seats when magnetic insert is removed. CHIP DETECTOR switch on the pedestal panel

"GO NO GO" TAKE-OFF DATA PLACARD

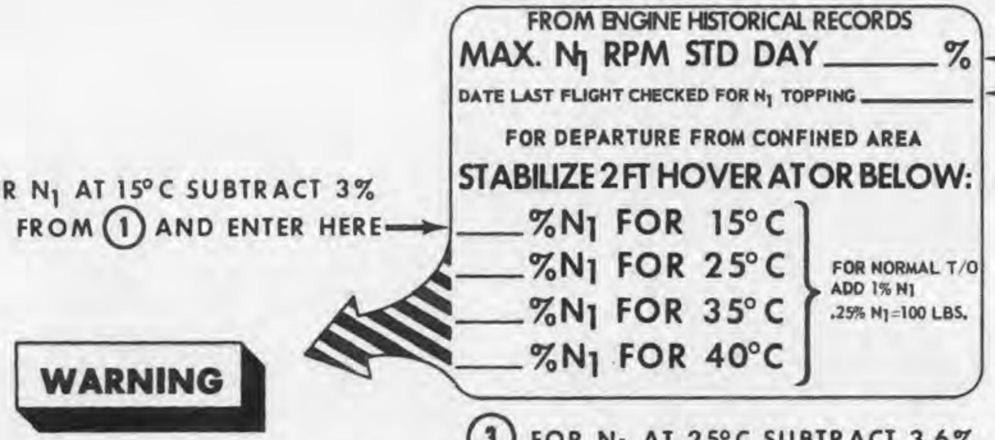
FOR ALL UH-1 SERIES HELICOPTERS WITH LYCOMING T53 SERIES ENGINES

INSTRUCTIONS

① OBTAIN MAXIMUM N_1 FOR STANDARD DAY FROM ENGINE HISTORICAL RECORDS AND ENTER HERE (USE PENCIL)

ENTER DATE AIRCRAFT WAS LAST FLIGHT CHECKED FOR N_1 TOPPING

② FOR N_1 AT 15°C SUBTRACT 3% FROM ① AND ENTER HERE



FROM ENGINE HISTORICAL RECORDS

MAX. N_1 RPM STD DAY ______ %

DATE LAST FLIGHT CHECKED FOR N_1 TOPPING ______

FOR DEPARTURE FROM CONFINED AREA

STABILIZE 2 FT HOVER AT OR BELOW:

____%N_1 FOR 15°C
____%N_1 FOR 25°C
____%N_1 FOR 35°C
____%N_1 FOR 40°C

FOR NORMAL T/O ADD 1% N_1
.25% N_1=100 LBS.

THIS PLACARD NOT APPLICABLE FOR T53-L-13 ENGINES.

③ FOR N_1 AT 25°C SUBTRACT 3.6% FROM ① AND ENTER

④ FOR N_1 AT 35°C SUBTRACT 4.4% FROM ① AND ENTER

⑤ FOR N_1 AT 40°C SUBTRACT 4.8% FROM ① AND ENTER

⑥ CUT OUT PLACARD, PEEL OFF BACK AND APPLY TO INSTRUMENT PANEL SO THAT ARROW POINTS TO N_1 GAUGE.

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Figure 2-5A. "Go No Go" take-off data placard

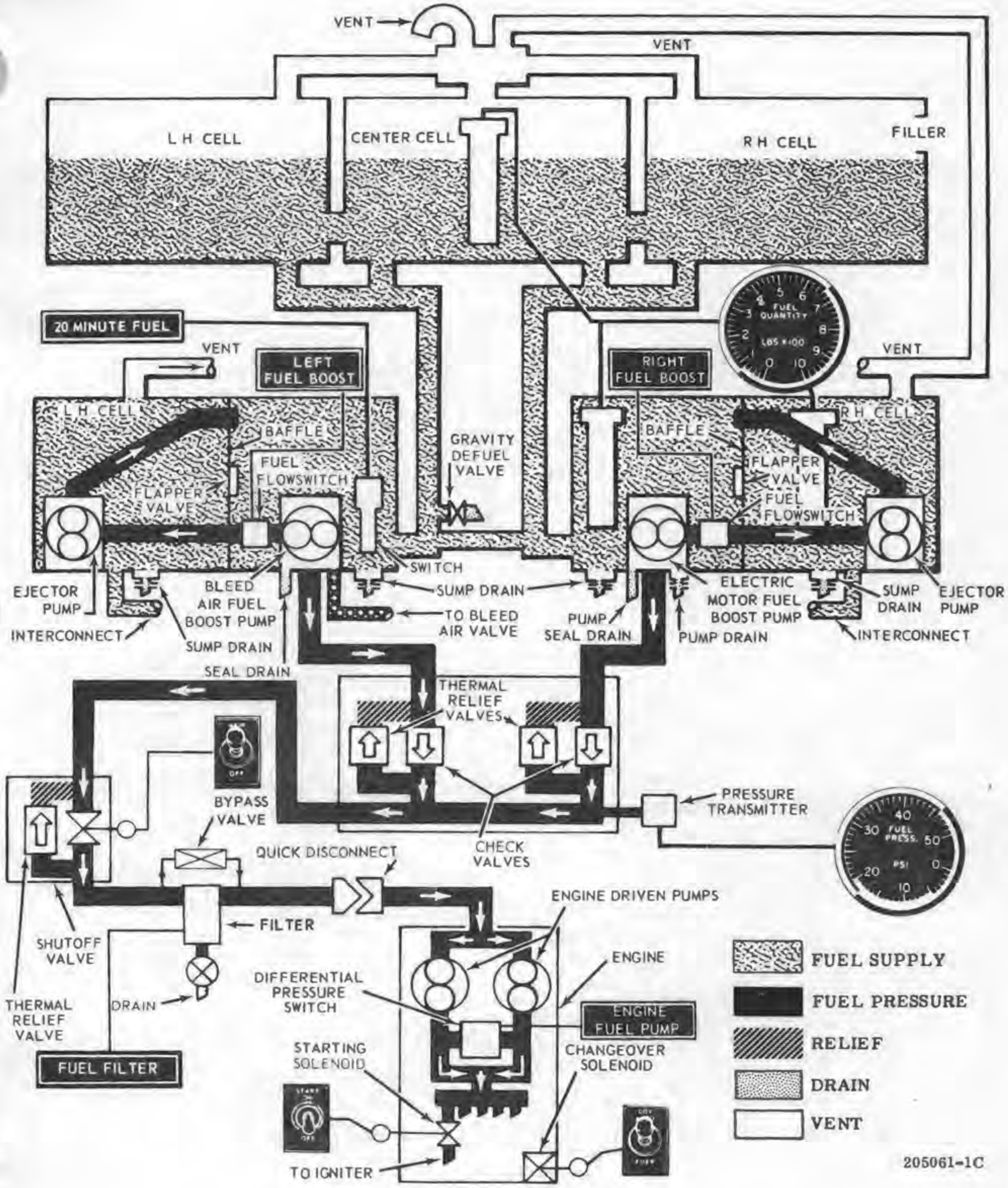
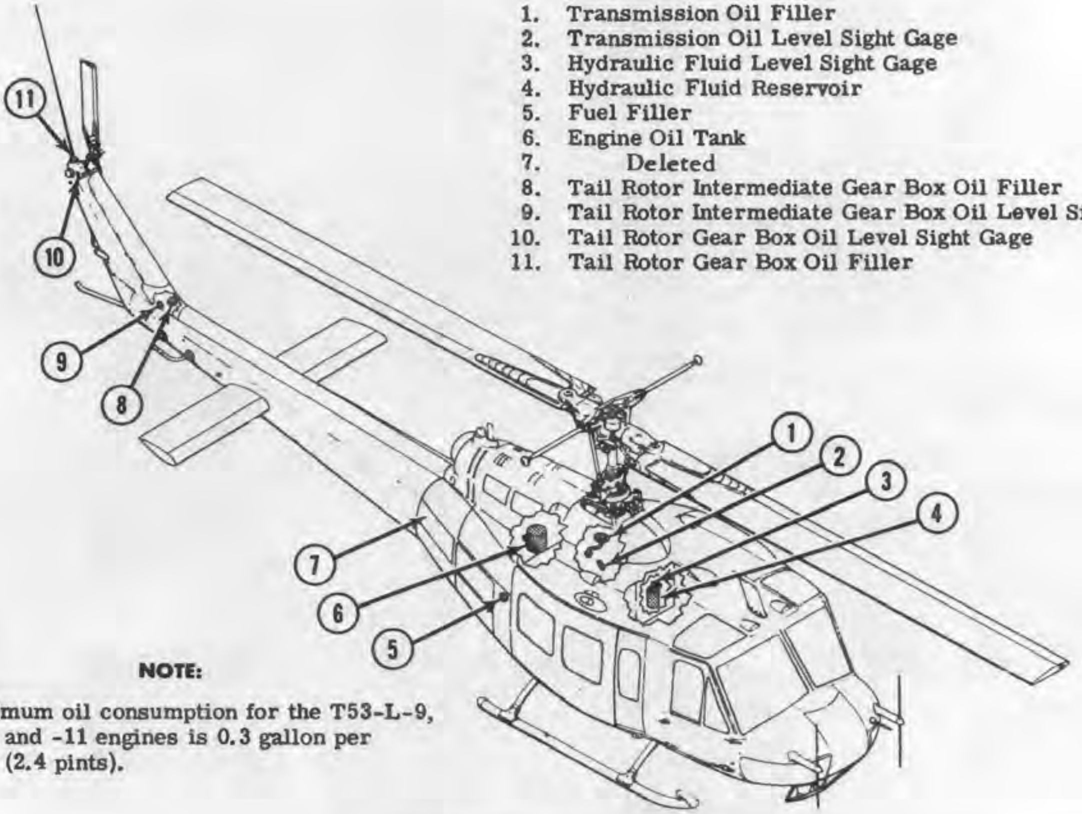


Figure 2–8. Fuel system schematic diagram – UH-1D (Sheet 2 of 2)



1. Transmission Oil Filler
2. Transmission Oil Level Sight Gage
3. Hydraulic Fluid Level Sight Gage
4. Hydraulic Fluid Reservoir
5. Fuel Filler
6. Engine Oil Tank
7. Deleted
8. Tail Rotor Intermediate Gear Box Oil Filler
9. Tail Rotor Intermediate Gear Box Oil Level Sight Gage
10. Tail Rotor Gear Box Oil Level Sight Gage
11. Tail Rotor Gear Box Oil Filler

NOTE:

Maximum oil consumption for the T53-L-9, -9A, and -11 engines is 0.3 gallon per hour (2.4 pints).

SPECIFICATIONS AND CAPACITIES

ENGINE FUEL - MIL-J-5624 Grade JP-4
ALTERNATE - Grade JP-5
(T53-L-11 engine)
Capacity 220 U.S. Gals.
NOTE: JP-4 and JP-5 are both primary fuels for the T53-L-13 engine

ENGINE OIL - MIL-L-7808
Capacity 3.0 U.S. Gals.

The following EMERGENCY fuels may be used in accordance with TB AVN 2:

TRANSMISSION - MIL-L-7808
Capacity 2.25 U.S. Gals.

TAIL ROTOR INTERMEDIATE GEAR OIL
MIL-L-7808, Capacity 0.375 U.S. Pint

TAIL ROTOR GEAR BOX OIL - MIL-L-7808
Capacity 0.50 U.S. Pint

HYDRAULIC FLUID - MIL-H-5606
System Capacity 7.3 U.S. Pints
Reservoir Capacity 1.5 U.S. Pints
Refill Reservoir Capacity 1 U.S. Pint

(a) Unleaded Gasoline (white gasoline)
(b) MIL-G-5572, Aviation Gasoline (Use lowest grade available)
(c) MIL-G-3056, Automotive Gasoline (Use lowest grade available)
(d) MIL-J-5624, Grade JP-5 (T53-L-9 and T53-L-9A)
NOTE: T53-L-13 Engine, MK-G-5592 Aviation Gasoline (6 hours maximum) (Use lowest grade available)

An entry shall be made in DA Form 2408-13 after use of ALTERNATE or EMERGENCY fuels.

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Figure 2-9. Servicing diagram

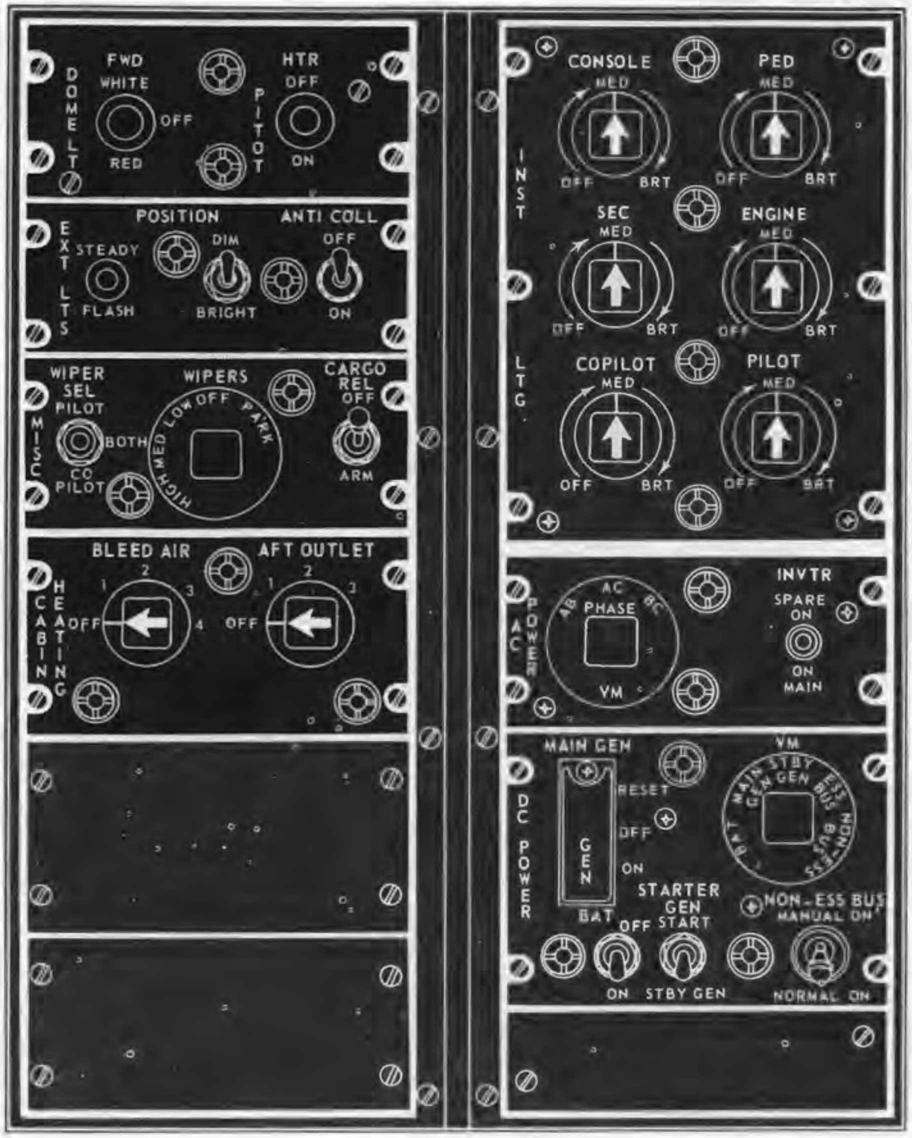

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Figure 2–11. Overhead console — typical

the percentage of total electrical system amperage being used by the helicopter's electrical system when standby generator is operating. Loadmeters will not indicate this percentage when the generators are inoperative.

2-72. Alternating Current Power Supply System.

The alternating current is supplied by two 250 volt-ampere, three-phase inverters (main and spare) which convert the 28-volt DC to 115-volt AC. The main and spare inverters are interchangeable in power output. Selection control, MAIN ON/OFF and SPARE ON, is accomplished from the AC POWER control panel (see 7, figure 2-11). Either inverter (at pilot's option) will supply 115-volt AC to attitude indicator system, AC failure relay, fuel quantity indicator and tank units, gyro magnetic compass system, and the 28-volt AC transformer. The 28-volt AC transformer, in turn, supplies 28-volt AC to the following: torque pressure transmitter and torquemeter, transmission oil pressure transmitter and indicator, engine oil pressure transmitter and indicator, and fuel pressure transmitter and indicator, and the course indicator.

2-73. Alternating Current Power Control. Alternating current power control is accomplished from the AC POWER control panel (see figure 2-11).

2-74. AC Power Control Panel. The AC POWER control panel (see 7, figure 2-11) is located on the overhead console. This panel is labeled AC POWER and contains the inverter (INVTR MAIN ON/SPARE ON) switch, the AC voltmeter (AC VM) selector switch, and two panel lights.

2-75. Inverter Switch — Main and Spare. The inverter switch, labeled INVTR, is located on the AC POWER control panel (see 7, figure 2-11). This is a three-position switch labeled SPARE ON/OFF/MAIN ON. For normal flight the inverter switch is in the MAIN ON position. The SPARE ON position is used to put the spare inverter into operation in the event of a main inverter failure. Inverter switch is supplied power by the 28-volt DC essential bus. Circuit protection is provided by the INVTR CONT circuit breaker (see figure 2-12).

2-76. AC Voltmeter Selector Switch. The AC VM (voltmeter selector switch is located on the left half of the AC POWER control panel (see 7, figure 2-11). The rotatable switch can easily be identified by the VM label on the round switch dial. The switch is used to monitor voltage between any of the three phases of the 115-volt alternating current electrical system. Actuation of switch is accomplished by a knob which has three (phase monitoring) positions labeled: AB, AC, and BC. When the selector switch is in AB position, the voltage indicated on instrument panel-mounted AC voltmeter is the voltage between phases A and B. In like manner, with selector switch in AC position, the voltage indicated on voltmeter is the voltage between phases A and C; with selector switch in BC position, the voltage indicated on voltmeter is the voltage between phases B and C.

2-77. Alternating Current Voltmeter. The AC voltmeter is mounted in the central area of the instrument panel directly under the DC voltmeter (see 36, figure 2-5). The alternating current voltage output from the inverter (main or spare) is indicated on this instrument. The voltage indicated between any two of the three selected positions (phases) should be 115 (±3.0) volts AC.

2-78. Circuit Breaker Panels.

Three circuit breaker panels are provided consisting of a direct current circuit breaker panel, alternating current circuit breaker panel, and an auxiliary circuit breaker panel.

2-79. DC Circuit Breaker Panel. The direct current circuit breaker panel is located on the overhead console within easy reach of the pilot's and copilot's positions (see figure 2-12). Each individual breaker is clearly labeled for the particular electrical circuit protected. In the event a circuit is overloaded, the circuit breaker protecting that circuit will pop out, de-energizing the circuit. The circuit is reset or actuated by pushing the circuit breaker in.

2-80. AC Circuit Breaker Panel. The alternating current circuit breaker panel is located on the right-hand side of the pedestal base, visible and within easy reach of the pilot (see figure 2-13). The upper and center panel plate, labeled AC 115V contains the circuit breakers which provide the circuit protection for the 115-volt AC electrical circuits. The lower panel plate, labeled AC 28V, contains the circuit breakers which provide circuit protection for the 28-volt AC electrical circuits. In the event a circuit is overloaded, the circuit breaker protecting that particular circuit will pop out, de-energizing the

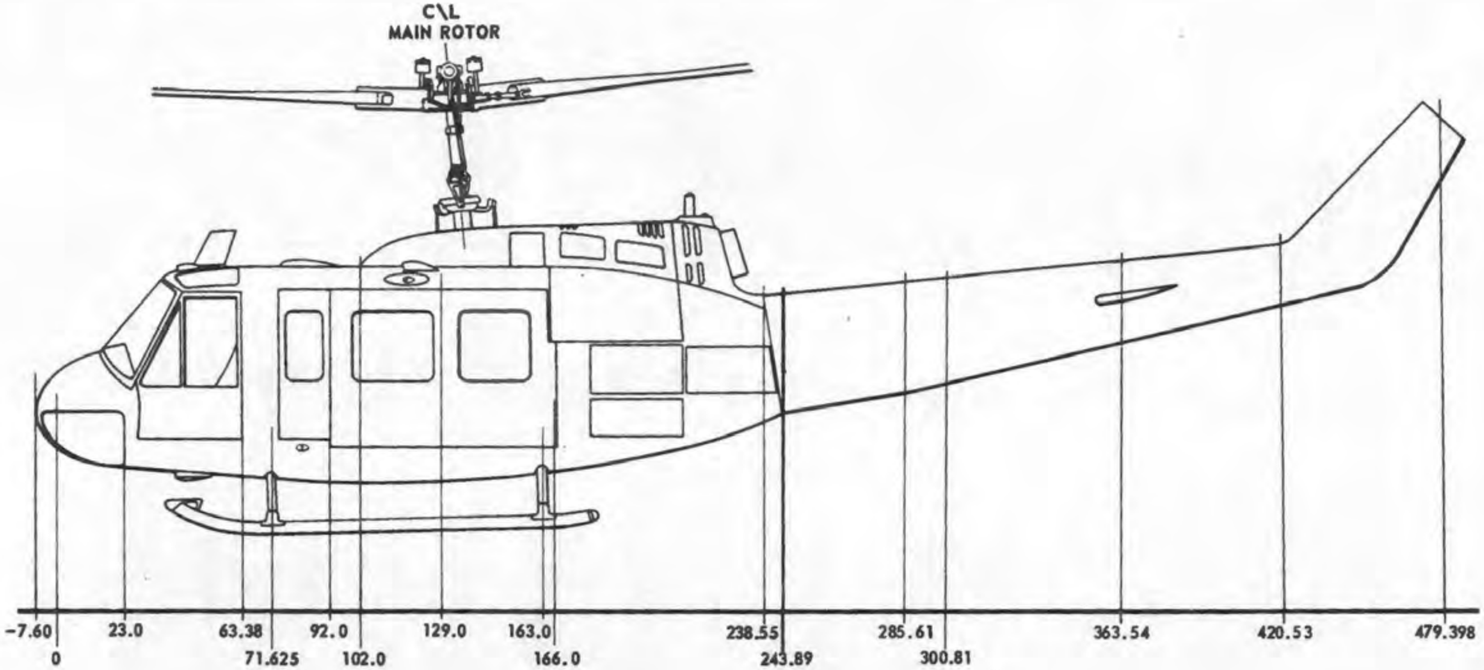


Figure 2-16. Stations diagram 48 ft. rotor (Sheet 2 of 2)

top center of the instrument panel (see 3, figure 2-5). When this light illuminates, the pilot is alerted to check the CAUTION panel (see figure 2-15) for the fault condition or conditions that have occurred.

2-115. *Caution Panel*. The CAUTION panel (see figure 2-15) is mounted in the instrument pedestal. When illuminated, the worded segment lettering in the panel will be aviation yellow; however, when not illuminated, segment lettering will not be visible. This panel functions to provide the pilot visual indicatons (day or night) of the fault conditions as follows:

FAULT CONDITION	CAUTION PANEL SEGMENT
Engine Oil Pressure Low	ENGINE OIL PRESS
Engine Icing Indicator	ENGINE ICING
Engine Ice Detector Disarmed	ENGINE ICE DET.
Left Fuel Boost Pump Inoperative	LEFT FUEL BOOST
Right Fuel Boost Pump OFF	RIGHT FUEL BOOST
Engine Fuel Pump Inoperative	ENGINE FUEL PUMP
Fuel Quantity Low	20 MINUTE FUEL
Auxiliary Fuel Tank Empty	AUX FUEL LOW
Transmission Oil Pressure Low	XMSN OIL PRESS
Transmission Oil Temperature High	XMSN OIL HOT
Hydraulic Pressure Low	HYD PRESSURE
AC Bus Failure (Inverter Failure)	INST INVERTER
DC Generator Failure	DC GENERATOR
External Power Plug	EXTERNAL POWER
Fuel Filter Clogged	FUEL FILTER
Engine air filter clogged	AIR FILTER
Metal particles present in 42° or 90° gear box	CHIP DETECTOR
Emergency fuel control	GOV EMER
IFF system inoperative	AN/APX-68

Note

IFF panel segment is only for the AN/APX-68. Failure of AN/APX-44 system, when installed, will not actuate the light.

2-116. Illumination of any of the worded segments on the CAUTION panel alerts the pilot to a fault condition or conditions. The panel is equipped with a RESET/TEST switch, a BRIGHT/DIM switch and two edge lights for illuminating the switches. Electrical power to the CAUTION panel is supplied by the 28-volt DC essential bus. Circuit protection is provided by the CAUTION LIGHTS circuit breaker on the DC circuit breaker panel (see figure 2-12).

2-117. *BRIGHT/DIM Switch — Caution Panel*. The BRIGHT/DIM switch on the CAUTION panel (see figure 2-15) permits the pilot to manually select a bright or dimmed condition for all the individual worded segments and the master caution indicator light (see 3, figure 2-5) on the instrument panel. After each initial application of power, the lamps will come on in the bright condition. Momentarily placing the switch in up position selects the BRIGHT condition, down position selects the DIM condition.

2-118. *Reset/Test Switch — Caution Panel*. The caution panel is provided with a reset/test switch enabling the pilot to manually reset and test the master caution system (see figure 2-15). This switch is labeled RESET in up position and TEST in the down position. Momentarily placing the reset/test switch in RESET position extinguishes and resets the master caution light on the instrument panel so it will

mm. BATtery — ON (OFF for APU starts).

nn. FIRE DETECTOR Light — TEST (15 Seconds MAXIMUM).

oo. MARKER BEACON Light — TEST.

pp. CARGO RELEASE ARMED Warning Light — TEST.

qq. CAUTION Panel and MASTER CAUTION — TEST.

rr. GOVernor R P M INCRease DECRease Switch — Decrease 8 to 10 seconds.

ss. Search Light Switch — STOW.

tt. LanDinG Light Switches — OFF and RETRact.

uu. Throttle — Position the throttle just below the ENGINE IDLE Stop Release (for abort start purposes).

3-22. Starting Engine. a. Fire Guard Posted.

b. Check Rotor Blades Clear.

c. Energize Starter and Start Clock. (Start fuel flow and ignition occur simultaneously.)

Caution

> Check DC Voltmeter, if voltage drops below 14 volts, abort start.

d. Start Fuel Switch — OFF at 400°C.*

**Note*

> The start fuel switch is removed on helicopter S/N 66-16034 and subsequent (including 66-8574 through 66-8577).

Caution

> Monitor EGT to avoid a hot start. If uneven or intermittent acceleration is accompanied by a rapid rise in EGT, shut down engine and immediately investigate. During starting or acceleration, the MAXIMUM allowable EGT is 760°C. If this limit is exceeded, perform a hot end inspection. If during the start operation of T53-L-9 or T53-L-9A engines, EGT exceeds 620°C for more than five seconds, record a hot start on DA Form 2408-13, and three such hot starts shall require a hot end inspection. If during the start operation of the T53-L-11 and T53-L-13 engines, EGT exceeds 650°C for more than five seconds, perform a hot end inspection.

e. Release Starter Switch at 40 percent nl speed, 42 percent for L-13 engine.

Caution

> Limit starter energize time to 40 seconds. If engine does not start, a three minute cooling period is recommended after which a second starting cycle may be attempted. Only three forty-second starting attempts are permissible in any one hour period.

f. Slowly advance the throttle over the ENGINE IDLE stop.

g. INVERTER — Spare ON.

h. ENGINE and TRANSMISSION OIL PRESSURES — CHECK.

Caution

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

i. Start Fuel Switch — ON.

j. Radios and headsets — ON.

3-23. Engine Run-Up. Retard the throttle to the ENGINE IDLE Stop and check the following:

a. GAS PRODUCER, 56 percent to 58 percent RPM (70 to 72 percent for the L-13 engine).

b. ENGINE and TRANSmission OIL PRESSures — in the green.

c. FUEL PRESSURE — in the green.

d. CAUTION Panel and MASTER CAUTION — all lights OFF.

e. LOW RPM Switch — AUDIO then OFF.

f. Co-Pilot's Attitude Indicator — CAGE.

g. FUEL (QUANTITY) GAGE TEST SWITCH — TEST.

h. PITOT HeaTeR — ON — note LOADmeter increase — then OFF.

i. AC POWER VoltMeter — CHECK all PHASES for 115 (plus or minus 3) VOLTS (on SPARE INVeRteR).

j. INVerTeR — MAIN ON.
k. AC POWER VoltMeter — CHECK all PHASES for 115 (plus or minus 3) VOLTS.

l. DC POWER VoltMeter — CHECK all positions and leave in NON-ESSential BUS position.

m. STARTER GENerator—STandBY GENerator.

n. MAIN GENerator — OFF — note that MAIN GENerator LOADmeter zeros and STandBY GENerator LOAD meter registers.

o. DC POWER VoltMeter — CHECK voltage zero (with NON-ESSential BUS power off).

p. NON-ESSential BUS — MANUAL ON (Note voltage restored).

q. NON-ESSential BUS — NORMAL ON.

r. DC POWER VoltMeter — MAIN GENerator.

s. MAIN GENerator — ON — note that MAIN GENerator LOADmeter registers and STandBY GENerator LOADmeter zeroes.

t. STandBY GENerator — START.

u. Pilot's Attitude Indicator — SET.

v. All engine and transmission instruments — Normal or in the green.

w. DE-ICE Switch — ON — note EGT rise.

x. DE-ICE Switch — OFF — note EGT decrease.

y. GOVernor RPM INCRease — DECRease Switch — Actuate thru full range (6000 to 6700 plus or minus 50 RPM) and leave at 6600 RPM. Check that light goes out.

z. LOW RPM Switch — AUDIO.

aa. FORCE TRIM — OFF — Check control freedom — then ON (if to be used).

bb. HYDraulic CONTROL — OFF — CAREFULLY check for control freedom then ON.

cc. ANTI-COLLision Light — ON.

techniques to effect landings and take-offs from these sites. Although the helicopter is designed for, and is capable of, operation from very restricted areas, the final analysis of the situation and the decision to land must be determined by the best professional judgment of the pilot. Prior to attempting operation of the helicopter from unsurfaced area, the pilot must consider certain basic factors and evaluate one against the other to determine what undesirable factors will be present in the contemplated operations.

3-39. ***Suitability of Usable Area.*** The suitability of the usable area can be determined by a low speed pass into wind over the intended landing site. Generally the landing site should be a level and cleared area approximately twice the diameter of the main rotor disc area. The pilot must consider density altitude, gross weight, personal skill, wind, and obstacles when evaluating the suitability of a landing area.

3-40. ***Wind Direction, Velocity, and Consistency.*** The effects of wind on the take-offs and landings are very important factors in the operation of the helicopter; however, in planning critical helicopter operation, the winds should not be relied upon to accomplish a landing and take-off from an obstructed area. If the helicopter were riding a gust on the final approach and the gust should decrease as the helicopter was approaching a hover, the helicopter would rapidly settle if the wind factor was planned on to execute the landing. This condition would also hold true during the initial phase of take-off. If an operation is dependent upon wind conditions, all other conditions being marginal, the helicopter should be lightened. When a landing area is determined to be marginal, the pilot should select another area. Another effect of wind that must be considered is the "lee effect" of the wind over hills, ridges, and obstacles. The downdraft resulting from these conditions particularly affects the initial phase of take-off or the final phase of landing.

3-41. ***Gross Weight.*** The gross weight of the helicopter is an important factor to be considered in determining the feasibility of any contemplated helicopter operation. The pilot must know the actual weight of the aircraft to adequately evaluate the situation. In all instances the fuel load, equipment, and personnel should be kept to the minimum required to accomplish the mission.

3-42. ***Terrain Evaluation.*** After the preceding factors have been considered practicable, the surface must be evaluated. In helicopter operation, the presence of shrubs, brush, stumps, rocks, holes, soft surfaces, etc., are a definite hazard to landing. The selected landing spot must be free of any obstacles that will result in damage to the helicopter. Prior to attempting a landing the pilot should "drag" the area several times and select that spot at which the aircraft can be landed with adequate fuselage, tail rotor, and main rotor blade clearance, and determine the most desirable approach to accomplish an into-the-wind landing and subsequent take-off.

3-43. ***Anticipated Helicopter Performance.*** The final step in the evaluation of a landing site is the anticipated helicopter performance during landing and take-off. After the size of the area and the effect of the obstacles, gross weight, and density altitude have been determined, the practicability of the contemplated operation should be determined.

3-44. Normal Approach. The objective of a normal approach and landing is to bring the helicopter to a hover over the spot of intended landing. The airspeed is decreased gradually, and a constant approach angle of 8 to 10 degrees is established at an engine speed of maximum rpm. In case of undershooting or overshooting, the approach angle is corrected by increasing or decreasing the power and the collective pitch lever. As the landing spot is approached, the airspeed and the rate of descent are described in order to attain a hovering attitude at approximately five feet.

Caution

> Never reduce forward airspeed to zero before reaching hovering altitude. If the landing spot has been overshot, execute a go-around immediately.

3-45. Steep Approach. The steep-approach procedure is a precision, power-controlled approach used to clear obstacles and to accomplish a landing in confined areas. The rate of descent in a steep approach should not exceed approximatetly 400 fpm with a constant approach angle of 12 to 15 degrees; and some forward airspeed should be maintained at all times. Since a reasonable amount of power will be required to control the rate of descent (power required is governed by the gross weight and atmospheric conditions), a minimum amount of additional power will remain to accomplish a hover. The airspeed is decreased by holding the cyclic stick aft. The rate of descent is controlled by proper application of power and collective pitch lever. In the final stages of approach, the collective pitch lever is increased gradually; and the cyclic stick is adjusted to maintain the originally established glide angle in a way which will reduce the rate of descent to zero the moment that hovering altitude is reached.

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 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 8 to 10 seconds. Of the 8 to 10 seconds, 4 to 5 seconds are allowed to compensate for pilot reaction time and effects due to altitude and temperature. The other 4 to 5 seconds are due to the inherent turbine engine lag. The total lag could possibly be in excess of 10 seconds, depending on how far the pilot has allowed nI and nII speeds to drop.

3-46. Normal Landing. (See figure 2-4.) With engine rpm at 6400 to 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.

3-47. Slope Landing. Make the slope landing by heading the helicopter generally cross-slope. Descend slowly, placing the upslope 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 collective pitch and application of cyclic (into the slope) until all the weight of the helicopter 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 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 helicopter will maintain its position on the slope, place the cyclic stick in neutral position.

3-48. Crosswind Landing. Crosswind landings can generally be avoided in helicopter operations. Occasionally plowed, furrowed, or eroded fields and narrow mountain ridges may require that crosswind landings be made. The crosswind landing, in instances where terrain features dictate, is utilized to prevent landing at a high tipping angle or dangerous tail-low attitude. Crosswind landings may also be accomplished on smooth terrain when deemed advisable by the pilot. When performing a crosswind landing, hold cyclic into the wind to prevent side drift.

3-49. After Landing Check. Refer to the following paragraph 3-50 Post-Flight Check.

3-50. Post-Flight Check. The engine post-flight check shall be performed after the last flight of the day or after any flight if engine malfunction occurs during flight. Enter complete information on engine and helicopter discrepancies, if circumstances require, on DA Form 2408A.

a. Gas Producer RPM, 56 to 58 percent.

b. Exhaust Gas Temperature Within Allowable Range — CHECK.

c. Engine Oil Pressure, 25 PSI MINIMUM.

d. Engine Oil Temperature, 93°C MAXIMUM.

e. Transmission Oil Temperature, 110°C MAXIMUM.

f. Transmission Oil Pressure, 30 PSI MINIMUM.

3-51. Engine Shutdown. The complete procedure for stopping the engine is given in the following steps:

a. Governor rpm increase-decrease switch — Decrease 8 to 10 seconds.

Figure 3–4. Deleted

b. Throttle — CLOSED.

Caution

If a rapid rise in exhaust gas temperature is noted, motor the engine (with throttle CLOSED and starter fuel OFF) to allow temperature to stabilize within limits. Do not exceed 40 seconds continuous starter application.

c. Fuel Main Switch — OFF.

d. EGT — NOTE for DECREASE.

Note

After stopping the engine, a fuel pressure indication in excess of 30 psig may be observed due to the expansion of fuel trapped between the fuel control and fuel shut-off valve. This expansion is caused by heat radiating from the engine, resulting in fuel pressure indication. Check valves located in the fuel system relieve pressure exceeding 40 to 45 psig and permit fuel to bleed into fuel cells.

3-52. Before Leaving The Helicopter. Perform the following steps before leaving the helicopter:

a. All Electrical Switches — OFF.

b. Radio Switches — OFF.

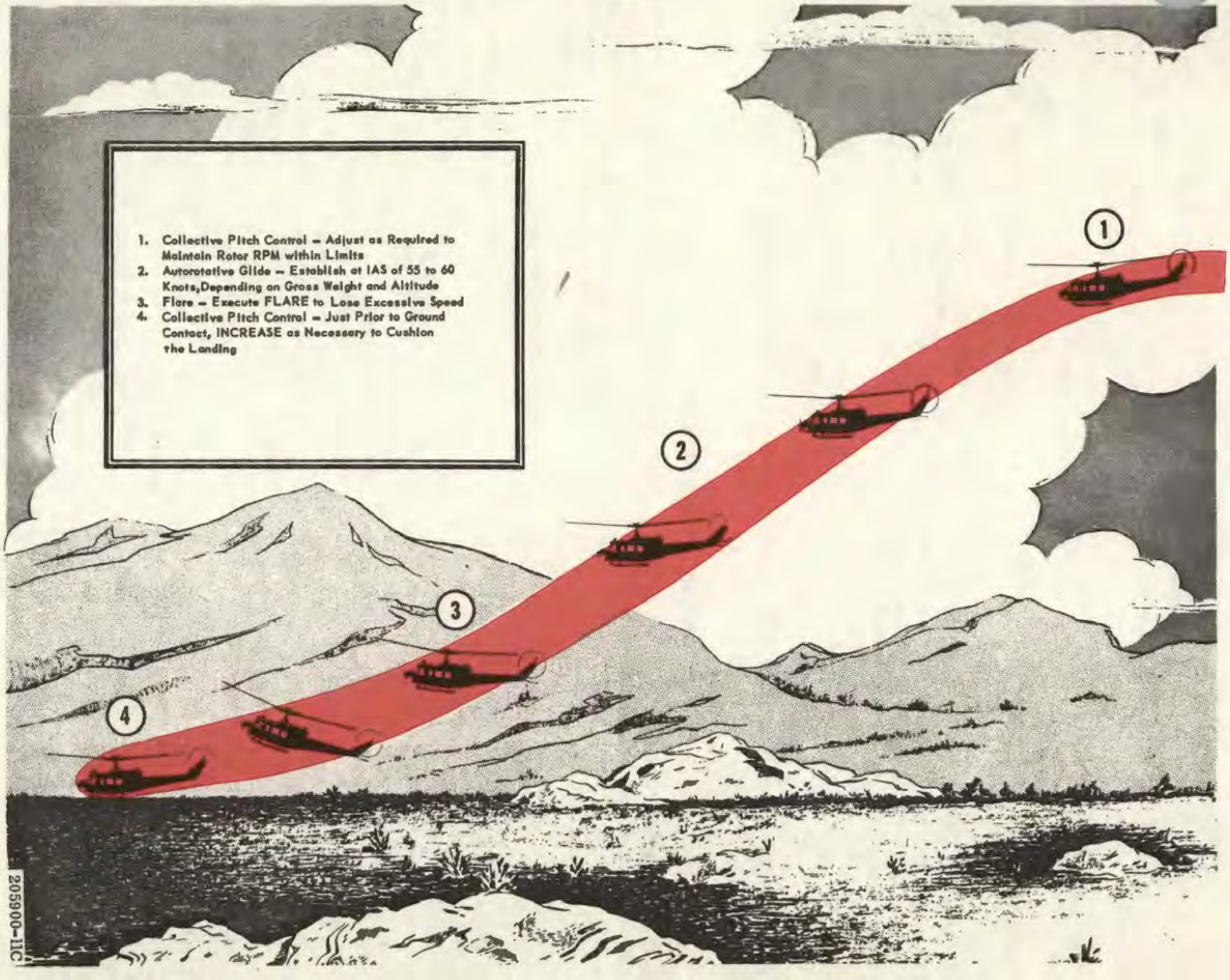
c. Collective Pitch Control — FULL DOWN and engage DOWN lock.

d. Secure aft main rotor blade with tie-down by drawing blade down lightly against static stop and tying web strap to the tail boom. Tie lower tail rotor blade to the vertical fin with web strap.

e. Exhaust Cover and Engine Inlet Cover — As required.

Note

In addition to the established requirements for reporting any system defects or unusual and excessive operations, the pilot will also make entries in DA Form 2408-13 to indicate when any limits in the Operator's Manual have been exceeded.



1. Collective Pitch Control – Adjust as Required to Maintain Rotor RPM within Limits
2. Autorotative Glide – Establish at IAS of 55 to 60 Knots, Depending on Gross Weight and Altitude
3. Flare – Execute FLARE to Lose Excessive Speed
4. Collective Pitch Control – Just Prior to Ground Contact, INCREASE as Necessary to Cushion the Landing

Figure 4-1. Approach and landing — power off

j. Gas Producer Tachometer — OBSERVE for engine START indication.

k. Fuel Start Switch — OFF at 400°C exhaust gas temperature

l. Starter-Ignition Switch — RELEASE at 35 to 42% rpm nI speed

m. Fuel Pressure Within Green Area — CHECK

n. Starter-Generator Switch — STBY GEN position

4-10A. Use of Governor (Emergency Position) During Starting. When mission dictates and starting the aircraft takes precedence, use of the emergency position of the governor can be used to prevent exceeding maximum allowable EGT. To conduct this type start proceed as follows:

As it becomes apparent that EGT will exceed maximum allowable limit:

a. Freeze throttle.

b. Governor selector switch to emergency until EGT stabilizes in the green arc, slowly advance throttle to increase nI RPM to 60 percent without exceeding maximum allowable EGT; do not "jockey" governor switch between auto and emergency positions. Retard throttle to flight idle stop and simultaneously reposition governor switch to auto position.

4-11. Engine Temperature Surge. If Engine temperature surge occurs during flight, the bleed air system shall be turned off. When operating at high power with DE-ICE switch ON, pilot shall closely observe exhaust gas temperature as overtemperature is possible.

4-12. Maximum Glide. A forward glide speed of (70 knots CAS for 44 foot rotor) and (94 knots TAS for 48 foot rotor) will result in obtaining maximum gliding distance (see figure 4-2).

Section III — Tail Rotor

4-13. Tail Rotor Malfunction. a. General Discussion. A common tendency among 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 antitorque malfunction could prove disastrous. 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 the probable effects therefrom.

(1) COMPLETE LOSS OF TAIL ROTOR THRUST. This is a situation involving a break in the drive system, such as a 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 tailboom swinging to the left (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.

(a) In powered flight the degree of sideslip and the degree of roll may be varied by changing airspeeds and by varying power (throttle or pitch), but neither can be eliminated. Below an airspeed of approximately 30 to 40 knots, the sideslip angle becomes uncontrollable and the tail of the aircraft begins to revolve on its vertical axis.

(b) 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 lost and the sideslip angle becomes uncontrollable. Upon pitch application at touchdown, the fuselage will tend to turn in the same direction the main rotor is turning (tail pylon swings right, opposite torque effect) due to an increase of friction in the transmission system. When normal control manipulations are used, the deceleration and pitch application should not cause excessive changes in sideslip angle.

(2) 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 tail pylon hangs 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.

(a) If the tail rotor pitch becomes fixed during an approach or other reduced power situation (right pedal applied), the tail pylon will swing left 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 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.

(b) If the tail rotor pitch becomes fixed during a takeoff or other increased power situation (left pedal applied), the tail pylon will swing left when power is reduced (as in leveling off with cruise power). This swing to the right upon power reduction will probably be to a lesser degree than the left swing encountered in any previously mentioned 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. 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.

(c) 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, than 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.

(3) Loss of the tail pylon, or portion thereof. The gravity of this situation is dependent upon the amount of weight (how much tail pylon) lost. If the loss is small, such as "aft of the 90° gear-box," the situation would be quite similar to "complete loss of tail rotor thrust." If more than that is lost, immediate autorotation may be the only (if any) solution of possible value.

b. Emergency Procedure For In-Flight Antitorque Malfunction.

(1) If the situation (altitude) permits, immediately reduce collective pitch (power) as an aid in gaining maximum possible control (trim) of the helicopter under the existing circumstances. Rolling off power (throttle) is not considered necessary at this time.

(2) The pilot should immediately analyze the existing emergency to the best of his ability before taking further action. The courses of action available will normally be —

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

(b) If a safe landing area is not immediately available, continue powered flight to a suitable landing area by gradually applying power to assume a level powered flight circumstance, 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 60 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 pitch pull just prior to touchdown in a level attitude with minimum ground roll (zero, if possible).

(c) If the pilot has determined that the tail rotor pitch is fixed in a "left pedal applied" position (tail rotor delivering thrust to the left), autorotative landing should 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.

c. Emergency Procedure for Antitorque Malfunction While at a Hover.
The best solution for antitorque failure while at a hover is normally to autorotate immediately. However, the exception described in paragraph above still applies. In this instance, gradually reduce pitch to accomplish a powered touchdown.

4-14. Deleted.

4-15. Deleted.

4-16. Deleted.

Section IV — Fire

4-17. Engine Fire During Starting. An engine fire during starting will be caused by an overload of fuel in the combustion chamber and a delayed ignition of the fuel, resulting in flame emitting from the tailpipe. To extinguish fire, proceed as follows:

a. Throttle — CLOSE and continue to crank engine.

b. Fuel Main Switch — OFF.

(Deleted)

4-18. Engine Fire During Flight. Immediately on discovery of an engine fire during flight prepare for a power-off landing and accomplish the following:

a. Throttle — CLOSE.

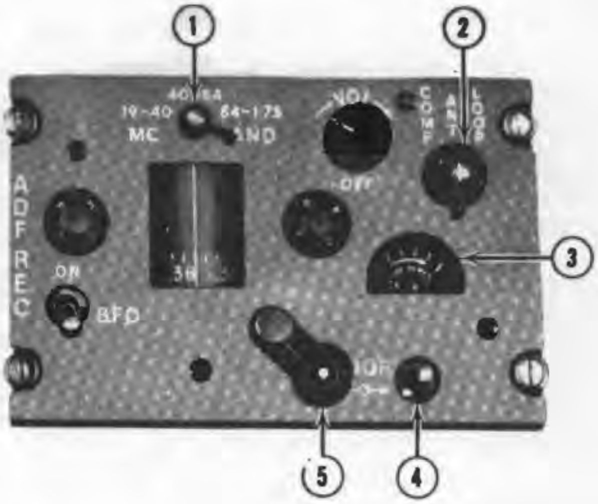
b. Autorotative Glide — ESTABLISH and prepare for a power-off landing.

c. Fuel Main Switch — OFF.

d. Battery Switch — OFF.

e. Generator Switch — OFF, except when power is required to operate lights or avionic equipment.

5-68. Direction Finder Control Panel. The direction finder control panel (see figure 5-16) is marked ADF REC. The control panel is located in the pedestal and is used to control the AN/ARN-59 receiver. The controls and indicators located on the panel and their functions are as follows:



1. Band Switch
2. Function Switch
3. Tuning Meter
4. Loop Switch
5. Tuning Crank

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Figure 5–16. ADF control panel

CONTROL	FUNCTION
MC BAND switch	Selects the desired frequency band.
VOL-OFF control	Turns direction finder set on or off. Adjusts receiver audio level when function switch is in COMP position. Adjusts receiver RF sensitivity when function switch is in ANT or LOOP position.
Function switch	COMP position — Receiver operates on combined loop and sense antennas as a radio compass.
	ANT position — receiver operates with sense antenna. Loop position — receiver operates with loop antenna.
LOOP switch	Positions the loop antenna when the function switch is in either COMP or LOOP position.
Tuning crank	Tunes the receiver to the frequency of the received signal.
Tuning meter	Facilitates accurate tuning of the receiver.
BFO switch	Turns BFO ON or OFF.

5-68A. Direction Finder Control Panel — C6899/ARN-83. The C-6899 control panel (see figure 5-16A) is marked ADF, and is located in the pedestal. The control panel is used to control the AN/ARN-83 receiver, and to select and control the loop antenna and sense antenna. The controls and indicators located on the panel and their functions are as follows:

CONTROL	FUNCTION
Band selector switch	Selects the desired frequency band.
TUNE control	Selects the desired frequency.
Tuning meter	Facilitates accurate tuning of the receiver.
GAIN control	Adjusts audio level when mode selector is in ANT or LOOP position.
Mode selector switch	Turns set OFF and selects ADF, ANT and LOOP modes of operation.
LOOP L-R switch	Controls rotation of loop left or right.
BFO switch	Turns BFO, on or off.

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Figure 5-16A. Direction finder control panel — C6899/ARN-83

5-69. Bearing-Heading Indicator. Two bearing-heading indicators are installed in the instrument panel (see figure 5-17 for illustration of the pilot's bearing-heading indicator). The copilot's indicator (not shown) is a repeater type instrument similar to pilot's indicator except that it does not have a set heading knob or a heading synchronization knob. The moving type dials on both indicators display the gyro magnetic compass heading. The No. 1 (single bar) pointers display the radio magnetic bearing from the direction finder set. The No. 2 (double bar) pointers display the bearing of the station being received on the VHF navigation receiver. The controls located on the bearing-heading indicators and their functions are as follows:

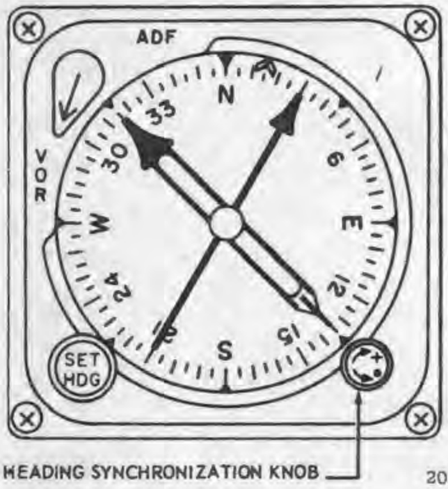

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Figure 5–17. Bearing-heading indicator

6-52. *After Firing Operation*. See Table 6-2.

6-53. *Before Leaving Helicopter*. Stow machine gun.

6-54. *Emergency Operation*. Emergency operation procedures are set forth in the following paragraphs:

6-55. *Failure To Fire*. a. Misfire. A misfire is a complete failure to fire. It must be treated as a hangfire until such possibility has been eliminated.

b. Hangfire. A hangfire is a delay in the functioning of a propelling charge.

Caution

> After any failure to fire, observe time intervals prescribed in paragraph 6-56.

c. Cook-Off. A cook-off is the firing of the chambered round due to a hot barrel.

6-56. *Immediate Action Procedures for Removing a Live Round in Case of Failure to Fire*. a. If a stoppage occurs, wait five seconds, retract cocking handle assembly to rear, insuring that the operating rod remains to the rear.

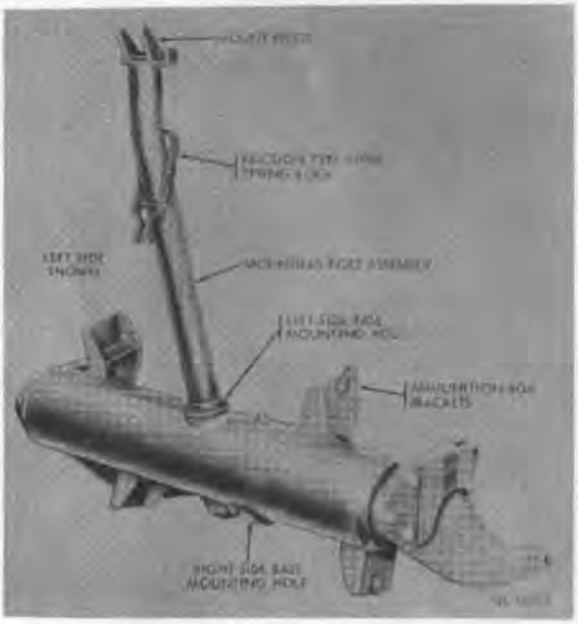


Figure 6-6. Mount assembly — left mount assembly shown

Figure 6-7. Machine gun XM60D positioned on left or right mount assembly on helicopter armament subsystem XM23

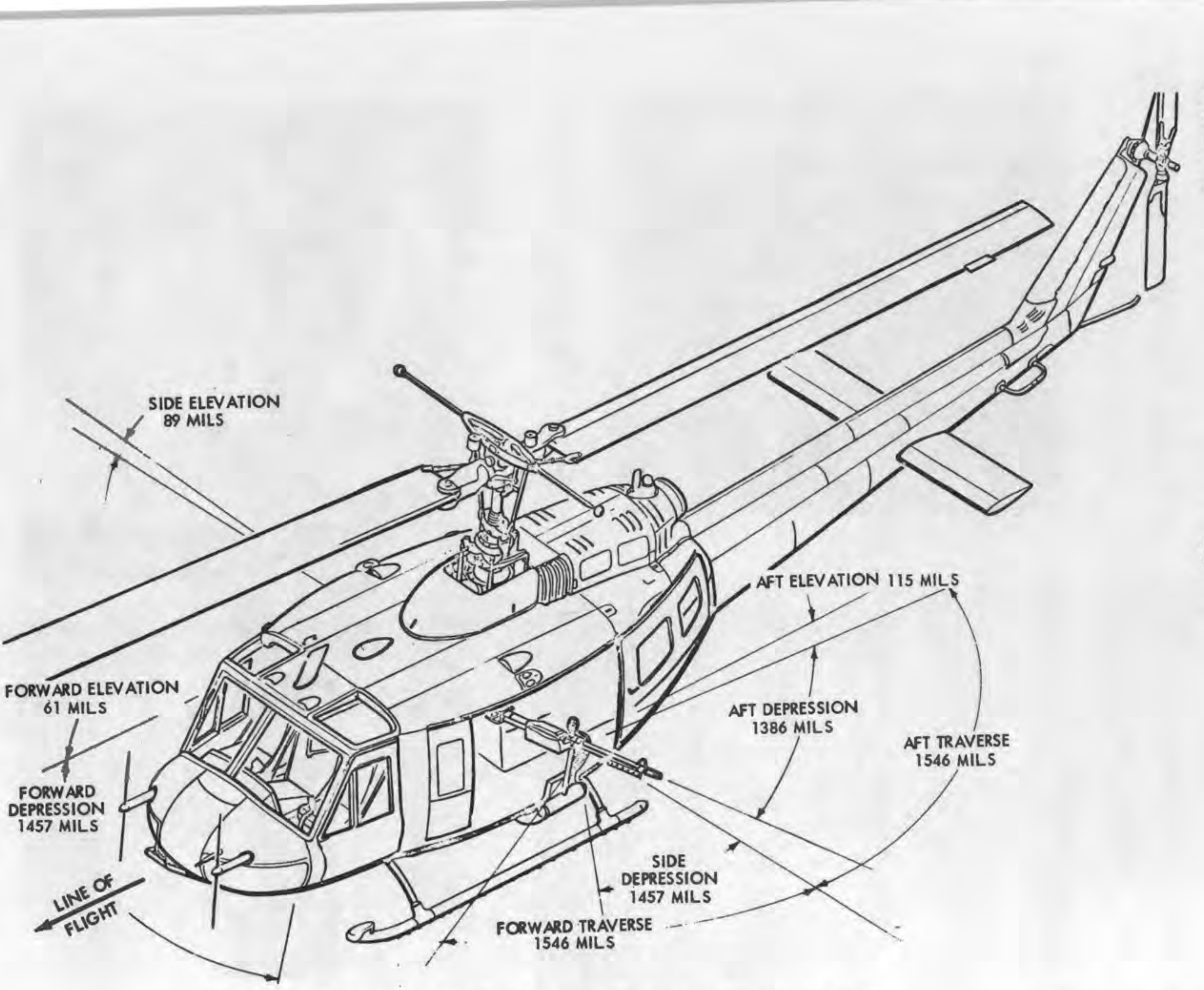


Figure 6-8. Machine gun XM60D traverse, elevation, and depression limits

pushbutton switch is on the cyclic control stick. Before the electrical release switch on the cyclic control stick can be actuated, the CARGO RELEASE switch on the overhead panel must be positioned to ARM. When not in use, the cargo suspension unit need not be removed, nor does it require stowing. Three cable and spring attachments keep the unit centralized, and the hook protrudes only slightly below the lower surface of the helicopter. A rear view mirror enables the pilot to visually check operation of the external cargo suspension hook.

6-64A. Internal Rescue Hoist. Provisions have been made for the installation of an internal rescue hoist. See figure 6-17A. This installation may be made in any one of four positions in the helicopter's cabin as shown in figure 6-17B. The hoist installation consists of a vertical column extending from the floor structure to the cabin roof, a boom, and an electrically operated winch. Two electrical controls for the operation of the rescue hoist are provided, one for the pilot, and one for the hoist operator. The pilot's control switch is located on the cyclic control stick (figure 2-4) and provides up and down operation of the hoist as well as positioning the boom. A four position hoist switch located on the hoist control pendant (figure 6-17C) is provided for the hoist operator. The pilot's control can override the hoist operator's control. An electrically operated ballistic charge type cable cutter is provided with two guarded type cable cutter switches. The pilot's cable cutter switch is mounted on the pedestal (figure 6-17D) and the hoist operator's cable cutter switch is mounted on the top of the hoist control box (figure 6-17E). The hoist drum has a usable capacity of 256 feet of cable. Two limiting switches provide automatic stoppage to control reel-in and reel-out limits of usable cable. An intercom headset, wired to the hoist and controlled by a switch on the pendant, gives the hoist operator interphone communications with the flight crew.

Note

The hoist cable is color coded as follows: The first 25 feet is yellow, the next 175 feet is unpainted. The next 40 feet is yellow and the last 16 feet is red.

6-64B. Rescue Hoist Operations. The rescue hoist is used to accomplish the lifting of personnel or cargo when a landing cannot normally be made. The types of lifts usually required in the use of the rescue hoist are:

a. Pickups from wooded or obstructed areas.

b. Pickups from water.

c. Pickups from boats or ships where landings could not be accomplished.

Note

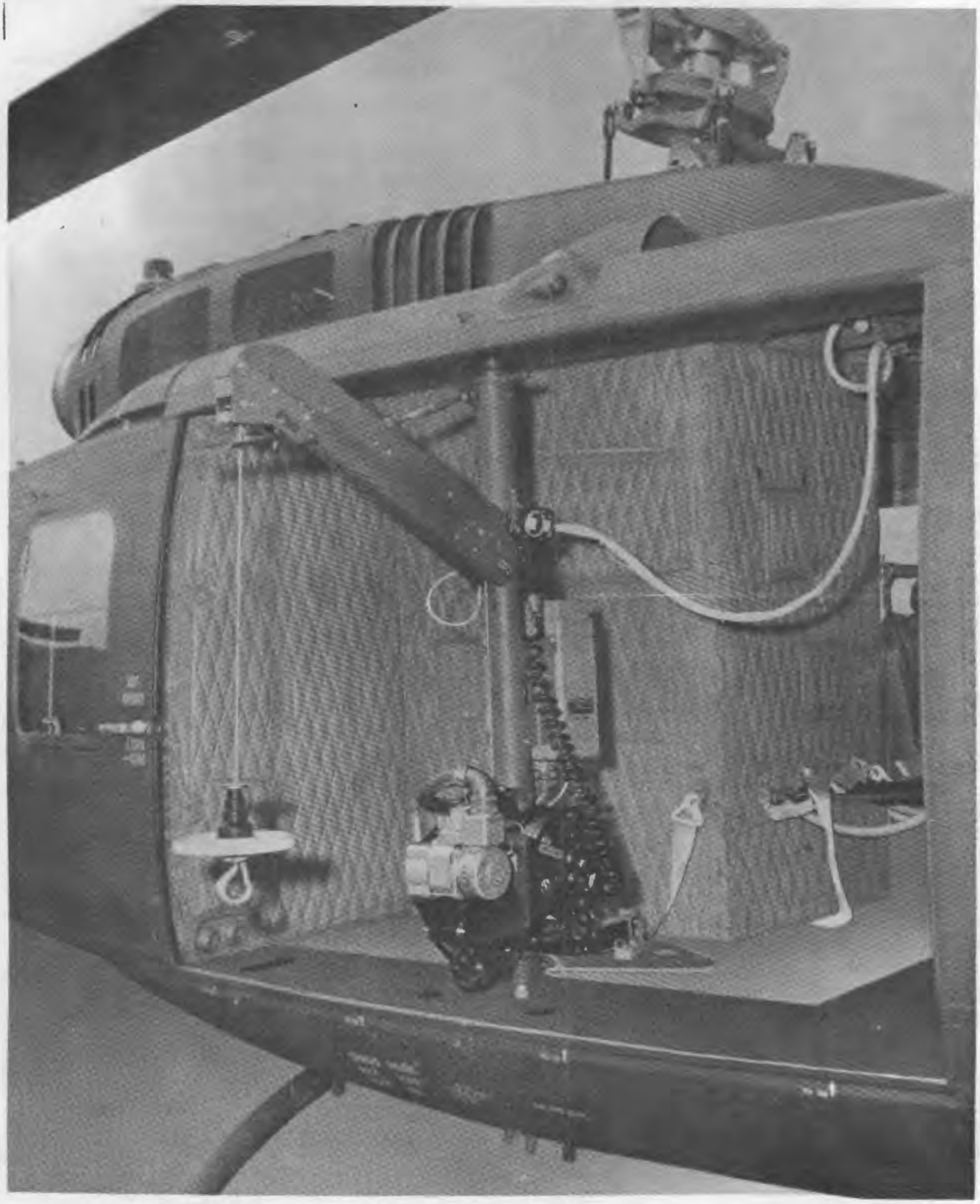
The hoist operator has variable speed control for raising or lowering the cable. The further the down/up toggle is pushed from its spring loaded neutral position, the faster the hoist will run. The hoist should normally be operated in the full speed condition as slow speed operation will cause the motor and gear box to heat excessively. See Hoist Cable Speed Versus Load Chart, 6-1.

Caution

A minimum of 5 pounds tension must be applied to the cable for a reel-out (cable down) at all times. The hook and hand wheel provide this weight. DO NOT PERMIT cable to become slack.

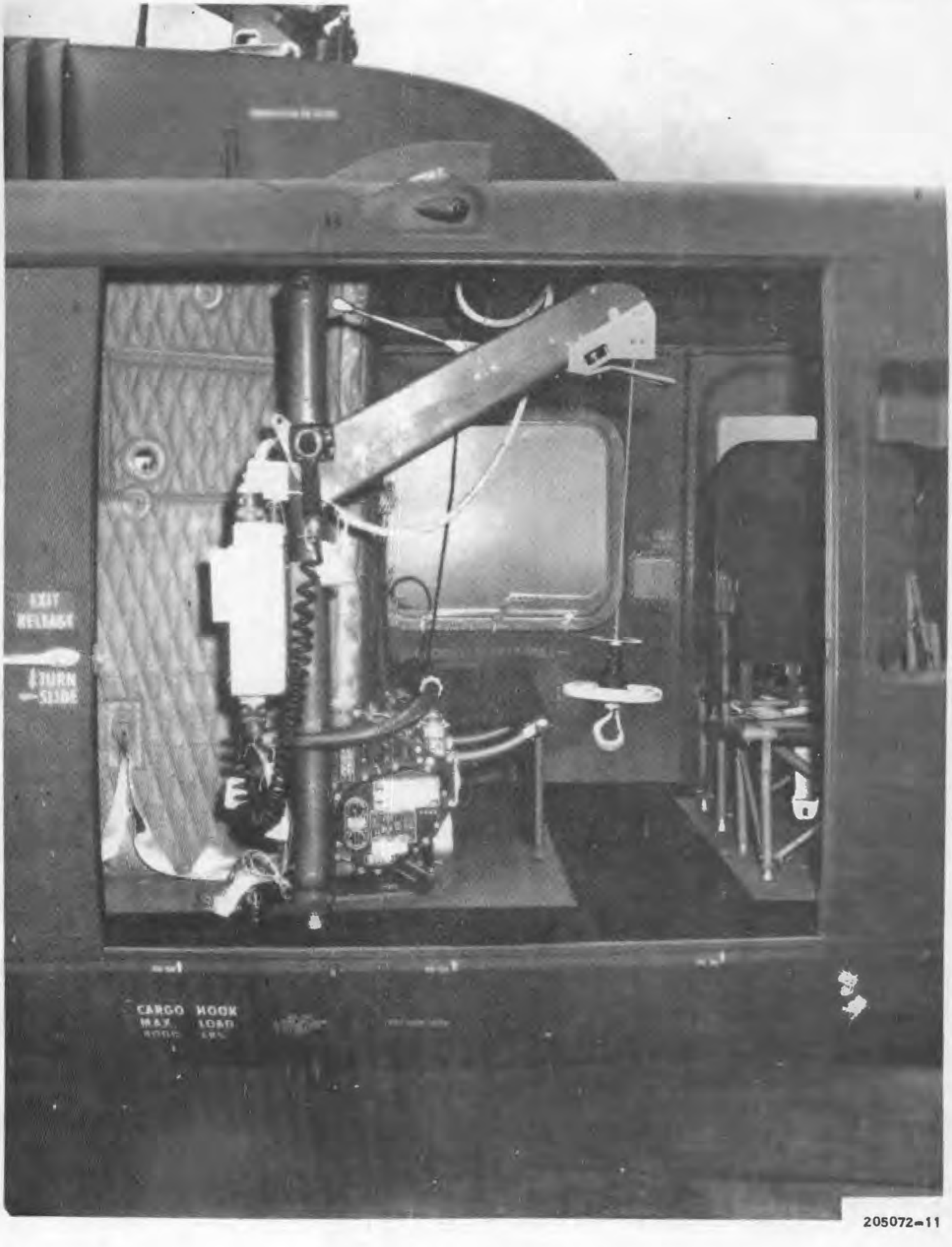
6-64C. Operating Data. The following general information is provided for use when operating rescue hoist.

a. Maximum Load	600 pounds for raising or lowering
b. Usable Cable Length	256 feet
c. Limits	
Boom In and Boom Out	Preset limit switches in the actuator
Up Limit	Trigger at end of boom (contacted by rubber bumper on the hook handwheel)
Down Limit	Switch (actuated when three wraps of cable remain on storage drum)
d. Override	The pilot's control will override the operator's control



205072—14

Figure 6-15A. Hoist installation (Sheet 1 of 2)



205072-11

Figure 6-15A. Hoist installation (Sheet 2 of 2)

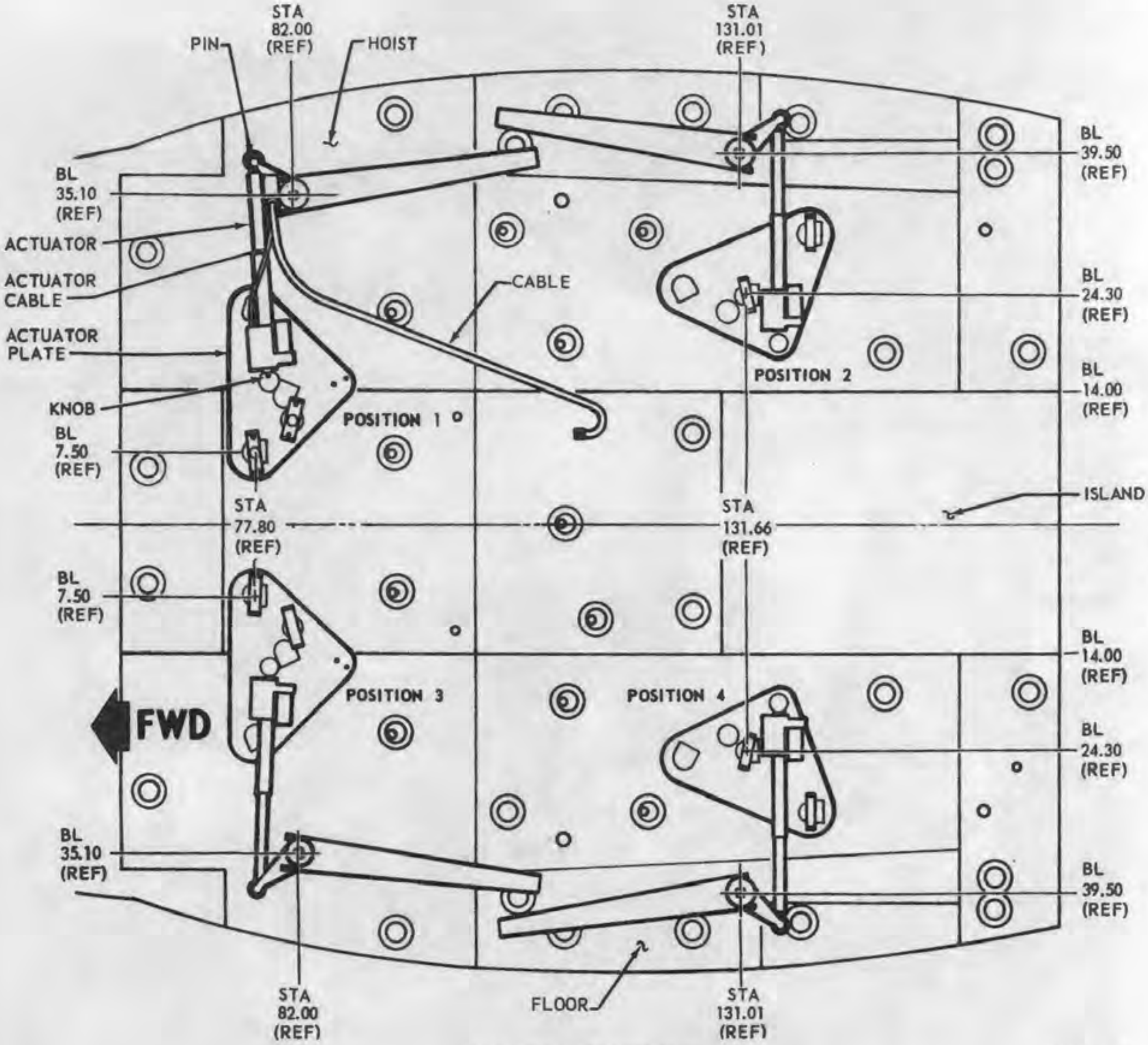


Figure 6-15B. Four positions hoist may occupy in cabin

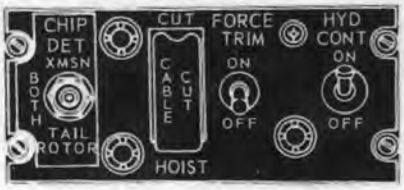


Figure 6-15D. Hoist cable cutter switch — pilot

Figure 6-15C. Pendant control — rescue hoist

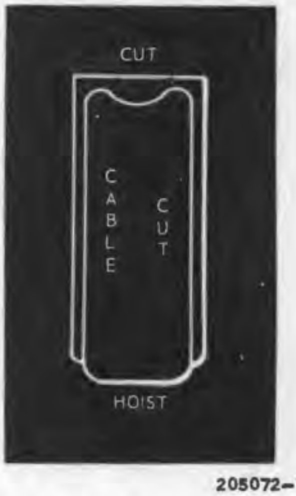


Figure 6-15E. Hoist cable cutter switch — hoist operator

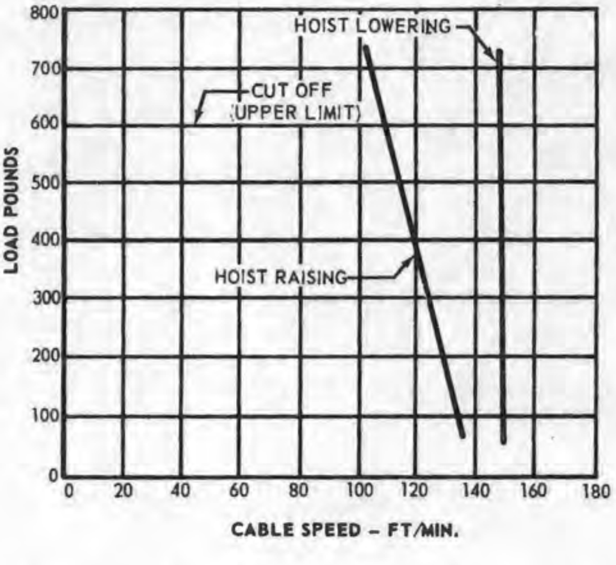


Chart 6-1. Hoist cable speed versus load plus or minus 15 percent

6-64D. *Weight and Balance Information.* Weight and balance information resulting from installation of the internal rescue hoist is as follows:

a. Forward position (hoist arm inside).

(1) Change in basic weight	Plus 151.3 pounds
(2) Moment arm	87.3 inches
(3) Change in basic moment	11.211 inch-pounds
(4) Chart "A" entry	Not applicable
(5) Chart "C" entry	Weight change, plus 151.3 pounds Moment Arm, 87.3 inches Moment/100, plus 132.1 inch-pounds

b. Aft position (hoist arm inside).

(1) Change in basic weight	Plus 151.3 pounds
(2) Moment arm	125.1 inches
(3) Change	18.927 inch-pounds
(4) Chart "A" entry	Not applicable
(5) Chart "C" entry	Weight change, plus 151.3 pounds Moment Arm, 125.1 inches Moment/100, plus 189.2 inch-pounds

c. Possible Loading and Hoist Loading Locations. See chart 6-2.

6-64E. *Operating Procedure — Pilot.* The pilot's hoist control switch is located on the cyclic control stick (see figure 2-4).

a. Check rescue hoist cable cutter, rescue hoist control and rescue hoist power circuit breakers are "IN".

b. Establish zero ground speed over pick-up location.

c. Move hoist control, on cyclic stick, to right to swing boom outboard.

Note

> Pilot's controls will override the hoist operator's control inputs, however the pilot has only a fixed full speed capability.

d. Move hoist control switch down to lower cable hook.

Note

> Hoist cable is painted at each end to provide visual indication of cable footage that is extended. The hoist cable is lowered approximately 150 feet per minute and is retracted approximately 120 feet per minute (see chart 6-1).

e. Move hoist control switch aft to raise hoist load.

Note

> In case the extended portion of the hoist cable has to be jettisoned a cable cut switch is provided on the instrument pedestal. (See figure 6-15D.) The cable cutter is an electrically initiated ballistic charge type.

f. Move hoist control switch to left to swing hoist boom inboard.

g. Bring hoist load into cabin and hoist to stowed position (fully inboard).

6-64F. *Operating Procedure — Hoist Operator.* The hoist operator's operating procedure is set forth in Chapter 11.

CHAPTER 7

OPERATING LIMITATIONS

Section I — Scope

7-1. Scope of Operating Limitations Data. All important limitations that must be observed during normal operations are covered in this chapter.

7-2. Limitations that are characteristic only of a specialized phase of operation are not repeated here.

Section II — Limitations

7-3. Introduction. The flight and engine limitations set forth in this chapter are the direct result of numerous flight test programs and actual operation experience. Compliance with these limits will allow YOU, THE PILOT, to safely perform the assigned missions and permit YOU to derive maximum utility from the helicopter, when used for intended purposes. The operational range limits (see figure 7-1) will serve as a constant reminder during operations. Additional limits concerning maneuvers, cg, and loading are also covered in this chapter. Close observation of instrument markings is required since they represent limits that are not necessarily repeated in the text.

7-4. Minimum Crew Requirements. The minimum crew requirement for all missions consists of only the pilot, whose station is on the right side. Additional crew members, as required, will be added at the discretion of the Commander in accordance with appropriate Department of Army Regulations.

7-5. Instrument Markings. The operating ranges and limits for both the helicopter and the engine are shown in figure 7-1.

7-6. Engine Limitations. The gas turbine power plant, as installed in this helicopter, is rated at an output torque value equivalent to 1100 hp at 6600 RPM for take-off and 900 hp at 6400 to 6600 RPM for continuous operation. Other engine limitations are as follows:

EXHAUST TEMPERATURE
320°C to 620°C Continuous Operation.
620°C to 640°C 30 Minute Limit.
760°C Maximum for starting and Acceleration.

GAS PRODUCER TACHOMETER
101.5 percent Maximum.

EXHAUST TEMPERATURE, T53-L-13 ENGINE.
390°C to 595°C Continuous Operation.
595°C to 625°C 30 Minute Limit.
650°C Starting and Acceleration Limit (Not more than 5 seconds.)
760°C Starting and Acceleration Limit (Maximum).

TORQUEMETER
50 PSI Maximum.

ENGINE OIL PRESSURE
25 PSI Minimum.
90 PSI Maximum.
100 PSI Maximum, T53-L-13 Engine.

ENGINE OIL TEMPERATURE
93°C Maximum.

7-7. Rotor Limitations. The normal operating range of the main rotor is 294 to 324 rpm and the range is marked on the dual tachometer as a green arc on the face of the instrument. Normally, autorotation rpm will be set at approximately 310 rotor rpm at sea level, 50 to 60 knots airspeed, and an approximate gross weight of 6600 pounds. Autorotation main rotor speed shall not exceed 339 rpm. main rotor speeds in excess of 339 rpm shall be logged. Rotor Operating Limits decal (see figure 7-2) located at the lower left of the instrument panel, specifies limitation conditions at specific altitudes and gross weights. It is possible to encounter blade stall within the operating range under high gross weight, high altitude, or high airspeed, or during acceleration or low rpm. Blade stall and the remedy are more thoroughly discussed in Chapter 8. At heavy gross weights, high density altitudes, or during maneuvering, the rotor rpm will tend to overspeed and shall be monitored and controlled by the pilot, using collective pitch to keep the rotor within limits.

7-8. Airspeed Limitations. The maximum permissible indicated forward airspeed for this helicopter is 120 knots, and this maximum is indicated by a red line on the airspeed indicator. Sideward and rearward airspeeds should be limited to 30 knots, which must be estimated for lack of instruments to provide these indications.

INSTRUMENT MARKINGS

**FUEL
GRADE
JP-4**

T53-L-11 Engines
JP-4 or JP-5

FUEL PRESSURE
🟩 5 to 35 PSI Continuous Operation

ENGINE OIL PRESSURE
🟥 25 PSI Minimum
🟥 90 PSI Maximum
🟥 100 PSI Maximum T53-L-13 Engine Only

ENGINE OIL TEMPERATURE
🟥 93°C Maximum

TRANSMISSION OIL PRESSURE
🟥 30 PSI Minimum
🟩 40 to 60 PSI Continuous Operation
🟥 70 PSI Maximum

TRANSMISSION OIL TEMPERATURE
🟥 110°C Maximum

205070-14-1F

Figure 7-1. Instrument markings (Sheet 1 of 3)

ROTOR TACHOMETER
🟩 294 to 324 RPM Continuous Operation
🟥 339 RPM Maximum for Autorotation

ENGINE TACHOMETER
🟨 6000 to 6400 RPM 0 to 70 Knots
🟩 6400 to 6600 RPM Continuous Operation
🟥 6600 RPM Maximum

AIRSPEED
🟥 120 Knots Maximum
🟨 Above 70 Knots 6400 RPM Minimum

GAS PRODUCER TACHOMETER
🟥 101.5 Percent Maximum

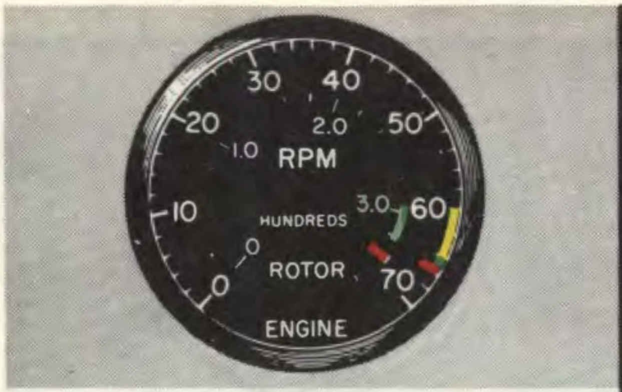
TORQUEMETER
🟥 50 PSI Maximum

EXHAUST TEMPERATURE
🟩 390°C to 620°C Continuous Operation
🟨 620°C to 640°C 30 Minute Limit
🟥 640°C
🟥 760°C Maximum for Starting and Acceleration.

EXHAUST TEMPERATURE
🟩 390°C to 595°C Continuous Operation
🟨 595°C to 625°C 30 Minute Limit
🟥 650°C Starting and Acceleration - Not More than 5 Seconds
🟥 760°C Starting and Acceleration Limit - Maximum

204070-14-2H

Figure 7-1. Instrument markings (Sheet 2 of 3)



ROTOR TACHOMETER

🟩 294 to 324 RPM Continuous Operation
🟥 339 RPM Maximum for Autorotation

ENGINE TACHOMETER

🟨 6000 to 6400 RPM 7500 lbs. Maximum (48' Rotor Only)
🟩 6400 to 6600 RPM Continuous Operation
🟥 6600 RPM Maximum

AIRSPEED

🟥 120 Knots Maximum

INSTRUMENT MARKINGS

**FUEL
GRADE
JP-4**

T53–L–11/13 Engines
JP–4 or JP–5

204070–14–3D

Figure 7–1. Instrument markings (Sheet 3 of 3)

CHAPTER 9

SYSTEMS OPERATION

Section I — Scope

9-1. Scope of Systems Operation. This chapter provides additional material, to that already presented in other chapters, on the operation of the free wheeling unit, the stabilizer system, engine anti-icing system and droop compensator.

9-2. These items have been presented here to avoid interrupting continuity of thought and overcrowding other chapters. Use of this information will result in more efficient operation and increase flight safety.

Section II — Systems

9-3. Freewheeling Unit. The freewheeling unit provides a positive disconnect from the engine in case of power failure and allows the main rotor and the tail rotor to rotate in order to accomplish safe autorotational landings.

9-4. Stabilizer System. The stability of the helicopter is the result of the action of the stabilizer bar. This unit is mounted horizontally, above and at 90 degrees to the main rotor blades. The stabilizer bar and control linkage are so designed as to take advantage of the inertia effect of the bar and thus provide stability which materially lessens pilot fatigue. For example: If the helicopter, while hovering in a level attitude, is tilted to the left, the bar, due to its inertia effect, will tend to remain in a horizontal or level plane. This inertia effect will cause the rotor blades by means of the mixing lever arrangement, to feather in such a manner as to return the helicopter to a near level attitude. If the bar were so completely unrestrained as to actually remain in its original plane of rotation, it would make the helicopter stable to the point of greatly reducing control from the pilot. However, due to restraint or damping in the see-saw attachment to the mast, the bar possesses a mast-following characteristic. This following time is regulated by two hydraulic dampers, which are connected to the bar outboard of the mast, one on each side. By means of these dampers, the following time may be regulated in such a manner as to give the helicopter the desired amount of stability and still leave the pilot with complete and responsive control of the helicopter. In its basic configuration this helicopter may be hovered in still air for short periods of time with hands off the controls.

9-5. Engine Anti-icing System. The engine is equipped with an anti-icing system consisting of a detection system, anti-icing valve, DE-ICE switch, and caution indicator lights. The anti-icing system supplies hot air under pressure to the inlet housing areas to prevent icing when the engine is operating under icing conditions. The detector unit, through a probe mounted in the engine air inlet, senses inlet total pressure on the forward side and a value less than static pressure on the aft side. These two pressures are applied to opposite sides of a diaphragm in the detector head. Operational engine airflow induces a pressure differential across the diaphragm. The diaphragm mechanically displaces a set of electrical contacts. When ice blocks the forward probe openings, a bleed hole in the diaphragm equalizes the pressure on both sides, causing the diaphragm to move. Repositioning of the electrical contacts transmits an electrical signal to the detector unit interpreter, where switching and relay action energizes an electrical heater in the probe and causes intermittent illumination of the ENGINE ICING caution light. The heater melts the ice, allowing a pressure differential to develop across the diaphragm. Movement of the diaphragm returns the electrical contacts to

the no-ice position, de-energizing the electrical heater and ENGINE ICING caution light. The detector unit is again capable of sensing an icing condition.

9-6. Pressurized hot air from the annular manifold within the centrifugal compressor housing flows forward through the shutoff anti-icing valve into the hollow annulus on top of the air inlet housing. Hot air is directed through five or six hollow inlet housing support struts to de-ice the air inlet area. Hot scavenge oil, draining through the lower strut in the accessory drive gear box, de-ices the bottom of the air inlet area. Hot air flows into the inlet guide vane area. Small openings in the bottom of the inlet guide vane allow air to bleed back into the compressor area. The shutoff anti-icing valve is spring-loaded in the open or ON position. The pilot can close the valve by positioning the DE-ICE switch on the ENGINE panel to OFF. this energizes a solenoid, causing the valve to shift to the closed or OFF position. If an electrical power failure occurs, the solenoid is de-energized, allowing the spring-loaded valve to open, and anti-icing becomes continuous. With anti-icing ON, full power will be limited due to a rise in exhaust gas temperature (egt). Pilot shall closely monitor egt when anti-icing is ON.

Caution

When the ENGINE ICE DET light is illuminated, the anti-icing detector and interpreter units are inoperative. The shut-off anti-icing valve allows continuous flow of hot air. Pilot shall closely monitor egt.

9-7. Power for the detection system is supplied by the 28-volt DC essential bus. Circuit protection is provided by the CAUTION LIGHTS and ANTI-ICE ENG circuit breakers. When an engine icing condition occurs, the MASTER CAUTION and ENGINE ICING lights will illuminate. Operation of the ENGINE ICING caution light will be intermittent. The ENGINE ICE DET light only illuminates to indicate a malfunction of the detection system components.

9-8. Droop Compensator. Droop is defined as the speed change in engine rpm (nII) as power is increased from a no-load condition. It is an inherent characteristic designed into the governor system. In the absence of any droop in the governor system instability would develop as engine output power was increased, resulting in nI speed overshooting or hunting the value necessary to satisfy the new power condition. Design droop of the engine governor system is as much as 300 to 400 rpm (flat pitch to full power). If nII power were allowed to droop, other than momentarily, the reduction in rotor speed could become critical; therefore, a droop compensator is installed on the governor control to raise nII speed, as power is increased, to the rpm value selected by the pilot. The compensator is a direct mechanical linkage between the collective control stick and the speed selector lever on the nII governor. Properly rigged, the droop compensator will hold nII to ± 50 rpm of selected value from flat pitch to climb-out power.

Caution

A shear pin is incorporated in the droop compensator linkage to permit collective control in the event of a bind occuring in the droop compensator linkage. When the pin is sheared, the droop compensator is inoperative and care must be taken to maneuver within power adjustment capabilities of the governor. Sheared pin shall be replaced before new flight.

Note

An improperly rigged droop compensator can result in the engine not developing rated power. Always check droop compensator rigging prior to checking full power.

9-9. Engine Characteristics (T53-L-13). With the phasing in of the T53-L-13 engine, there are certain different operating characteristics that should be observed. These characteristics are set forth in the following paragraphs.

9-10. *Power*. The L-13 engine is rated at 1400 hp (military) for standard sea level conditions as compared to 1100 hp (take-off) for the L-11. Therefore, a much greater potential for drive system over-torque exists, even during warm, ambient conditions.

9-11. *Acceleration*. Since the L-13 engine (for the UH-1D installation) is considerably de-rated and engine acceleration is very good, an acceleration check is not considered necessary.

9-12. ***Starting.*** The starting procedure for the L-13 is identical to the L-11 except maintain the starter engage until 40 to 42 percent nI speed is reached. The L-13 inherently starts slower and hotter than the L-11, and in some cases, 30 seconds are required to reach 42 percent nI when using the aircraft battery as a power source.

9-13. ***Flight Idle.*** Flight idle for the L-13 engine has been established at 70 to 72 percent nI.

9-14. ***Fuel Drainage.*** A small amount of fuel discharge from the combustor drain after shut down is considered normal.

9-15. ***Manual Fuel Control.*** A compressor stall "pop" may occur when changing from manual fuel control operation to automatic. This effect can be lessened by allowing the nI speed to drop to 50 percent prior to changeover. This is a system characteristic, and stalls in this region are not structurally damaging. Usage of the manual fuel control during the start cycle is not recommended under normal operating conditions.

l. External Power Supply — OPTIONAL (Connected for starting at temperatures below 0°C (32°F).

m. Safety Belt and Shoulder Harness — SECURED and shoulder harness unlocked.

n. Headgear Radio Leads — CONNECTED.

o. Inverter Switch — CHECK spare, then switch to main if external power is connected.

p. AC Phase Selector (VM) — ROTATE to each position and observe AC voltmeter for reading of 115 (±3.0) volts at each position, and return selector to AC position for flight.

q. Pitot Heater — CHECK operation with ground personnel.

r. Radio Equipment — ON.

s. Hydraulic Control Switch — ON.

t. Caution Panel Switch — TEST all caution lights and master caution light on instrument panel illuminated, then RESET.

u. Compass Slaving Switch — IN (slaved) or OUT (free gyro) as desired.

v. Fuel Quantity Gage Test — PRESS and HOLD switch. Observe indicator needle for travel counterclockwise. Upon releasing switch, the needle will return (clockwise rotation) to the actual fuel quantity reading.

w. Fire Warning Indicator Light — PRESS to test.

x. Gyro Magnetic Compass — SET.

y. Attitude Indicator Gyro — SET after flag has disappeared.

z. Altimeter — SET.

aa. Clock — SET.

bb. Controls — Check for smooth movement and full travel.

Note

When an engine start is to be made without external power, steps o. through z. and the night flight checks shall be performed after engine start is accomplished and the electrical loadmeter shows an indication of sufficient generator output to prevent battery drain.

10-41. Interior Check — Night Flights 0°C to -54°C (32°F to -65°F). When performing the Interior Check for night flights, in this temperature range, the following items shall be checked with external power connected.

a. Cockpit Lights — CHECK.

b. Dome Lights — CHECK.

c. Navigation Lights — CHECK.

d. Instrument Lights — CHECK.

e. Anti-Collision Light — CHECK.

f. Landing and Searchlights — CHECK.

g. Flashlight — CHECK.

Note

Use of the anti-collision light on the ground shall be kept to an absolute minimum because excessive heat created in the unit while on the ground is detrimental to bulb life, thus increasing maintenance problems.

10-42. Engine Pre-Start Check 0°C to -54°C (32°F to -65°F). At this temperature range the following items shall be checked, with external power connected, when performing the Engine Pre-start Check.

Caution

Use external power whenever possible for engine starts to prevent possibility of hot start with low battery.

Note

T53-L-11 engine only. At low ambient temperatures, JP-5 fuel may cause slower engine starts. If engine fails to start with JP-5 fuel, the starting fuel line must be disconnected from the scheduled fuel port and connected to the unscheduled port. The starting procedure for this configuration is the same as with the scheduled port.

a. Fuel Main Switch — ON.

b. Engine Fuel Governor Switch — AUTO.

c. Throttle — FULL OFF.

d. Ignition System — Igniter Solenoid and Starter Relay Circuit Breakers — IN.

e. Collective Pitch Control — MINIMUM and release downlock.

f. RPM Increase-Decrease Switch — HOLD in DECR position several seconds for minimum governor setting.

g. Cyclic Control — CENTERED.

h. Fire Guard Posted — Check that rotors will have sufficient obstruction clearances.

10-43. Engine Starting 0°C to -54°C (32°F to -65°F). In this temperature range perform the engine starting procedure as follows with external power connected.

a. Fuel Start Switch — ON.

b. Throttle — FLIGHT IDLE.

Caution

Limit the starter-energized time to 40 seconds. If engine does not start, a three minute cooling period is recommended, after which a second starting cycle may be attempted. Only three 40-second starting attempts are permissible in any one hour period.

c. Starter Ignition Switch — PULL and HOLD until an indicated 40 percent gas producer speed is reached. If engine does not continue to accelerate, abort start. Motor engine to clear combustor. Attempt another start.

d. Spare Inverter — CHECK then switch to main.

e. Engine Oil Pressure—25 PSIG MINIMUM.

Caution

If no oil pressure is indicated by the time the gas producer has reached 40 percent, shut down engine and investigate.

f. With the engine operating and the throttle set in the flight idle detent, CHECK the following:

(1) Gas Producer, 56 to 58 percent nI rpm.

(2) Exhaust Gas Temperature — STEADY state BELOW 570°C (1058°F).

Note

At OAT between -21°C and -54°C (-4°F and -65°F), the exhaust gas temperature may be as low as 290°C (554°F) at flight idle.

(3) Engine Oil Pressure, 20 to 60 PSIG.

(4) Transmission Oil Pressure, 40 PSIG MINIMUM.

(5) External Power Supply — DISCONNECT.

Note

At this point, electrical power failure will occur unless battery or either spare or main generator is on.

(6) Spare Generator — CHECK for operation, voltmeter indication 27(±1.5) volts.

(7) Battery Switch — ON.

(8) Main Generator — ON, guard down, voltmeter indication 28 (±1.5) volts when operating on main generator.

(9) Fuel pressure 12 to 16 psig—CHECK.

Warning

(Deleted)

Warning

Control systems checks should be performed with extreme caution when helicopter is parked on snow and ice.

CHAPTER 11

CREW DUTIES

Section I — Scope

11-1. Scope. This chapter covers the responsibilities of each crew member and the primary and alternate functions of each.

11-2. The purpose of this chapter is to provide a compact collection of material and the steps of procedure that must be followed wherein each crew member can readily determine his complete duties.

11-3. Sequence of phases and actions is arranged chronologically and designed to avoid requiring that the crew member retrace any steps.

11-4. A condensed version of these procedures is contained in the condensed checklist Technical Manual TM 55-1520-210-10 CL.

Section II — Responsibilities

11-5. Rescue Hoist Operating Procedure — Hoist Operator. The following sets forth the necessary steps for the hoist operator to actuate the hoist boom outboard, lower cable, retract cable and return hoist boom to the stowed position. The pilot's hoist controls have priority over the hoist operator's controls.

Note

> The hoist cable is color coded as follows: The first 25 feet is yellow, the next 175 feet is unpainted, the next 40 feet is yellow and the last 16 feet is red.

a. Check with the pilot (use intercom) that rescue hoist cable cutter, rescue hoist control and rescue hoist power circuit breakers are "IN".

b. After pilot has established zero airspeed over the desired location, move boom toggle switch to "OUT" position to swing hoist boom outboard.

c. Move variable speed control knob (labeled DOWN/UP) on the hoist control pendant to "DOWN" to lower the hoist cable. The knob must be moved to the right then forward.

Note

> The further the DOWN/UP knob is moved from its spring loaded neutral position, the faster the hoist will run. The hoist should normally be operated at full speed as slow speed operation will cause the motor and gear box to heat excessively. Hoist cable is painted at each end to provide visual indication of cable footage that is extended.

d. Move control knob (DOWN/UP) to "UP" to raise the hoist load. The knob must be moved to the left then aft.

Note

> In case the extended portion of the hoist cable has to be jettisoned, a CABLE CUT switch is provided on the control box. The cable cutter is an electrically initiated ballistic charge type.

e. Move boom toggle switch to "IN" position to swing hoist boom inboard.

f. Bring hoist load into cabin and swing hoist boom to stowed position (fully inboard).

CHART E
SHEET 16 of 16
MODEL UH-1D (48)
CHART DATE: See Sheet 1

TYPICAL LOADING EXAMPLES

In the examples below, the values for Basic Weight and Moment are assumed to be as shown. Normally these values are obtained from Chart C. To arrive at Minimum Landing Gross Weight (Operating Weight), add to the Basic Weight those load items pertinent to the mission. Refer to the Center of Gravity Table to determine if loading falls within limits. If loading is satisfactory, determine Take Off Gross Weight by adding the expendable load items to the Minimum Landing Gross Weight. Again it is necessary to check the Center of Gravity Table to determine if loading falls within the limits.

ITEM	WEIGHT	MOMENT/100
Basic Helicopter	4920	7103
Pilot	200	93
Oil - Engine	24	42
MINIMUM LANDING GROSS WEIGHT	5144	7238

The minimum Landing Gross Weight and Moment as located on the Center of Gravity Table fall within the recommended cg limits. Therefore the loading is satisfactory for landing.

Minimum Landing Gross Weight	5144	7238
Add: Fuel	1040	1509
Passengers	800	936
TAKE-OFF GROSS WEIGHT	6984	9683

Take-off Gross Weight and Moment as loacted on the Center of Gravity Table fall within the recommended cg limits; therefore, the loading is satisfactory for take-off.

Chart 12-3. Chart E — loading data, 48 foot rotor (Sheet 16 of 16)

12-21A. The data in chart 12-3A provides weight and balance information for various kits available on the UH-1D helicopters. Data is provided for the following listed kits:

100,000 BTU Heater Winterization Kit.
Aft Battery Installation.
Armored Seal Kits.
300 Gallon Internal Auxiliary Fuel Tank.
60 Gallon External Auxiliary Fuel Tanks.
100 Gallon External Auxiliary Fuel Tanks.
XM-23 Door Mounted M-60.
M-6 Subsystem.
XM-3 FFAR Subsystem.
External Stores Support.

100,000 BTU HEATER WINTERIZATION KIT

ITEM	WEIGHT	ARM	MOMENT
UH-1D (205-706-001) Complete Heater Instl.	73.2	197.0	14421

AFT BATTERY INSTL. UH-1D

ITEM	WEIGHT	ARM	MOMENT
Battery (Fwd)	80.0	5.0	400
Battery (Aft)	80.0	233.0	18640
Aft Battery Provisions (205-1682-1)	15.0	224.8	3378

ARMORED SEAT KITS UH-1D

ITEM	WEIGHT	ARM	MOMENT
Pilot Seat Kit 177510	165.9	53.0	8793
Co-Pilot Seat Kit 177510	164.3	53.0	8708
Total GFE & Kit	330.2	53.0	17501

ITEM	WEIGHT	ARM	MOMENT
CFE Removed			
Standard Seats	−61.8	55.1	−3404
Inertia Reel Fittings	− 1.6	66.3	− 106
Total CFE Removed	−63.4	55.4	−3510
GFE			
Pilot Seat 177787-3	169.0	55.0	9295
Co-Pilot Seat 177755-3	165.0	55.0	9075
Total GFE	334.0	55.0	18370
Total Kit	270.6	54.9	14860

Chart 12-3A. System weight and balance data, UH-1D kits (Sheet 1 of 5)

ARMORED SEAT KITS
UH-1D
(Cont)

ITEM	WEIGHT	ARM	MOMENT
CFE Removed			
Standard Seats	−61.8	55.1	−3404
Inertia Reel Fittings	− 1.6	66.3	− 106
Total CFE Removed	−63.4	55.4	−3510
GFE			
Pilot Seat 178061-1	140.0	55.0	7700
Co-Pilot Seat 178062-1	135.0	55.0	7425
Total GFE	275.0	55.0	15125
Total Kit	211.6	54.9	11615

UH-1D
300 GALLON INTERNAL AUX. FUEL TANK

ITEM	WEIGHT	ARM	MOMENT
Tank Installation (205-706-012)			
Tank Assy., L.H.	50.8	151.3	7686
Tank Assy., R.H.	50.8	151.3	7686
Hose, Assy., L.H.	3.1	138.1	428
Hose Assy., R.H.	3.1	138.1	428
Electrical & Misc.	.4	140.0	56
Hardware	3.5	142.6	499
Total Instl. Weight	111.7	150.3	16783
Full Fuel	1950.0	151.0	294450

UH-1D
60 GALLON EXTERNAL AUX. FUEL TANKS

ITEM	WEIGHT	ARM	MOMENT
CFE (204-706-043)			
Tank & Pylon Adaptor Instl., L.H.	31.4	139.4	4377
Tank & Pylon Adaptor Instl., R.H.	31.4	139.4	4377
Tank Assy., L.H.	32.0	142.5	4560
Tank Assy., R.H.	32.0	142.5	4560
Aft External Stores Support Instl.	58.3	142.5	8308
Total CFE	185.1	141.4	26182

Chart 12-3A. System weight and balance data, UH-1D kits (Sheets 2 of 5)

UH-1D
60 GALLON EXTERNAL AUX. FUEL TANKS
(Cont)

ITEM	WEIGHT	ARM	MOMENT
GFE			
Pylon Assy., L.H.	30.0	142.5	4275
Pylon Assy., R.H.	30.0	142.5	4275
Total GFE	60.0	142.5	8550
Total Kit	245.1	141.7	34732
Full Fuel	780.0	142.5	111150

100 GALLON EXT. AUX. FUEL TANKS

ITEM	WEIGHT	ARM	MOMENT
CFE (204-706-043)			
Tank & Pylon Adaptor Instl., L.H.	31.4	139.4	4377
Tank & Pylon Adaptor Instl., R.H.	31.4	139.4	4377
Aft External Stores Support Instl.	58.3	142.5	8308
Total CFE	121.1	140.9	17062
GFE			
Tank Assy., L.H.	48.4	142.5	6897
Tank Assy., R.H.	48.4	142.5	6897
Pylon Assy., L.H.	30.0	142.5	4275
Pylon Assy., R.H.	30.0	142.5	4275
Total GFE	156.8	142.5	22344
Total Kit	277.9	141.8	39406
Full Fuel	1300.0	142.5	185250

XM-23 DOOR MOUNTED M-60
UH-1D

ITEM	WEIGHT	ARM	MOMENT
CFE	NONE		
GFE			
Mounts & Ammunition Boxes	67.0	142.6	9555
Guns & Ejection Control Bags	56.0	142.0	7949
Total GFE & Total Kit	123.0	142.3	17504
Ammunition, 1200 Rds. 7.62 MM	78.0	140.4	10950

Chart 12-3A. System weight and balance data, UH-1D kits (Sheets 3 of 5)

M-6 SUBSYSTEM
UH-1D

ITEM	WEIGHT	ARM	MOMENT
CFE (204-706-024)			
Adapter, Gun Turret	7.8	74.1	578
Ammunition Tie Down Rack	13.3	81.9	1089
External Hydraulic Instl.	4.0	73.8	295
External Wiring	2.0	73.5	147
External Hardware	2.5	72.8	182
Fwd. External Stores Support Instl.	63.0	74.2	4676
Total CFE	92.6	75.2	6967
GFE			
M60-C Machine Guns	83.9	77.5	6502
02153 Ammunition Box	46.6	83.6	3896
04703 Ammunition Chutes	18.4	73.4	1351
04704 Ammunition Chutes	13.1	81.9	1073
04683 Loop Clamp	0.4	80.0	32
02234 Sight Stations	9.3	42.0	391
02109 Control Panel	5.4	50.0	270
04618 Gun Mount & Charger	130.8	73.9	9666
Total GFE	307.9	75.3	23181
Total Kit	400.5	75.3	30148
Ammunition, 7.62 MM (6000 Rounds)	390.0	83.6	32604

XM-3 FFAR SUBSYSTEM
UH-1D

ITEM	WEIGHT	ARM	MOMENT
CFE (204-706-041)			
Sight Support	1.6	25.0	40
Electrical Wiring, Internal Kit	3.8	118.4	450
Equipment Shelf	1.9	113.2	215
Sight Light Panel	.9	50.0	45
Hardware	.4	52.5	21
Aft External Stores Support Instl.	58.3	142.5	8308
Total CFE	66.9	135.7	9079
GFE			
Mark VIII Sight	6.0	31.0	186
Control Panel	4.0	46.0	184
External Wiring	8.0	142.0	1136

Chart 12-3A. System weight and balance data, UH-1D kits (Sheet 4 of 5)

XM-3 FFAR SUBSYSTEM
UH-1D
(Cont)

ITEM	WEIGHT	ARM	MOMENT
Rocket Pods	268.0	146.0	39128
Pylons & Braces	33.0	147.0	4851
Cranks & Adapters	54.0	144.0	7776
Redstone Junction Box	35.0	113.0	3955
Hardware	2.0	142.0	284
Total GFE	410.0	140.2	57500
Total Kit	476.9	139.6	66579
2.75" FFAR Rockets (48)	1036.3	138.9	143942

EXTERNAL STORES SUPPORT
UH-1D

ITEM	WEIGHT	ARM	MOMENT
Stores Rack (205-706-013-5)			
Cross Beam Assys.	29.5	142.5	4207
Fwd. Beam Assys.	11.5	129.0	1481
Aft Beam Assys.	11.9	155.1	1843
Fwd. Sway Brace Assys.	1.1	135.3	152
Aft Sway Brace Assys.	1.2	149.7	186
Hardware	3.1	142.9	439
Total Aft Stores Instl.	58.3	142.5	8308
Stores Rack (205-706-013-11)			
Cross Beam Assys.	31.1	73.9	2301
Fwd. Beam Assys.	11.7	63.0	
Aft Beam Assys.	13.6	84.5	1148
Fwd. Sway Brace Assys.	1.9	68.4	130
Aft Sway Brace Assys.	1.5	79.7	120
Hardware	3.2	74.0	239
Total Fwd. Stores Instl.	63.0	74.2	4676

Chart 12-3A. System weight and balance data, UH-1D kits (Sheet 5 of 5)

Section V — Weight and Balance Clearance

Form F, DD Form 365F

12-22. Weight and Balance Clearance Form F, DD Form 365F. This form is the summary of the actual disposition of the load in the helicopter. It records the balance status of the helicopter, step-by-step. It serves as a work sheet on which to record weight and balance calculations and any corrections that must be made to insure that the helicopter will be within weight and cg limits. A form F is required for Models YUH-1D and UH-1D helicopters only when the loading is such as to seriously affect the flying characteristics and safety of the helicopter, and in all cases where alternate loading is employed.

12-23. ***Use.*** Form F is furnished in expendable pads, or as separate sheets, which can be replenished when exhausted. An original and carbon are prepared for each loading, as applicable. The original sheets, carrying the signature of responsibility can be removed and placed in the helicopter "G" files to serve as certificates of proper weight and balance as required by AR 95-16. The duplicate copy shall be retained in the helicopter for the duration of the flight. On a cross country flight, this form aids the weight and balance technician at refueling bases and stopover stations. There are two versions of this form TRANSPORT and TACTICAL.

Note

> U.S. Army special mission helicopters shall use DD Form 365F titled TRANSPORT.

12-24. These two versions were designed to provide for the prospective loading arrangement of two types of helicopters. However, the general use and fulfillment of either version is the same. Specific instructions for filling out both versions of this form, applicable to Models YUH-1D and UH-1D helicopters, are given in the following paragraphs.

Note

> The choice of which version to use is the responsibility of the weight and balance technician at the take-off base.

12-25. ***DD Form 365F — Transport (Special Mission) Helicopters.*** Ascertain that transport aircraft Form (F) (see Chart 12-4) entries are completed in accordance with the following instructions.

a. Insert the necessary identifying information at the top of the form. In the blank spaces of the "Limitations" table, enter the gross weight and cg restrictions obtained from Chapter 7. (See chart 12-4 for sample form.)

b. Reference 1 — Enter the helicopter basic weight and moment/100 value. Obtain these figures from the last entry on Chart C — Basic Weight and Balance Record.

Note

> Enter moment/100 values throughout the form. Obtain these values from Chart E.

c. Reference 2 — Enter the quantity and weight of oil.

d. Reference 3 — Enter the number and weight of crew. Use actual crew weights if available.

e. Reference 4 — Enter weight of crew's baggage.

f. Reference 5 — Not applicable.

g. Reference 6 — Enter the weight of emergency equipment, if applicable.

h. Reference 7 — Enter the weight of any extra equipment, if applicable.

i. Reference 8 — Enter the sum of the weights of references 1 through 7 to obtain "operating weight."

j. Reference 9 — Enter the number of gallons and weight of take-off fuel. The weight of fuel used during warm-up shall not be included.

Note

> List under REMARKS the fuel tanks concerned and the amount of fuel in each tank. If the external or internal fuel is carried, make appropriate entries to that effect in the space provided.

k. Reference 10 — Not applicable.

CHAPTER 14

PERFORMANCE DATA

Section I — Scope

14-1. Scope of Performance Data. The charts contained in this chapter are intended to provide you with the latest operating information.

a. The data shown on these charts originates from flight test programs and the operational experience gained through actual helicopter usage. The performance charts are presented in tabular, graphic or profile form. Calculated figures are shown in red.

b. The charts are arranged to give maximum facility of use for pre-flight and in-flight mission planning in a safe, efficient manner.

Section II — Instruction for Chart Use

14-2. Interpretation of the Charts. Data is given for planning the various types of missions which can reasonably be expected to be performed with the Model UH-1D helicopters. Familiarization with the charts and their functions will be necessary for proper understanding and to derive maximum benefit from their use. A description of each chart and its use is also included.

14-3. *Reading the Charts.* It is of the utmost importance that the charts be read accurately, especially in the case of multi-variable graphs. In this type of presentation, errors in reading can be cumulative, with resulting large final errors. A hard, fine-pointed pencil should be used at all times when reading the curves, and close attention should be paid to subdivisions of the grid.

14-4. True Altitude. True altitude is the actual height above sea level. It is sometimes called the "tapeline" altitude; that is, the altitude that would be measured by a tapeline dropped from the helicopter perpendicularly to the earth's surface at sea level.

14-5. Pressure Altitude. The pressure of air at a given tapeline altitude may depart considerably from standard. If the atmospheric pressure is measured at the helicopter level, an altitude corresponding to this pressure can be determined from a standard air table. This altitude is known as the pressure altitude of the helicopter. It is also the altitude recorded by the altimeter if the altimeter has no instrument error and is set to 29.92 inches of mercury at sea level. It will therefore indicate higher or lower than the true altitude in a nonstandard atmosphere.

14-6. Density Altitude. As with pressure, density of the air at a given true altitude may vary widely from the standard; the less dense the air, the higher density altitude. If the density is measured at the helicopter level, an altitude corresponding to this density can be determined from a standard air table. This altitude is known as the density altitude of the helicopter.

14-7. Density Altitude Chart. A high density altitude affects the performance of both the main rotor and the engine. When density altitude is high, less lift is developed by the rotor blades for any given power setting, and the engine is incapable of producing sea level rated power. Chart 14-1 shows temperature and pressure altitude versus density altitude. An example of the use of the chart is contained in the chart. Knowing pressure altitude and temperature, the density altitude can be determined. The explanation of ($\frac{1}{\sqrt{\sigma}}$) used in chart 14-1 is as follows: The reciprocal of the square root of density ratio, at the appropriate density altitude. The Greek letter sigma (σ) is used to represent the density ratio.

14-8. Standard Atmospheric Chart. To provide a convenient reference, the National Advisory Committee for Aeronautics (NACA) has established a set of values for temperature, density, and pressure at sea level (zero tapeline altitude). This is known as standard atmosphere, or just "standard day." The first row of numbers in chart 14-2 lists this relationship at sea level for standard air. In addition, a variation of these values with an increase in tapeline altitude has been established.

14-9. Deleted.

14-10. Airspeed Installation Correction Chart. An airspeed installation correction chart (chart 14-4) is provided to supply the correction required to determine calibrated airspeed (CAS). (For helicopter with 48 foot rotor configuration, refer to paragraph 14-45.) Indicated airspeed (IAS), as read from the instrument and corrected for instrument error, plus or minus installation correction, equals calibrated airspeed. Because of the speed range at which the helicopter operates, compressibility correction is negligible; therefore, it has been intentionally omitted. An approximate true airspeed (TAS) for a standard day can be obtained from CAS by adding 1½ percent of CAS per 1000 feet density altitude to CAS.

14-11. Engine Operating Limits Chart. Maximum power available for these T53-L-9, -9A, and -11 engines is given in chart 14-5. (For helicopter with 48 foot rotor configuration, refer to paragraph 14-45.) These powers are based on the engine manufacturer's specifications and guarantees. Corrections based on flight tests are included for installation losses of the engine in the helicopter.

14-12. Performance data given in this manual are based on an engine which can produce specification or rated power. Ordinarily, the engine installed in the helicopter is capable of producing more power; therefore, unless engine deterioration has occurred, adequate power should be available for loading and ceiling limits given in this manual. If deterioration in engine output is suspected, the curves in chart 14-5 may be used to make a rough comparison of actual and rated engine performance, using the flight instruments available to the pilot. To make the comparison, mentally record pressure altitude and OAT; and, at the same time apply full power. Now, note the torquemeter reading. Enter the curves at the recorded pressure altitude and temperature, and read torque pressure available. The torquemeter reading attained in flight should be at least as great as that shown on the curve. It is emphasized that such comparisons are approximate, and they can result in low engine power indications. This is due to several factors: (1) the high rate of climb when full power is applied, which in turn results in rapidly changing air pressure and temperatures; (2) manufacturing tolerances in the torquemeter and flight instruments; (3) readability of flight instruments; (4) and pilot techniques. In addition, two precautions should be observed by the pilot when making the flight check. (1) Avoid hovering with full power inground effect, except for take-off and translational lift, due to the decrease in power caused by an engine inlet temperature rise when inground effect (2) more torque will be obtained if engine rpm is allowed to drop below 6700 when full power is applied.

4-13. If the engine does not appear to be producing specification power and torque, allowable hovering ceiling or load limits as given in this manual will be decreased. Conservative rules of thumb in this event are to reduce gross weight 200 pounds for each psig of deficient torque — or reduce hovering ceiling 1000 feet for each psig of deficient torque. These increments may be subtracted directly from the maximum take-off gross weight and ceiling which the pilot determines from the curves and tables given elsewhere in the manual. The curves and tables are entered normally at the actual or anticipated air temperature and pressure altitude of the flight, then the increments in gross weight or altitude are subtracted.

14-14. Take-Off Distance Chart. The take-off distance charts (chart 14-6) list minimum take-off distances for various pressure altitudes, air temperatures, and gross weights. (For helicopter with 48 foot rotor configuration, refer to paragraph 14-45.) Take-off distances are given for maximum performance take-off procedures only, as distinguished from normal take-off procedures described in Chapter 3. Maximum performance take-offs result in the minimum take-off distance.

r or not the helicopter is capable of performing a given mission. The information required to use the chart can be obtained directly from the instrument panel, i.e., the pressure altimeter and the OAT indicator. Estimated capabilities derived from the chart are valid for the T53-L-9, -9A, and -11 engines; however, the chart is actually based on the T53-L-9 engine. The chart also assumes negligible wind effects. Consequently, when any wind is present, or when a T53-L-11 engine is installed, the helicopter will be capable of better performance than indicated by the chart. Two examples will be given to demonstrate how the chart may be used. The first example will determine the gross weight which can be lifted at a specified altitude and outside air temperature. The second example will determine what the maximum outside air temperature should be for a specified gross take-off weight and pressure altitude.

14-40. ***Example 1:*** The pressure altitude indicated is 6000 feet; the OAT indication is 17°C. What is the maximum gross weight of the helicopter, both in- and out-of-ground effect? Referring to Graph A on chart 14-16, trace the dotted line upward from 17°C to the 6000 foot pressure altitude line, then to the right onto Graph B, stopping at the 6000 foot pressure altitude line on that graph. The maximum gross weight is immediately indicated at this point as 6900 pounds. The available engine torque under the specified conditions is also indicated by extending the dotted line downward and reading 38 psig torque.

14-41. ***Example 2:*** The gross take-off weight and pressure altitude are known; it is desired to estimate at what outside air temperature the helicopter's capabilities could become marginal. Using the same pressure altitude and weight as in Example 1, the dotted line extends from Graph B to the 6000 foot pressure altitude line on Graph A and then downward to the 17°C indication. At any OAT above this temperature, the helicopter's capabilities could become marginal and off-loading of fuel or cargo should be considered.

14-42. Maximum Power Check. The power which can be extracted from the T53-L-9, -9A, -11, and -13 engines is limited by the torque which can be transmitted by the gear train and the first stage turbine (turbine inlet temperature). The torque is observed by the pilot monitoring of the torquemeter red line. The turbine inlet temperature limit is controlled automatically by the fuel control when operating on automatic fuel control.

14-43. The standard day (15°C) sea level take-off power ratings of the engines are as follows:

T53-L-9	Engine, 1100 shp at 6610 rpm
T53-L-9A	Engine, 1100 shp at 6610 rpm
T53-L-11	Engine, 1100 shp at 6610 rpm
T53-L-13	Engine, 1100 shp at 6610 rpm

The above ratings are attainable and are limited by torquemeter pressure at sea level for temperatures of approximately 15°C or less or for altitudes above sea level at temperatures below standard. As temperature increases above standard or altitude increases above sea level, take-off power available is limited by turbine inlet temperature and is of less value than that shown above. In addition, the take-off power rating specified by the engine manufacturer cannot be realized in the helicopter due to installation losses resulting from the induction system, accessory drives, compressor bleed, and exhaust system. A misrigged throttle (power lever) system, droop cam, or governor speed selector lever, a maladjusted fuel control or inadvertent failure to have the twist grip to the full open position when operating on automatic control, all could prevent a normally functioning engine from delivering take-off (maximum) power.

14-44. The fuel control regulator must be re-adjusted from factory setting to perform satisfactorily under local operating conditions. Perform a check on the fuel control regulator as follows:

a. Perform normal engine start. Ensure that anti-icing and bleed air heater are turned off.

b. Advance throttle to full open (maintaining collective pitch full down) and check instruments for normal indications.

c. Check operation of GOV RPM INCR/DECR switch through range of 6000 to 6700 rpm; set switch on 6600 rpm.

d. Perform a normal take-off. The nII rpm should hold to ±50 rpm of selected value from flat pitch to climb-out power. If rpm range exceeds this figure, droop compensator linkage must be adjusted before full power check is made.

e. Execute a full power climb by increasing GOV RPM INCR/DECR switch to full increase rpm and collective pitch as necessary to reduce nII rpm to 6600. At this point, nI rpm should be at a maximum. Record nI rpm and outside air temperature (OAT).

f. Further increase collective pitch until nII drops to 6400 rpm. If nI does not remain constant, droop compensator is out of adjustment and must be adjusted. Rerun full power check upon completion of adjustment.

g. Upon landing, compare data obtained during check with engine historical records to determine if engine is producing rated power. Refer to appropriate maintenance personnel for fuel control adjustment if necessary.

14-45. Performance Data — 48 Foot Rotor Installation. Performance data and charts specifically applicable to helicopters with 48 foot rotor installed are listed in charts 14-18 through 14-29.

Note

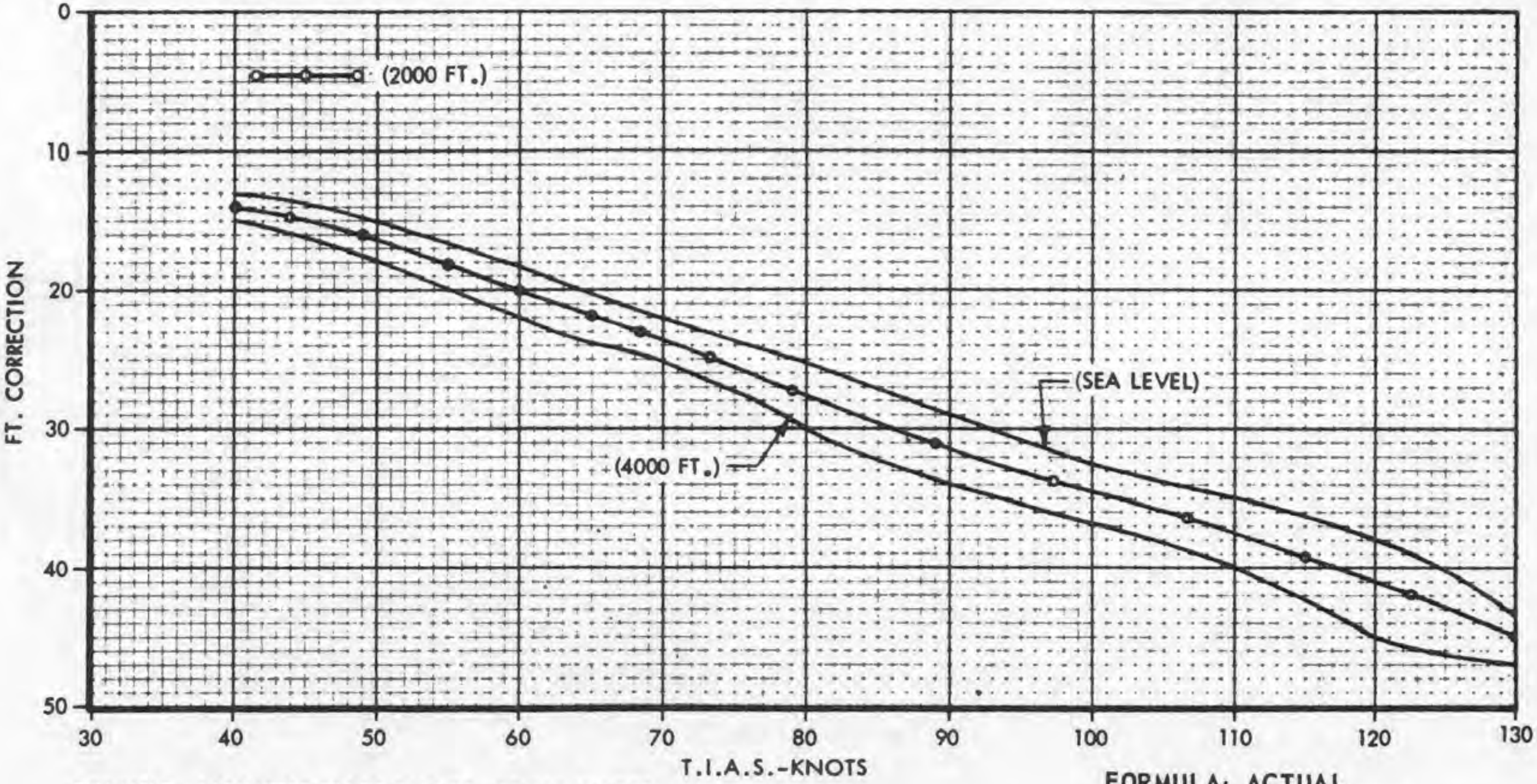
> Performance Data — 48 Foot Rotor with T53-L-13 Engine Installation. Performance data and charts specifically applicable to helicopters with 48 foot rotor and T53-L-13 engine installed are listed in charts 14-30 through 14-38.

MODEL: UH-1D 48 FT.

DATA AS OF: AUG 1966

DATA BASIS: 81:JAB:eh 625

CONDITION: CRUI LT



EXAMPLE: ALTIMETER READS 2000 FT. AT 120 KNOTS.
ACTUAL 2041 FT.

FORMULA: ACTUAL
ALTITUDE= ALTIMETER
READING + CORRECTION

CHART 14-2A ALTIMETER CORRECTION TABLE
UH-1D (48 FT. ROTOR)

Chart 14-2A. Altimeter correction table

Deleted

Chart 14-3. Psychrometric chart

AIRSPEED INSTALLATION CORRECTION TABLE

Model(s): UH-1D
Data as of: November 1964
DATA BASIS: FTC-TDR-63-43, "YHU-1B Category II Performance Tests" and Unpublished Data

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal.

	Indicated Airspeed* (IAS)-Kts	Airspeed Correction -- Kts	Calibrated Airspeed (CAS)-Kts
Level Flight	20	5	25
	30	5	35
	40	5	45
	50	5	55
	60	5	65
	70	5	75
	80	5	85
	90	5	95
	100	5	105
	110	5	115
	120	5	125
	130	5	135
Climb	40	-1	39
	50	0	50
	60	1	61
Autorotation	40	11	51
	50	10	60
	60	9	69

Add Correction to Indicated Airspeed*
To Obtain Calibrated Airspeed

*Corrected For Instrument Error

Chart 14-4. Airspeed installation correction chart — 44 foot rotor

AIRSPEED INSTALLATION CORRECTION TABLE

CLEAN CONFIGURATION

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test, FTC-TDR-64-27.

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

	Indicated Airspeed* (IAS)-Kts	Airspeed Correction --Kts	Calibrated Airspeed (CAS)-Kts
Level Flight & Climb*	20	4.5	24.5
	30	4.5	34.5
	40	4.5	44.5
	50	4.5	54.5
	60	4.5	64.5
	70	4.5	74.5
	80	4.5	84.5
	90	4.5	94.5
	100	4.5	104.5
	110	4.5	114.5
	120	4.5	124.5
	130	4.5	134.5
Autorotation	40	7	47
	50	6	56
	60	6	66
	70	5	75
	80	6	86
	90	6	96
	100	7	107

Add Correction To Indicated Airspeed*
To Obtain Calibrated Airspeed

*Corrected For Instrument Error

Note

Refer to chart 14–30A for correction when the Pitot Static Tube is roof mounted on the helicopter.

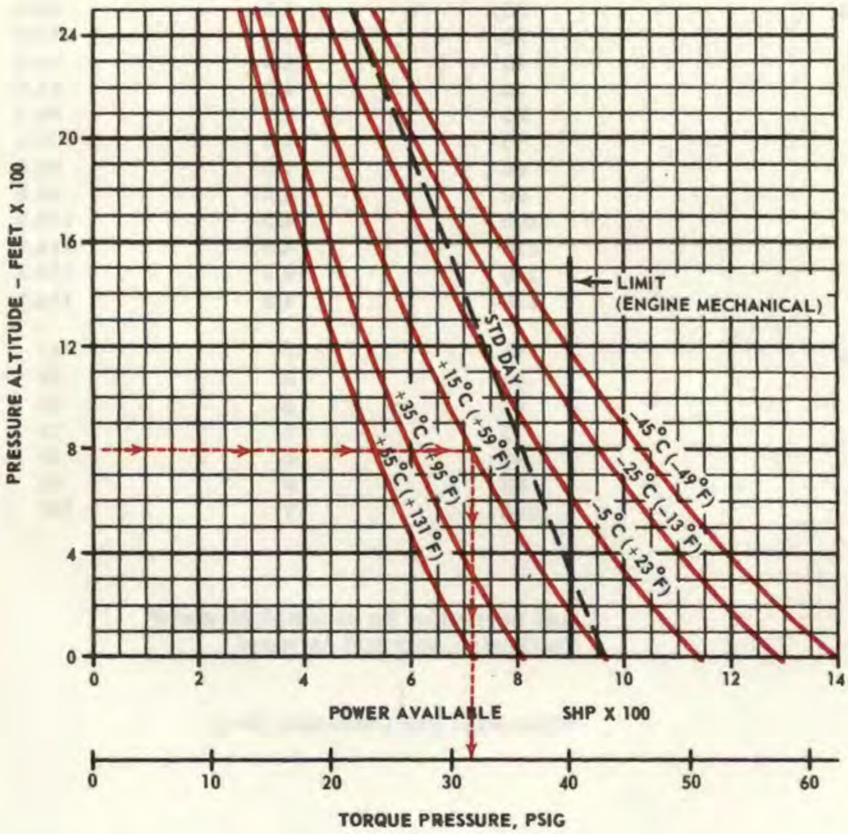
Chart 14-18. Airspeed installation correction — 48 foot rotor

ENGINE OPERATING LIMITS

NORMAL POWER AVAILABLE

2°C INLET TEMPERATURE RISE

ARMY MODEL(S)	UH-1D	ENGINES:	Lycoming T53-L-9/9A/11
DATA AS OF:	MARCH 1963	ENGINE SPEED:	6400 RPM
DATA BASIS:		FUEL GRADE:	JP-4
		FUEL DENSITY:	6.5 LB/GAL



REMARKS:

Chart 14-19. Engine operating limits — 48 foot rotor

AIRSPEED INSTALLATION CORRECTION TABLE

CLEAN CONFIGURATION

Model(s): UH-1D (48)
Data as of: September 23, 1966
DATA BASIS: Bell Helicopter Company Flight Tests With Roof Mounted Pitot Static Tube

Engine(s): Lycoming T53-L-11/L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

	Indicated Airspeed* (IAS)-Kts	Airspeed Correction --Kts	Calibrated Airspeed (CAS)-Kts
Level Flight	20	5.5	25.5
	30	3.0	33.0
	40	1.5	41.5
	50	-0.0	50.0
	60	-1.5	58.5
	70	-2.0	68.0
	80	-3.0	77.0
	90	-3.2	86.8
	100	-3.5	96.5
	110	-3.7	106.3
	120	-4.0	116.0
	130	-4.2	125.8
Climb	40	+5.0	45.0
	50	+6.0	56.0
	60	+5.0	65.0
	70	+2.0	72.0
	80	+1.2	81.2
Autorotation	40	0.0	40.0
	50	-2.4	47.6
	60	-5.0	55.0
	70	-6.2	63.8
	80	-8.0	72.0
	90	-9.0	81.0
	100	-10.0	90.0

Add Correction To Indicated Airspeed* To Obtain Calibrated Airspeed

*Corrected For Instrument Error

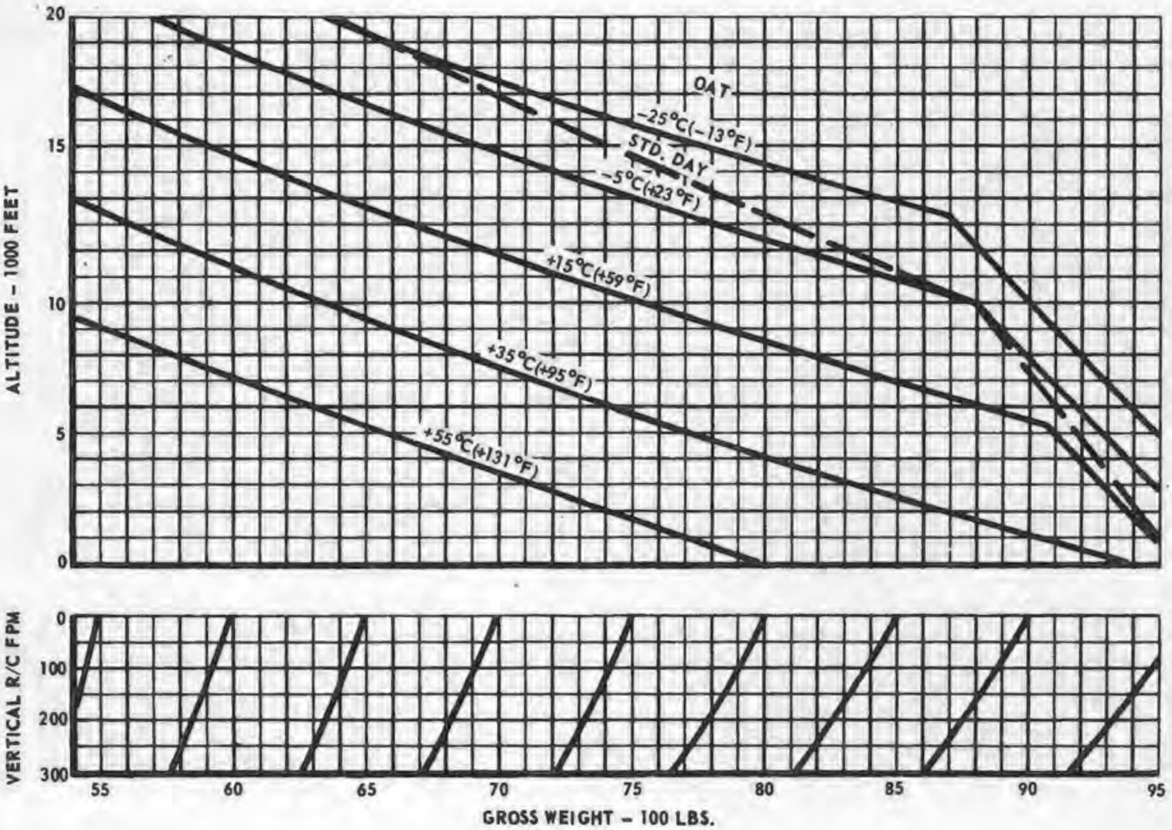
Chart 14-30A. Airspeed Installation Correction Table Roof Mounted Pitot Static Tube

TAKE-OFF GROSS WEIGHT LIMITATIONS

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING OUT OF GROUND
EFFECT WITH MILITARY POWER
2°C INLET TEMPERATURE RISE

Model(s): UH-1D (48)
Data as of: NOVEMBER 1964
DATA BASIS: UH-1D CATEGORY II, FLIGHT TEST

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.



REMARKS:

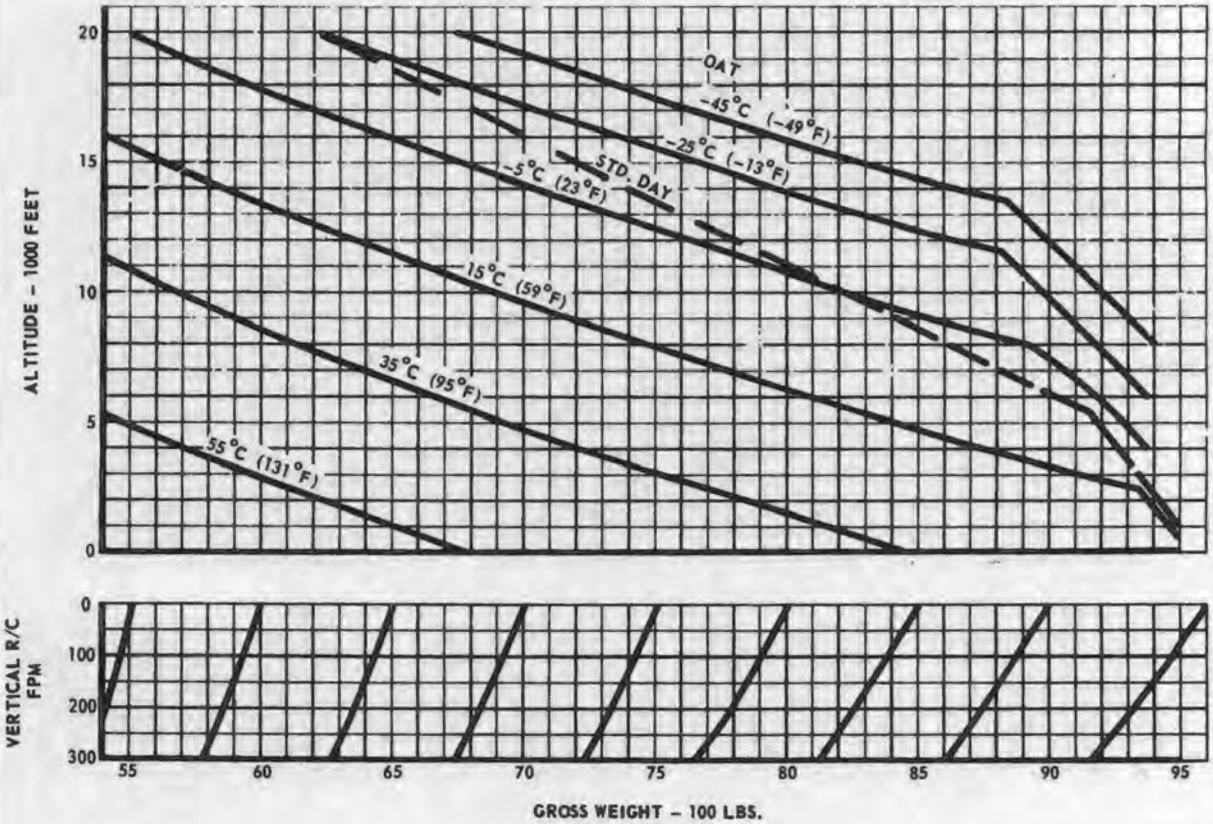
Chart 14-32A. Take-off gross weight limitations curve (Sheet 1 of 2)

TAKE-OFF GROSS WEIGHT LIMITATIONS

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING OUT OF GROUND
EFFECT WITH NORMAL POWER
2°C INLET TEMPERATURE RISE

Model(s): UH-1D (48)
Data as of: NOVEMBER 1964
DATA BASIS: UH-1D CATEGORY II, FLIGHT TEST

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.



REMARKS:

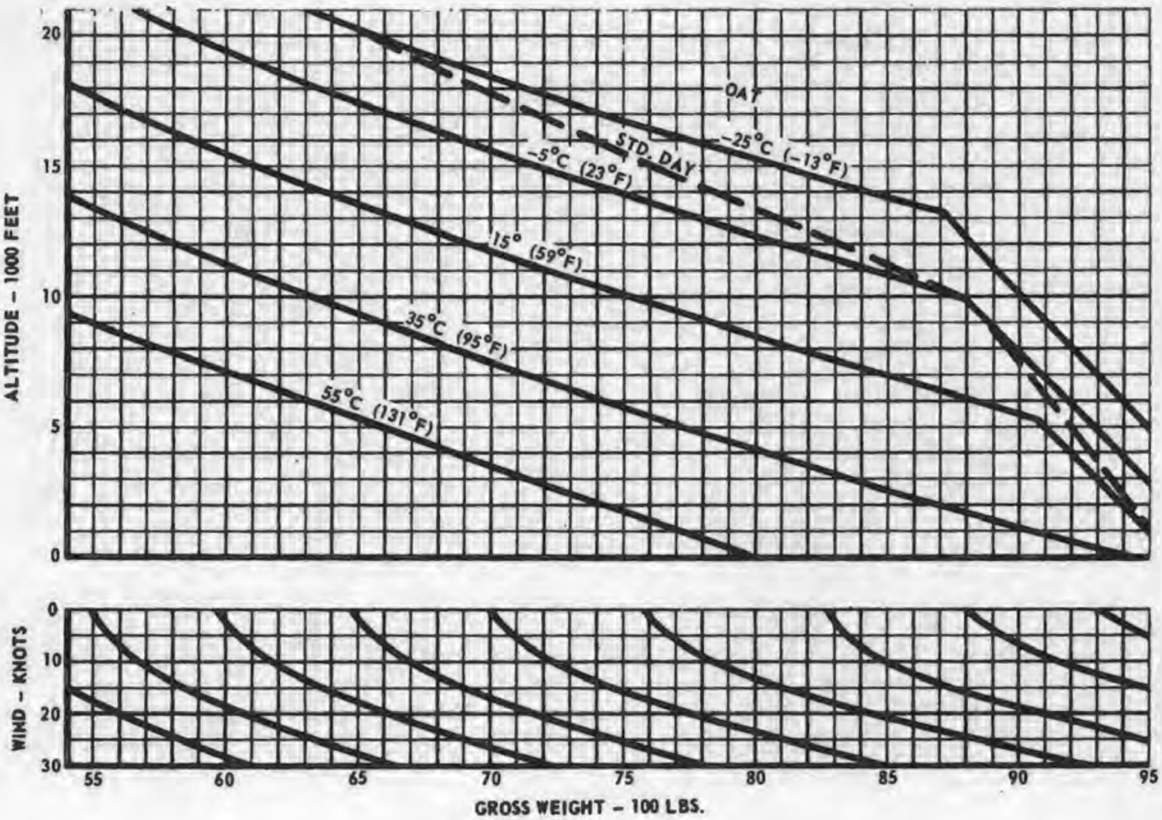
Chart 14-32A. Take-off gross weight limitations curve (Sheet 2 of 2)

HOVERING

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING OUT-OF-GROUND EFFECT WITH MILITARY POWER
2°C INLET TEMPERATURE RISE

Model(s): UH-1D (48)
Data as of: NOVEMBER 1964
DATA BASIS: UH-1D CATEGORY II, FLIGHT TEST

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.



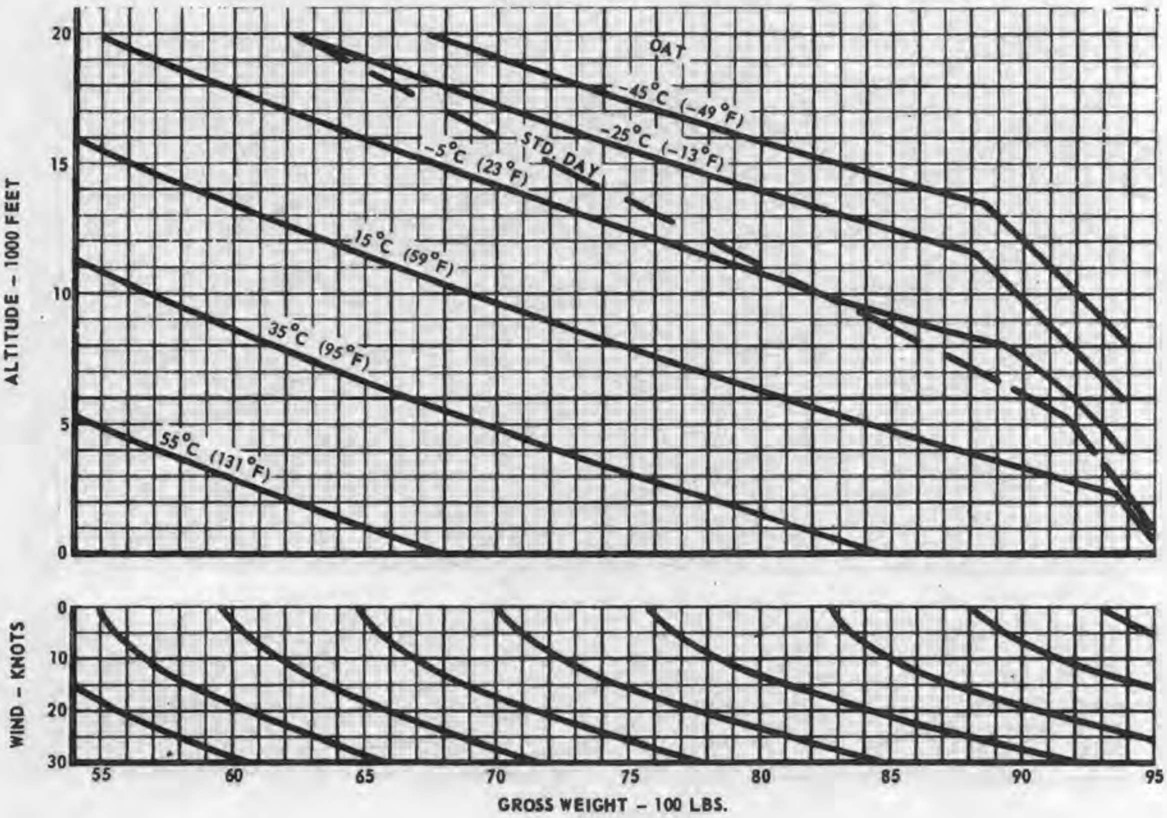
REMARKS:

Chart 14-32B. Hovering out-of-ground effect chart (Sheet 1 of 2)

HOVERING

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING OUT-OF-GROUND EFFECT WITH NORMAL POWER
2°C INLET TEMPERATURE RISE

Model(s):	UH-1D (48)	Engine(s): Lycoming T53-L-13
Data as of:	NOVEMBER 1964	Engine RPM: 6600
DATA BASIS:	UH-1D CATEGORY II, FLIGHT TEST	Fuel Grade: JP-4
		Fuel Density: 6.5 LB/GAL.



REMARKS:

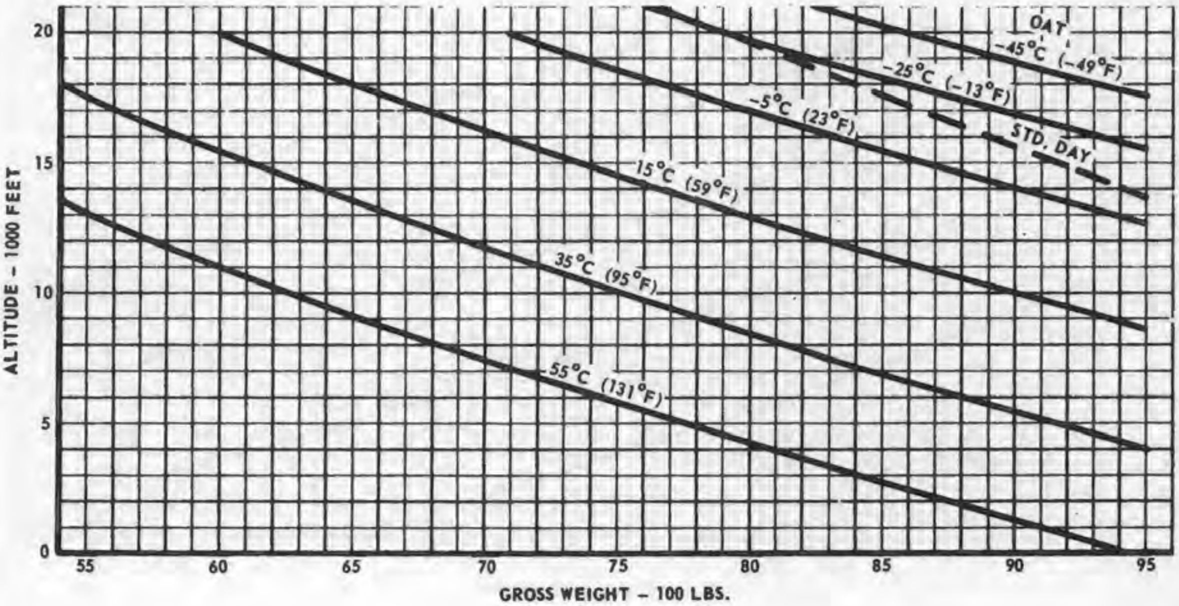
Chart 14-32B. Hovering out-of-ground effect chart (Sheet 2 of 2)

HOVERING

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING IN GROUND EFFECT
WITH MILITARY POWER
2°C INLET TEMPERATURE RISE

Model(s):	UH-1D (48)
Data as of:	NOVEMBER 1964
DATA BASIS:	UH-1D CATEGORY II, FLIGHT TEST

Engine(s):	Lycoming T53-L-13
Engine RPM:	6600
Fuel Grade:	JP-4
Fuel Density:	6.5 LB/GAL.



REMARKS:

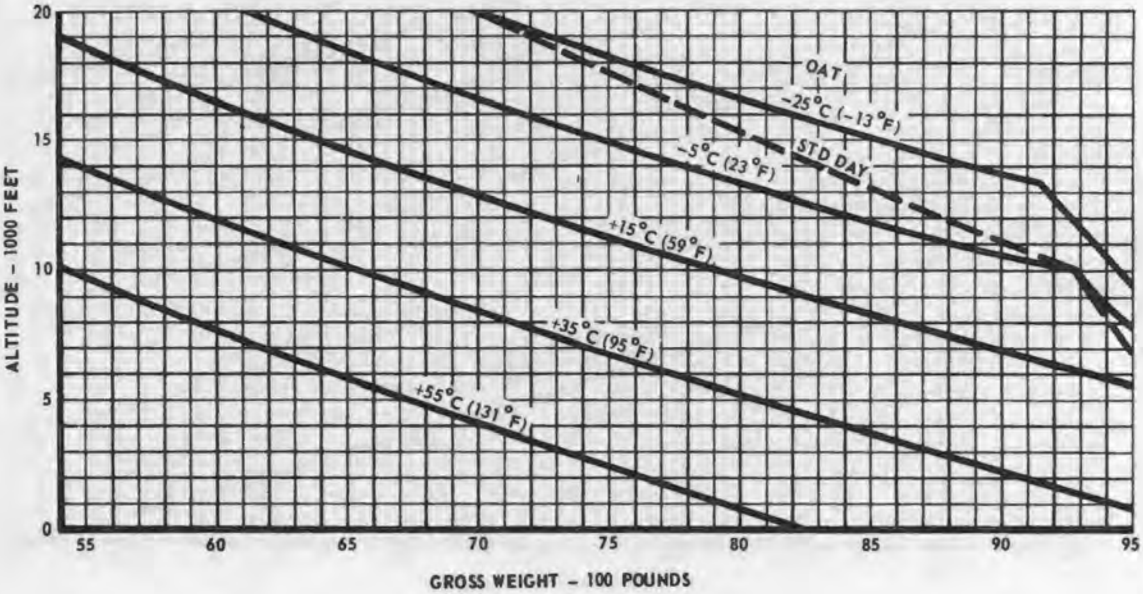
Chart 14-32C. Hovering in-ground effect chart (Sheet 1 of 3)

HOVERING

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING IN GROUND EFFECT WITH MILITARY POWER
2°C INLET TEMPERATURE RISE - 15 FEET

Model(s): UH-1D (48)
Data as of: NOVEMBER 1964
DATA BASIS: UH-1D CATEGORY II, FLIGHT TEST

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.



REMARKS:

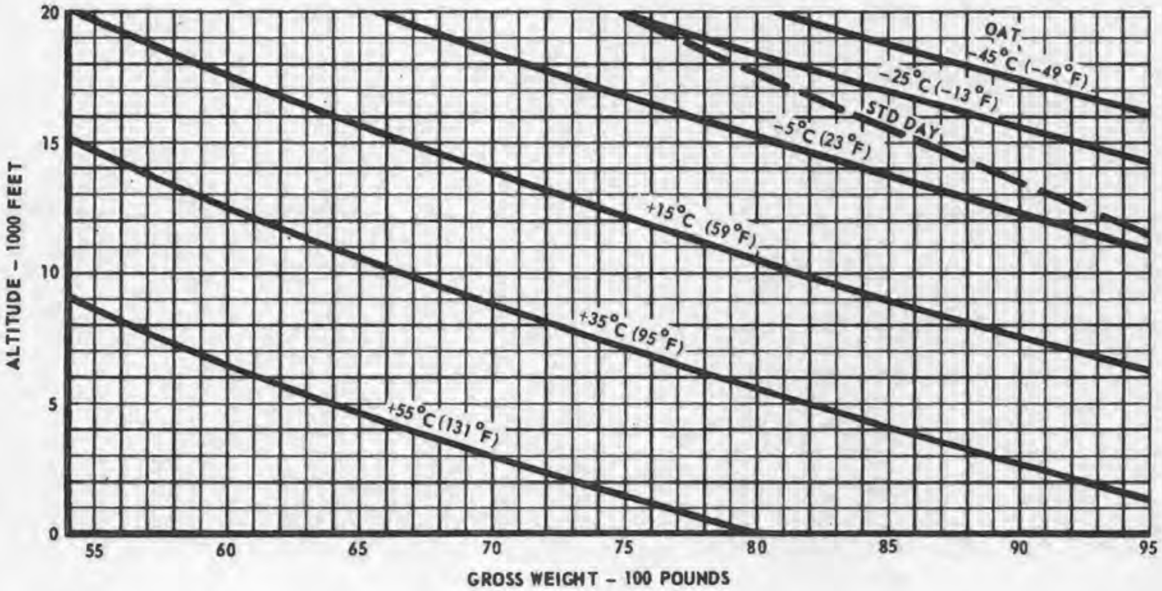
Chart 14-32C. Hovering in-ground effect chart (Sheet 2 of 3)

HOVERING

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING IN GROUND EFFECT
WITH NORMAL POWER
2°C INLET TEMPERATURE RISE

Model(s):	UH-1D (48)
Data as of:	NOVEMBER 1964
DATA BASIS:	UH-1D CATEGORY II, FLIGHT TEST

Engine(s):	Lycoming T53-L-13
Engine RPM:	6600
Fuel Grade:	JP-4
Fuel Density:	6.5 LB/GAL.



REMARKS:

Chart 14-32C. Hovering in-ground effect chart (Sheet 3 of 3)

ALPHABETICAL INDEX

Asterisk (*) preceding Page Number denotes Illustration or Chart

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TM 55–1520–210–10
C 4

CHANGE
No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *20 September 1966*

Operator's Manual

ARMY MODEL UH–1D HELICOPTER

TM 55–1520–210–10, 28 December 1965, is changed as follows:

	Remove pages	Insert pages
Chapter 2, Sections I, II	2–1 and 2–2	2–1 and 2–2
	2–5 and 2–6	2–5 and 2–6
Chapter 7, Sections I, II	7–1 thru 7–4	7–1 thru 7–4
Chapter 14, Section II	14–7 and 14–8	14–7 and 14–8
	14–133 thru 14–186	14–133 thru 14–186
Index	1 thru 10	1 thru 10

Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:

To be distributed in accordance with DA Form 12–31 requirements for Operators Instructions for UH–1 aircraft.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1966—254489/112

CHAPTER 2

DESCRIPTION

Section I — Scope

2-1. Scope. The function of chapter 2 is to describe the helicopter and all its systems and controls which contribute to the physical act of flying the helicopter.

2-2. Included in this chapter is all the emergency equipment that is not part of the auxiliary system. This chapter contains description only. The procedures are covered elsewhere in this manual.

Section II — Aircraft Systems and Controls Description

2-3. General Configuration and Arrangement. The YUH-1D and UH-1D helicopters, manufactured by the Bell Helicopter Company, are military type aircraft of the compact design, featuring a low silhouette and low vulnerability to meet combat requirements. A wide cargo-passenger compartment, with large cubic foot volume, permits the helicopter to be used in a variety of services: for transport of personnel, special teams or crews, and equipment and supplies; for medical evacuation and emergency ambulance service between medical installations where fixed-wing aircraft cannot be used; and as an instrument trainer. This helicopter is capable of operating from prepared take-off landing areas, under instrument (IFR) conditions (including light icing), day or night. It can also be used to navigate by dead reckoning or by use of radio aids to navigation. Maximum visibility is afforded the pilot and crew by use of transparent plastic panels at the top, front, bottom, and sides of the cabin.

2-4. Access. Entrance is accomplished by means of four doors. Crew entrance is through the two swing-hinged doors located in the forward cabin next to the pilot's and copilot's stations. Entrance to the cargo-passenger area aft of the pilot's and copilot's stations is accomplished by means of two large sliding doors, one on each side of the aft cabin area. The cargo-passenger area provides seating for a maximum of eleven passengers or troops, in one of two alternate arrangements. One arrangement consists of five seats facing forward across the cabin immediately forward of the transmission support structure and six seats facing outboard, three on either side of the center line of the helicopter, located as follows: one immediately aft of the pilot-copilot station and two immediately aft of the five seats located across the ship. Another seating arrangement is five seats facing outboard on each side of the helicopter approximately in line with the side faces of the transmission support structure and one seat facing forward immediately forward of the transmission support structure and the center line of the helicopter. Removing the passenger seats and the copilot's seat provides an unrestricted loading space for cargo or equipment transportation. For medical evacuation and ambulance service, the area aft of the crew may be utilized to accommodate six litter patients and a medical attendant.

2-5. *Propulsion*. The propulsion system consists of the engine and drive system and is located aft of the cabin and mounted above the fuselage on a platform which provides footing for maintenance personnel while servicing the helicopter. The engine and drive system are enclosed by cowling that can be quickly opened or removed for easy access. This drive system with its independently mounted units and quick disconnect couplings, allows rapid servicing, and repair or replacement under combat conditions without the use of special tools or ground equipment. Use of this type drive system results in maximum availability of the helicopter for mission accomplishment.

2-6. Airframe. The fuselage consists of two main sections, the forward (cabin) section, and the aft (tail boom) section. The forward fuselage section consists primarily of two longitudinal beams with transverse bulkheads and metal covering. The beams provide the supporting structure for the cabin sections, landing gear, fuel tanks, transmission, engine, and tail boom and are attaching points for the external cargo suspension unit. The aft (tail boom) section is a semimonocoque structure with metal covering and attaches to the forward fuselage section with bolts to allow easy removal for repair or replacement. The rear of the tail boom supports the tail rotor, vertical fin, and synchronized elevator. The landing gear is of the skid type, attached to the fuselage at four points. Ground handling wheels are provided in the loose equipment and are quickly installed for moving the helicopter on the ground or removed to present a clean configuration for flight. The helicopter can be flown with cargo doors full open at 120 knots.

2-7. Crew Configuration. The crew required for operation of the helicopter consists of the pilot alone, pilot and medical attendant, or pilot and copilot, depending on the mission assigned.

2-8. Principal Dimensions — Maximum. Maximum dimensions of the helicopter are as specified in table 2-1.

2-9. Weights. The helicopter weight empty and gross operating weight will change according to the configuration or equipment installed for the type of mission to be performed. Refer to chapter 12, Weight and Balance Computation.

2-10. Engine. The helicopter is equipped with either the T53-L-9, -9A, -11, or -13 engine. The three engines are similar in design and, except for stated differences (see table 2-2), will be treated as one engine in the description. The turbine engine and its accessories are located aft of the cabin and mounted on a platform deck to provide maximum accessibility for servicing and maintenance (see figure 2-2). The complete engine and power transfer system is enclosed in an easily opened or quickly removable light-weight cowling. This engine is a free turbine type designed for low fuel consumption, minimum size and weight, and maximum performance.

2-11. Principles of Operation. The engine consists of a reduction gear section, an arial-centrifugal compressor, a diffuser, a combustion chamber, a first stage turbine, a second stage (free power) turbine, a power shaft, and an exhaust diffuser. The compressor consists of five axial stages and one centrifugal impeller, which produces a six to one compression ratio. The first stage turbine drives the compressor and the second stage turbine drives the power shaft. An acceleration airbleed assembly mounted on the axial compressor section improves engine performance during starts and acceleration. The power shaft extends coaxially through the compressor rotor, and drives the reduction gearing at the forward end of the engine. Power is extracted through an internally-splined output gear shaft driven by the reduction gearing. The through shaft arrangement permits mounting the accessory drives and power take-offs on the inlet housing, at the cool end of the engine, thus avoiding the problems of a hot end drive.

2-12. The free-power part of the engine eliminates the need for a clutch and provides free, smooth, and trouble-free engagement of the helicopter's rotor. The T53-L-9, -9A, -11, and -13 engines are rated at 900 hp at 6600 rpm for maximum continuous power minus installation losses.

2-13. The T53-L-9A engine is the same as the T53-L-9, except for relocation of the bleed air take-off point. On the T53-L-9 engine, the bleed air is taken from the inlet side of the impeller and delivered through a port on the top of the compressor housing. On the T53-L-9A, -11, and -13 engines, bleed air for driving the oil cooling fan and for heating purposes is taken from the outlet side of the impeller.

2-14. Engine Fuel Control System. The engine fuel system consists of the engine fuel regulator and engine overspeed governor, solenoid valve, starting — and main fuel manifolds, igniter nozzles, fuel vaporizers, and igniter plugs. The electrical cable assembly is connected to the fuel system at two points, at the solenoid valve and at the main fuel control assembly. The coil and lead assembly connects to the igniter plugs. From the helicopter fuel tanks, fuel enters and passes through the fuel regulator assembly to the starting and main discharge ports. The starting fuel flows to a solenoid valve which is wired in with the ignition system. Energizing the ignition system actuates the solenoid valve, which allows starting fuel to enter the starting fuel manifold and combustion chamber through five (T53-L-9 and

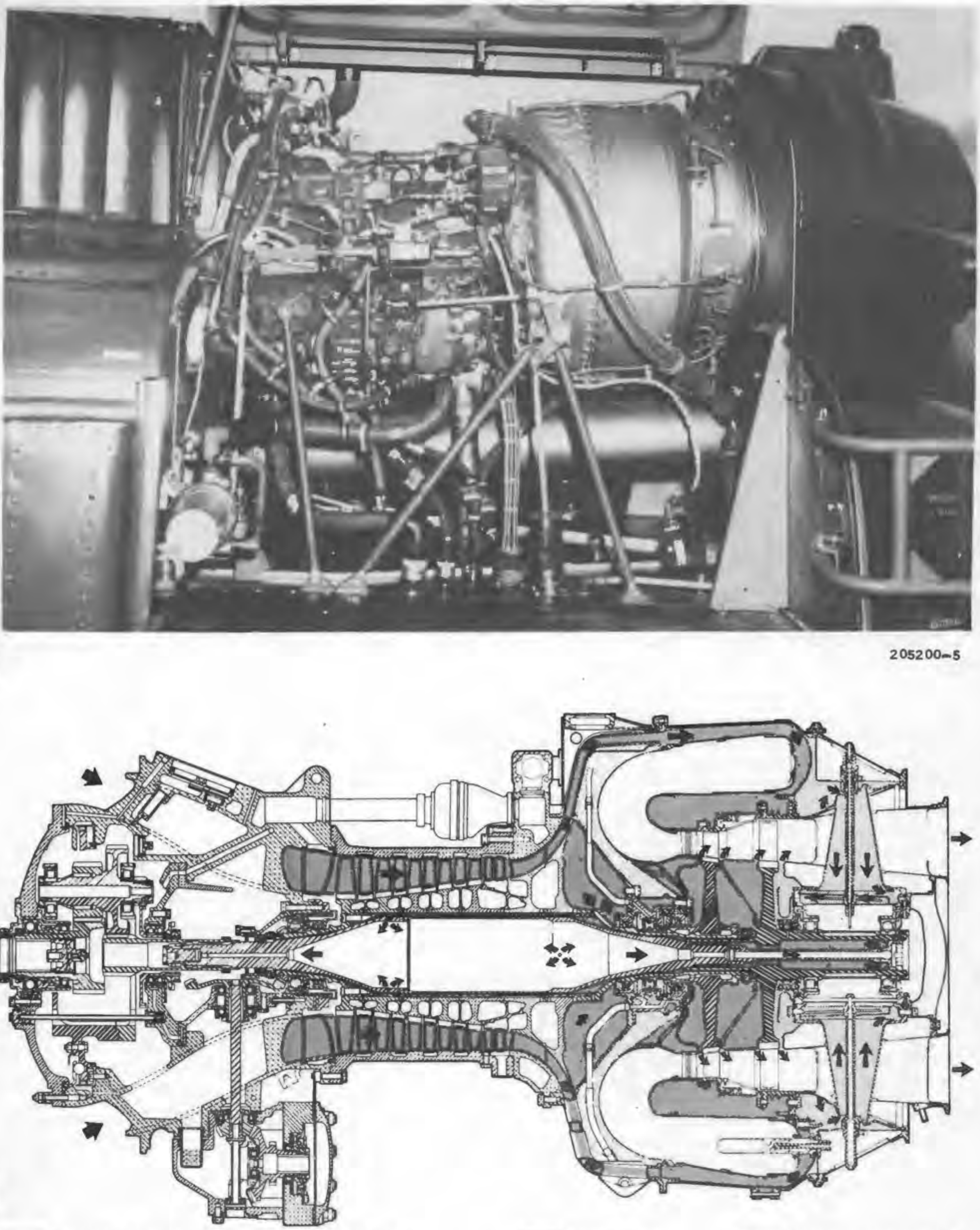


Figure 2–2. Engine installation and engine airflow

Table 2–2. Comparison of T53-L-9, -9A, -11 and -13 engines

	T53-L-9	T53-L-9A	T53-L-11	T53-L-13
*Power Rating in Shaft hp (min)				
Take-off	1100	1100	1100	1100
Military	1000	1000	1000	1000
Normal	900	900	900	900
75% Normal	675	675	675	675
*Fuel Consumption in lbs/hr				
Take-off	750.2	750.2	750.2	750.2
Military	690	690	690	690
Normal	631.8	631.8	631.8	631.8
75% Normal	514.4	514.4	514.4	514.4
JP-5 Fuel Use	***Emergency	***Emergency	Alternate	JP-4 or JP-5 Primary Fuels
Dry Weight	485 lbs	490 lbs	505 lbs	549 lbs.
Ignition Nozzles	5	5	2	4
Combustor	Scoops Coated	Scoops Coated	Scoopless Uncoated	Scoopless Uncoated
Bleed Air Extraction Point	Compressor	Diffuser	Diffuser	Diffuser
Fuel Control Assembly (connection to interstage airbleed assembly)	No	No	Yes	Yes
Interstage Airbleed System (Acceleration)	Yes	Yes	**Yes	**Yes
Acceleration — 60 to 90% nI	5 sec (max)	5 sec (max)	4 sec (max)	4 sec (max)

*Horsepower and Fuel Consumption ratings are based on sea level standard day conditions (plus 59°F, 29.92 inches Hg).

**Also responds to transient speed changes in operating range.

***Grade JP-5 as alternate only after incorporation of the Scoopless Combustor.

-9A engines or two L-11 engines and four L-13 engines) igniter nozzle assemblies. The igniter plugs initiate the flame. After combustion occurs and the ignition system is re-energized, the solenoid valve shuts off the starting fuel flow. Main fuel is delivered to the main fuel system when the engine rpm is great enough to deliver minimum fuel pressure. Main fuel flow is maintained as the engine flame is propagated. After an engine shutdown, a pressure-actuated valve automatically drains any remaining unburned fuel from the combustion chamber. Engine fuel control is accomplished by a hydro-mechanical type fuel control system consisting of a fuel regulator assembly and overspeed governor assembly. An emergency fuel metering system is also provided as an integral part of

CHAPTER 7

OPERATING LIMITATIONS

Section I — Scope

7-1. Scope of Operating Limitations Data. All important limitations that must be observed during normal operations are covered in this chapter.

7-2. Limitations that are characteristic only of a specialized phase of operation are not repeated here.

Section II — Limitations

7-3. Introduction. The flight and engine limitations set forth in this chapter are the direct result of numerous flight test programs and actual operation experience. Compliance with these limits will allow YOU, THE PILOT, to safely perform the assigned missions and permit YOU to derive maximum utility from the helicopter, when used for intended purposes. The operational range limits (see figure 7-1) will serve as a constant reminder during operations. Additional limits concerning maneuvers, cg, and loading are also covered in this chapter. Close observation of instrument markings is required since they represent limits that are not necessarily repeated in the text.

7-4. Minimum Crew Requirements. The minimum crew requirement for all missions consists of only the pilot, whose station is on the right side. Additional crew members, as required, will be added at the discretion of the Commander in accordance with appropriate Department of Army Regulations.

7-5. Instrument Markings. The operating ranges and limits for both the helicopter and the engine are shown in figure 7-1.

7-6. Engine Limitations. The gas turbine power plant, as installed in this helicopter, is rated at an output torque value equivalent to 1100 hp at 6600 RPM for take-off and 900 hp at 6400 to 6600 RPM for continuous operation. Other engine limitations are as follows:

EXHAUST TEMPERATURE
320°C to 620°C Continuous Operation.
620°C to 640°C 30 Minute Limit.
760°C Maximum for starting and Acceleration.

GAS PRODUCER TACHOMETER
101.5 percent Maximum.

EXHAUST TEMPERATURE, T53-L-13 ENGINE
390°C to 580°C Continuous Operation
580°C to 615°C 30 Minute Limit.
760° Maximum for Starting and Acceleration.

TORQUEMETER
50 PSI Maximum.

ENGINE OIL PRESSURE
25 PSI Minimum.
90 PSI Maximum.

ENGINE OIL TEMPERATURE
93°C Maximum.

7-7. Rotor Limitations. The normal operating range of the main rotor is 294 to 324 rpm and the range is marked on the dual tachometer as a green arc on the face of the instrument. Normally, autorotation rpm will be set at approximately 310 rotor rpm at sea level, 50 to 60 knots airspeed, and an approximate gross weight of 6600 pounds. Autorotation main rotor speed shall not exceed 339 rpm. main rotor speeds in excess of 339 rpm shall be logged. Rotor Operating Limits decal (see figure 7-2) located at the lower left of the instrument panel, specifies limitation conditions at specific altitudes and gross weights. It is possible to encounter blade stall within the operating range under high gross weight, high altitude, or high airspeed, or during acceleration or low rpm. Blade stall and the remedy are more thoroughly discussed in Chapter 8. At heavy gross weights, high density altitudes, or during maneuvering, the rotor rpm will tend to overspeed and shall be monitored and controlled by the pilot, using collective pitch to keep the rotor within limits.

7-8. Airspeed Limitations. The maximum permissible indicated forward airspeed for this helicopter is 120 knots, and this maximum is indicated by a red line on the airspeed indicator. Sideward and rearward airspeeds should be limited to 30 knots, which must be estimated for lack of instruments to provide these indications.

INSTRUMENT MARKINGS

FUEL
GRADE
JP-4

T53-L-11 Engines
JP-4 or JP-5

FUEL PRESSURE
🟩 5 to 35 PSI Continuous Operation

ENGINE OIL PRESSURE
🟥 25 PSI Minimum
🟥 90 PSI Maximum

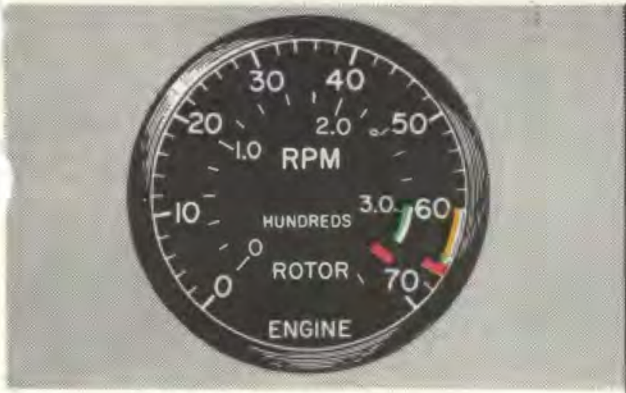
ENGINE OIL TEMPERATURE
🟥 93°C Maximum

TRANSMISSION OIL PRESSURE
🟥 30 PSI Minimum
🟩 40 to 60 PSI Continuous Operation
🟥 70 PSI Maximum

TRANSMISSION OIL TEMPERATURE
🟥 110°C Maximum

205070-14-1D

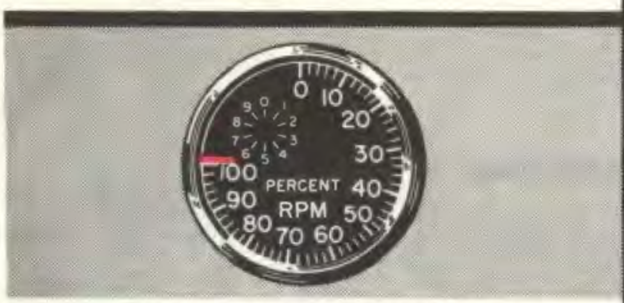
Figure 7-1. Instrument markings (Sheet 1 of 3)



ROTOR TACHOMETER
🟩 294 to 324 RPM Continuous Operation
🟥 339 RPM Maximum for Autorotation

ENGINE TACHOMETER
🟧 6000 to 6400 RPM 0 to 70 Knots
🟩 6400 to 6600 RPM Continuous Operation
🟥 6600 RPM Maximum

AIRSPEED
🟥 120 Knots Maximum
🟧 Above 70 Knots 6400 RPM Minimum



GAS PRODUCER TACHOMETER
🟥 101.5 Percent Maximum

TORQUEMETER
🟥 50 PSI Maximum

EXHAUST TEMPERATURE

🟩 390°C to 620°C Continuous Operation
🟧 620°C to 640°C 30 Minute Limit
🟥 640°C
🟥 760°C Maximum for Starting and Acceleration

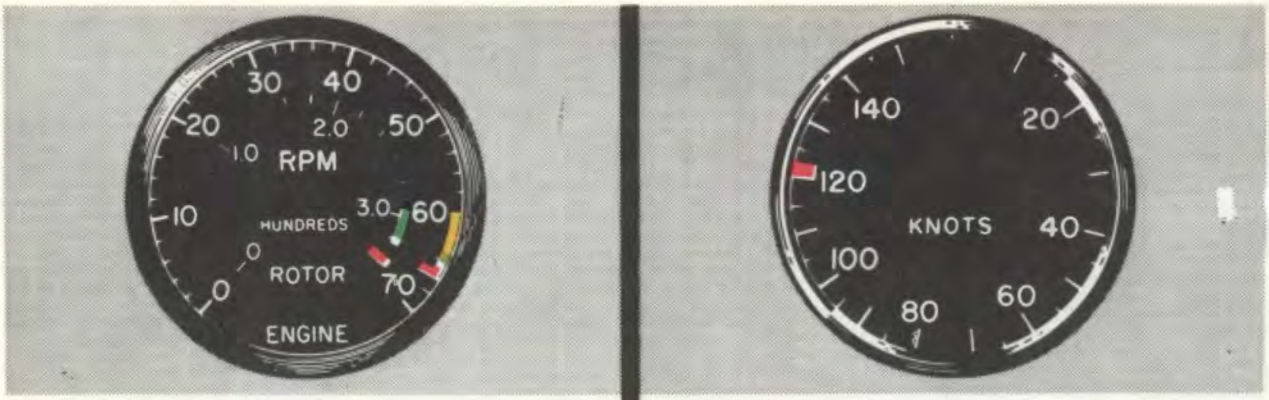
T53-L-13
ENGINE
ONLY

EXHAUST TEMPERATURE

🟩 390°C to 580°C Continuous Operation
🟧 580°C to 615°C 30 Minute Limit
🟥 615°C
🟥 760°C Maximum for Starting and Accelleration

205070-14-2F

Figure 7-1. Instrument markings (Sheet 2 of 3)



ROTOR TACHOMETER
🟩 294 to 324 RPM Continuous Operation
🟥 339 RPM Maximum for Autorotation

ENGINE TACHOMETER
🟨 6000 to 6400 RPM 7500 lbs. Maximum (48' Rotor Only)
🟩 6400 to 6600 RPM Continuous Operation
🟥 6600 RPM Maximum

AIRSPEED
🟥 120 Knots Maximum

INSTRUMENT MARKINGS

FUEL
GRADE
JP-4

T53–L–11/13 Engines
JP–4 or JP–5

204070-14-3D

Figure 7–1. Instrument markings (Sheet 3 of 3)

er or not the helicopter is capable of performing a given mission. The information required to use the chart can be obtained directly from the instrument panel, i.e., the pressure altimeter and the OAT indicator. Estimated capabilities derived from theh chart are valid for the T53-L-9, -9A, and -11 engines; however, the chart is actually based on the T53-L-9 engine. The chart also assumes negligible wind effects. Consequently, when any wind is present, or when a T53-L-11 engine is installed, the helicopter will be capable of better performance than indicated by the chart. Two examples will be given to demonstrate how the chart may be used. The first example will determine the gross weight which can be lifted at a specified altitude and outside air temperature. The second example will determine what the maximum outside air temperature should be for a specified gross take-off weight and pressure altitude.

14-40. ***Example 1:*** The pressure altitude indicated is 6000 feet; the OAT indication is 17°C. What is the maximum gross weight of the helicopter, both in- and out-of-ground effect? Referring to Graph A on chart 14-16, trace the dotted line upward from 17°C to the 6000 foot pressure altitude line, then to the right onto Graph B, stopping at the 6000 foot pressure altitude line on that graph. The maximum gross weight is immediately indicated at this point as 6900 pounds. The available engine torque under the specified conditions is also indicated by extending the dotted line downward and reading 38 psig torque.

14-41. ***Example 2:*** The gross take-off weight and pressure altitude are known; it is desired to estimate at what outside air temperature the helicopter's capabilities could become marginal. Using the same pressure altitude and weight as in Example 1, the dotted line extends from Graph B to the 6000 foot pressure altitude line on Graph A and then downward to the 17°C indication. At any OAT above this temperature, the helicopter's capabilities could become marginal and off-loading of fuel or cargo should be considered.

14-42. Maximum Power Check. The power which can be extracted from the T53-L-9, -9A, and -11 engines is limited by the torque which can be transmitted by the gear train and the temperature of the gases impinging upon the first stage turbine (turbine inlet temperature). The torque is observed by the pilot monitoring of the torquemeter red line. The turbine inlet temperature limit is controlled automatically by the fuel control when operating on automatic fuel control.

14-43. The standard day (15°C) sea level take-off power ratings of thhe engines are as follows:

T53-L-9	Engine—1100 shaft horsepower—6610 rpm
T53-L-9A	Engine—1100 shaft horsepower—6610 rpm
T53-L-11	Engine—1100 shaft horsepower—6610 rpm

The above ratings are attainable and are limited by torquemeter pressure at sea level for temperatures of approximately 15°C or less or for altitudes above sea level at temperatures below standard. As temperature increases above standard or altitude increases above sea level, take-off power available is limited by turbine inlet temperature and is of less value than that shown above. In addition, the take-off power rating specified by the engine manufacturer cannot be realized in the helicopter due to installation losses resulting from the induction system, accessory drives, compressor bleed, and exhaust system. A misrigged throttle (power lever) system, droop cam, or governor speed selector lever, a maladjusted fuel control or inadvertent failure to have the twist grip to the full open position when operating on automatic control, all could prevent a normally functioning engine from delivering take-off (maximum) power.

14-44. The fuel control regulator must be readjusted from factory setting to perform satisfactorily under local operating conditions. Perform a check on the fuel control regulator as follows:

a. Perform normal engine start. Ensure that anti-icing and bleed air heater are turned off.

b. Advance throttle to full open (maintaining collective pitch full down) and check instruments for normal indications.

c. Check operation of GOV RPM INCR/DECR switch through range of 6000 to 6700 rpm; set switch on 6600 rpm.

d. Perform a normal take-off. The nII rpm should hold to ±50 rpm of selected value from flat pitch to climb-out power. If rpm range exceeds this figure, droop compensator linkage must be adjusted before full power check is made.

e. Execute a full power climb by increasing GOV RPM INCR/DECR switch to full increase rpm and collective pitch as necessary to reduce nII rpm to 6600. At this point, nI rpm should be at a maximum. Record nI rpm and outside air temperature (OAT).

f. Further increase collective pitch until nII drops to 6400 rpm. If nI does not remain constant, droop compensator is out of adjustment and must be adjusted. Rerun full power check upon completion of adjustment.

g. Upon landing, compare data obtained during check with engine historical records to determine if engine is producing rated power. Refer to appropriate maintenance personnel for fuel control adjustment if necessary.

14-45. Performance Data — 48 Foot Rotor Installation. Performance data and charts specifically applicable to helicopters with 48 foot rotor installed are listed in charts 14-18 through 14-29.

Note

> Performance Data — 48 Foot Rotor with T53-L-13 Engine Installation. Performance data and charts specifically applicable to helicopters with 48 foot rotor and T53-L-13 engine installed are listed in charts 14-30 through 14-38.

LANDING DISTANCE — FEET

POWER OFF

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: 'JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	BEST APPROACH	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
		KNOTS	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL		
9000	SL	60	740	30	756	30	778	30	805	30	835	30		
	2000	59	765	30	785	30	810	30	839	30	864	30		
	4000	58	789	30	812	30	839	30	867	30	885	30		
	6000	56	809	30	834	30	861	30	884	30	891	30		
	8000	54	824	30	848	30	871	30	886	30	876	30		
	10000	53	828	30	849	30	864	30	865	30	-	-		
	12000	51	818	30	832	30	832	30	-	-	-	-		
	14000	48	790	30	791	30	-	-	-	-	-	-		
	16000	45	739	30	-	-	-	-	-	-	-	-		
	18000	-	-	-	-	-	-	-	-	-	-	-		
9000	20000	-	-	-	-	-	-	-	-	-	-	-		
9500	SL	61	800	30	819	30	845	30	876	30	904	30		
	2000	60	825	20	848	30	876	30	906	30	928	30		
	4000	58	847	30	873	30	901	30	928	30	939	30		
	6000	56	864	30	890	30	916	30	935	30	931	30		
	8000	56	872	30	896	30	914	30	921	30	892	30		
	10000	52	867	30	884	30	890	30	878	30	-	-		
	12000	51	844	30	850	30	-	-	-	-	-	-		
	14000	48	799	30	-	-	-	-	-	-	-	-		
	16000	-	-	-	-	-	-	-	-	-	-	-		
	18000	-	-	-	-	-	-	-	-	-	-	-		
9500	20000	-	-	-	-	-	-	-	-	-	-	-		

REMARKS:
1. No wind.
2. Clean configuration
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-29. Landing distance chart — power off — 48 foot rotor (Sheet 5 of 5)

AIRSPEED INSTALLATION CORRECTION TABLE

CLEAN CONFIGURATION

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test, FTC-TDR-64-27.

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

	Indicated Airspeed* (IAS)-Kts	Airspeed Correction -- Kts	Calibrated Airspeed (CAS)-Kts
Level Flight and Climb*	20	4.5	24.5
	30	4.5	34.5
	40	4.5	44.5
	50	4.5	54.5
	60	4.5	64.5
	70	4.5	74.5
	80	4.5	84.5
	90	4.5	94.5
	100	4.5	104.5
	110	4.5	114.5
	120	4.5	124.5
	130	4.5	134.5
Autorotation	40	7	47
	50	6	56
	60	6	66
	70	5	75
	80	6	86
	90	6	96
	100	7	107

Add Correction To Indicated Airspeed*
To Obtain Calibrated Airspeed

*Corrected For Instrument Error

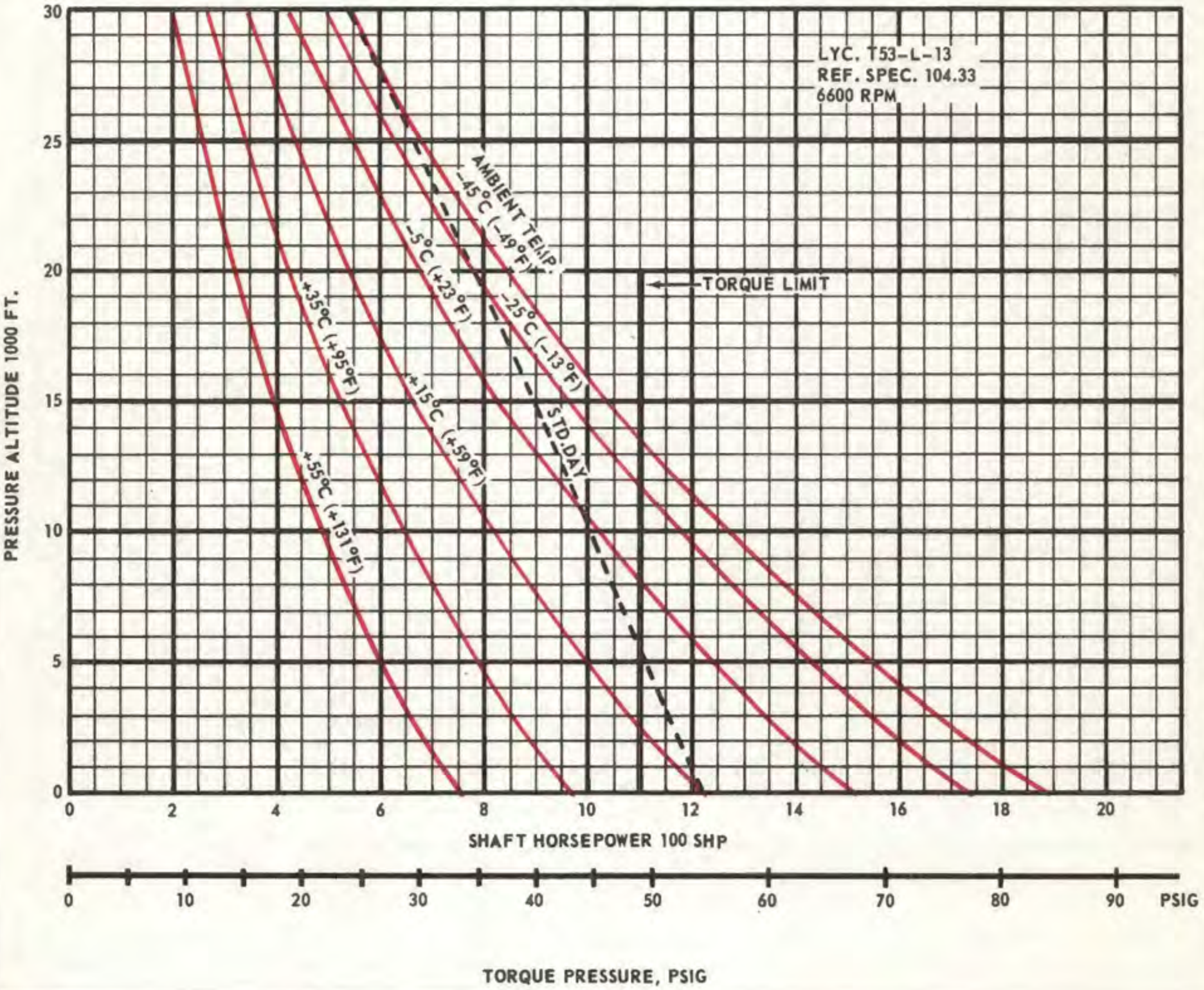
Chart 14-30. Airspeed installation correction table-48 foot rotor — T53-L-13 engine

ENGINE OPERATING LIMITS

NORMAL POWER AVAILABLE
2°C INLET TEMPERATURE RISE

ARMY MODEL UH-1D
DATA AS OF: AUGUST 1966
DATA BASIS: CALCULATED, Lycoming Engine Spec. No. 104.33 (Engine Installed)

ENGINES: Lycoming T53-L-13
ENGINE SPEED: 6600 RPM
FUEL GRADE: JP-4
FUEL DENSITY: 6.5 LB/GAL.



REMARKS:

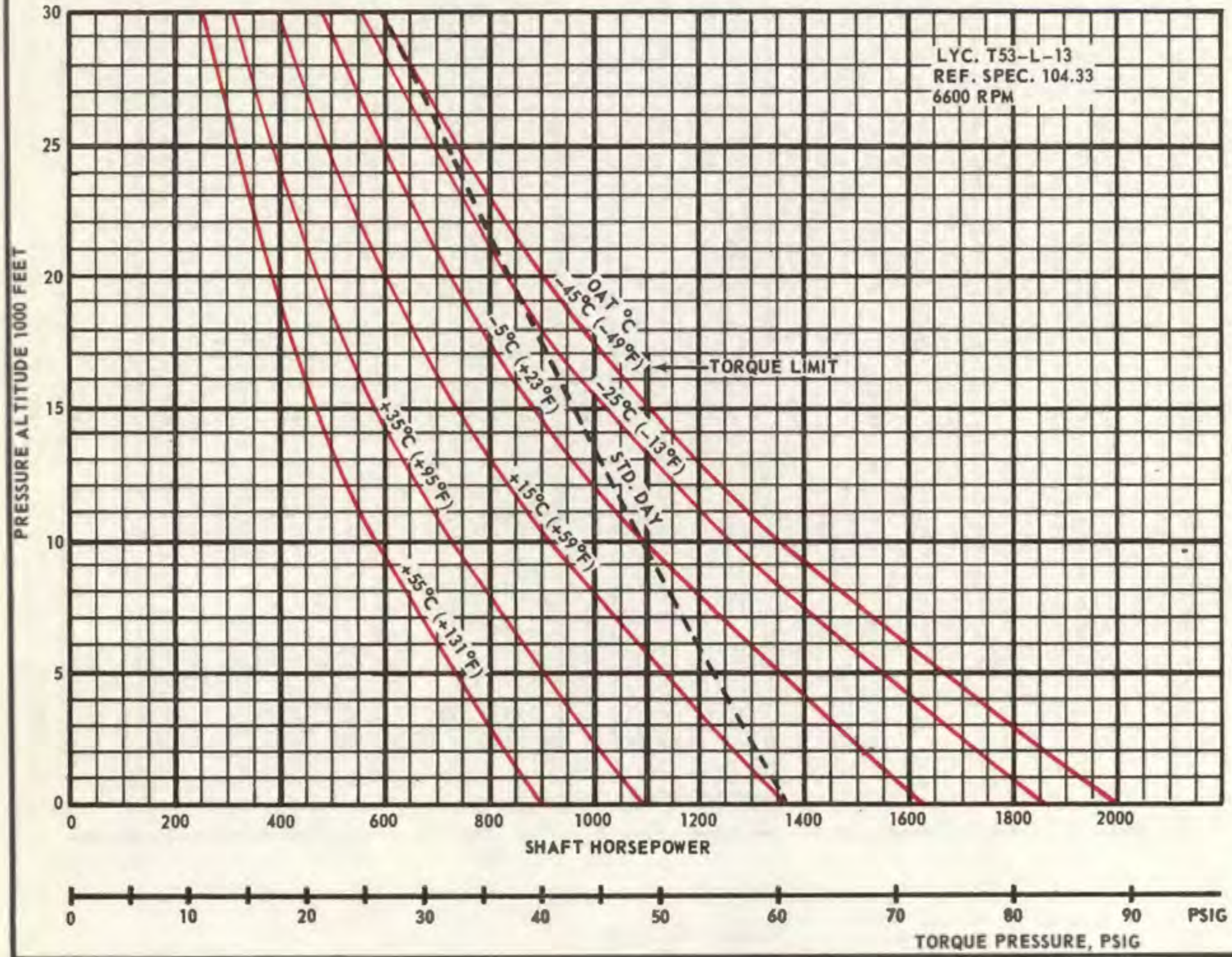
Chart 14-31. Engine operating limits — T53-L-13 engine — normal power (Sheet 1 of 2)

ENGINE OPERATING LIMITS

MILITARY POWER AVAILABLE
2°C INLET TEMPERATURE RISE

ARMY MODEL: UH-1D
DATA AS OF: AUGUST 1966
DATA BASIS: CALCULATED, Lycoming Engine Spec. No. 104.33 (Engine Installed)

ENGINES: Lycoming T53-L-13
ENGINE SPEED: 6600 RPM
FUEL GRADE JP-4
FUEL DENSITY: 6.5 LB/GAL.



REMARKS:

Chart 14-31. Engine operating limits — T53-L-13 engine — military power (Sheet 2 of 2)

TAKE-OFF DISTANCE – FEET

LIGHT ON SKIDS - TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
5000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	21.2	371.				
	14000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	16000	0.0	0.	0.0	0.	0.0	0.	18.5	228.	----	----				
	18000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	20000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
5500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	19.2	260.	----	----				
	16000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	18000	0.0	0.	0.0	0.	15.9	138.	----	----	----	----				
	20000	0.0	0.	0.0	0.	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 1 of 20)

TAKE-OFF DISTANCE — FEET

LIGHT ON SKIDS - TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
6000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	19.5	272.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	16000	0.0	0.	0.0	0.	16.3	148.	----	----	----	----				
	18000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	20000	0.0	0.	14.2	99.	----	----	----	----	----	----				
6500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	21.2	376.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	19.4	267.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	14000	0.0	0.	0.0	0.	16.2	146.	----	----	----	----				
	16000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	18000	0.0	0.	14.3	99.	----	----	----	----	----	----				
	20000	0.0	0.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 2 of 20)

TAKE-OFF DISTANCE – FEET

LIGHT ON SKIDS - TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
7000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.6	332.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	19.0	247.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	15.8	133.	----	----	----	----				
	14000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	16000	0.0	0.	13.8	90.	----	----	----	----	----	----				
	18000	0.0	0.	----	----	----	----	----	----	----	----				
7500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	19.8	291.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	18.3	217.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	12.9	76.	----	----	----	----	----	----				
	16000	0.0	0.	----	----	----	----	----	----	----	----				
	18000	15.9	137.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 3 of 20)

TAKE-OFF DISTANCE – FEET

LIGHT ON SKIDS - TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-1
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
8000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	19.3	264.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	----	----	----	----	----	----	----	----				
	16000	14.5	103.	----	----	----	----	----	----	----	----				
8500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	18.0	205.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	16.3	148.	----	----	----	----	----	----				
	14000	12.7	73.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 4 of 20)

TAKE-OFF DISTANCE — FEET

LIGHT ON SKIDS - TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
9000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	19.6	279.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	16.3	148.	----	----	----	----				
	8000	0.0	0.	14.5	103.	----	----	----	----	----	----				
	10000	14.5	103.	14.6	106.	----	----	----	----	----	----				
	12000	14.6	106.	----	----	----	----	----	----	----	----				
9500	S.L.	0.0	0.	0.0	0.	0.0	0.	17.9	203.	----	----				
	2000	0.0	0.	0.0	0.	17.9	202.	----	----	----	----				
	4000	0.0	0.	17.9	202.	18.0	207.	----	----	----	----				
	6000	17.9	202.	18.0	207.	----	----	----	----	----	----				
	8000	18.0	207.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 5 of 20)

TAKE-OFF DISTANCE – FEET

MAXIMUM PERFORMANCE - HOVERING TECHNIQUE - TWO FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
5000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	317.				
	14000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	16000	0.0	0.	0.0	0.	0.0	0.	20.0	265.	----	----				
	18000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
5000	20000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
5500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	20.0	278.	----	----				
	16000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	18000	0.0	0.	0.0	0.	20.0	224.	----	----	----	----				
	20000	0.0	0.	0.0	0.	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 6 of 20)

TAKE-OFF DISTANCE – FEET

MAXIMUM PERFORMANCE - HOVERING TECHNIQUE - TWO FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
6000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	20.0	283.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	16000	0.0	0.	0.0	0.	20.0	230.	----	----	----	----				
	18000	0.0	0.	0.0	0.	----	----	----	----	----	----				
6000	20000	0.0	0.	20.0	201.	----	----	----	----	----	----				
6500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	318.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	20.0	281.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	14000	0.0	0.	0.0	0.	20.0	228.	----	----	----	----				
	16000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	18000	0.0	0.	20.0	201.	----	----	----	----	----	----				
6500	20000	0.0	0.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 7 of 20)

TAKE-OFF DISTANCE – FEET

MAXIMUM PERFORMANCE - HOVERING TECHNIQUE - TWO FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
7000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	304.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	20.0	273.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	20.0	221.	----	----	----	----				
	14000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	16000	0.0	0.	20.0	195.	----	----	----	----	----	----				
7000	18000	0.0	0.	----	----	----	----	----	----	----	----				
7500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	289.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	20.0	261.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	20.0	184.	----	----	----	----	----	----				
	16000	0.0	0.	----	----	----	----	----	----	----	----				
7500	18000	20.0	224.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 8 of 20)

TAKE-OFF DISTANCE – FEET

MAXIMUM PERFORMANCE - HOVERING TECHNIQUE - TWO FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
8000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	280.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	----	----	----	----	----	----	----	----				
8000	16000	20.0	204.	----	----	----	----	----	----	----	----				
8500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	20.0	256.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	20.0	229.	----	----	----	----	----	----				
8500	14000	20.0	182.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 9 of 20)

TAKE-OFF DISTANCE – FEET

MAXIMUM PERFORMANCE - HOVERING TECHNIQUE - TWO FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
9000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	20.0	285.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	20.0	229.	----	----	----	----				
	8000	0.0	0.	20.0	204.	----	----	----	----	----	----				
	10000	20.0	204.	20.0	205.	----	----	----	----	----	----				
9000	12000	20.0	206.	----	----	----	----	----	----	----	----				
9500	S.L.	0.0	0.	0.0	0.	0.0	0.	20.0	255.	----	----				
	2000	0.0	0.	0.0	0.	20.0	255.	----	----	----	----				
	4000	0.0	0.	20.0	255.	20.0	257.	----	----	----	----				
	6000	20.0	255.	20.0	257.	----	----	----	----	----	----				
9500	8000	20.0	257.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 10 of 20)

TAKE-OFF DISTANCE – FEET

HOVERING TECHNIQUE - FIFTEEN FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
5000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	688.				
	14000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	16000	0.0	0.	0.0	0.	0.0	0.	20.0	292.	----	----				
	18000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
5000	20000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
5500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	874.				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	20.0	335.	----	----				
	16000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	18000	0.0	0.	0.0	0.	20.0	252.	----	----	----	----				
5500	20000	0.0	0.	0.0	0.	20.0	952.	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 11 of 20)

TAKE-OFF DISTANCE — FEET

HOVERING TECHNIQUE - FIFTEEN FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
6000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	867.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	20.0	359.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	16000	0.0	0.	0.0	0.	20.0	254.	----	----	----	----				
	18000	0.0	0.	0.0	0.	----	----	----	----	----	----				
6000	20000	0.0	0.	20.0	233.	----	----	----	----	----	----				
6500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	709.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	20.0	348.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	14000	0.0	0.	0.0	0.	20.0	254.	----	----	----	----				
	16000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	18000	0.0	0.	20.0	233.	----	----	----	----	----	----				
6500	20000	0.0	0.	20.0	603.	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 12 of 20)

TAKE-OFF DISTANCE — FEET

HOVERING TECHNIQUE - FIFTEEN FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
7000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	525.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	20.0	315.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	20.0	251.	----	----	----	----				
	14000	0.0	0.	0.0	0.	20.0	832.	----	----	----	----				
	16000	0.0	0.	20.0	224.	----	----	----	----	----	----				
	18000	0.0	0.	20.0	483.	----	----	----	----	----	----				
7000	20000	20.0	258.	----	----	----	----	----	----	----	----				
7500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	399.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	20.0	282.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	20.0	553.	----	----	----	----				
	14000	0.0	0.	20.0	203.	----	----	----	----	----	----				
	16000	0.0	0.	20.0	348.	----	----	----	----	----	----				
7500	18000	20.0	252.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 13 of 20)

TAKE-OFF DISTANCE — FEET

HOVERING TECHNIQUE - FIFTEEN FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
8000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	343.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	20.0	357.	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	20.0	273.	----	----	----	----	----	----				
	16000	20.0	236.	----	----	----	----	----	----	----	----				
8000	18000	20.0	873.	----	----	----	----	----	----	----	----				
8500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	20.0	644.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	20.0	273.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	20.0	254.	----	----	----	----	----	----				
	14000	20.0	198.	----	----	----	----	----	----	----	----				
8500	16000	20.0	389.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 14 of 20)

TAKE-OFF DISTANCE – FEET

HOVERING TECHNIQUE - FIFTEEN FOOT SKID HEIGHT
TAKE-OFF POWER

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
9000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	20.0	372.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	20.0	254.	----	----	----	----				
	8000	0.0	0.	20.0	236.	----	----	----	----	----	----				
	10000	20.0	236.	20.0	238.	----	----	----	----	----	----				
	12000	20.0	238.	20.0	667.	----	----	----	----	----	----				
9000	14000	20.0	264.	----	----	----	----	----	----	----	----				
9500	S.L.	0.0	0.	0.0	0.	0.0	0.	20.0	272.	----	----				
	2000	0.0	0.	0.0	0.	20.0	271.	----	----	----	----				
	4000	0.0	0.	20.0	271.	20.0	274.	----	----	----	----				
	6000	20.0	271.	20.0	275.	20.0	460.	----	----	----	----				
	8000	20.0	274.	20.0	287.	----	----	----	----	----	----				
	10000	20.0	287.	20.0	320.	----	----	----	----	----	----				
	12000	20.0	320.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 15 of 20)

TAKE-OFF DISTANCE – FEET

MAXIMUM PERFORMANCE - BLEED-OFF TECHNIQUE - LIGHT ON SKIDS
TAKE-OFF POWER - ENGINE SPEED MAXIMUM 6400 RPM, MINIMUM 5800 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
5000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	272.				
	14000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	---				
	16000	0.0	0.	0.0	0.	0.0	0.	20.0	231.	----	---				
	18000	0.0	0.	0.0	0.	0.0	0.	----	----	----	---				
	20000	0.0	0.	0.0	0.	0.0	0.	----	----	----	---				
5500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	---				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	---				
	14000	0.0	0.	0.0	0.	0.0	0.	20.0	242.	----	---				
	16000	0.0	0.	0.0	0.	0.0	0.	----	----	----	---				
	18000	0.0	0.	0.0	0.	20.0	197.	----	----	----	---				
	20000	0.0	0.	0.0	0.	----	----	----	----	----	---				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 16 of 20)

TAKE-OFF DISTANCE — FEET

MAXIMUM PERFORMANCE - BLEED-OFF TECHNIQUE - LIGHT ON SKIDS
TAKE-OFF POWER - ENGINE SPEED MAXIMUM 6400 RPM, MINIMUM 5800 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
6000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	20.0	245.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	16000	0.0	0.	0.0	0.	20.0	201.	----	----	----	----				
	18000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	20000	0.0	0.	-0.0	176.	----	----	----	----	----	----				
6500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	273.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	20.0	244.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	14000	0.0	0.	0.0	0.	20.0	200.	----	----	----	----				
	16000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	18000	0.0	0.	20.0	176.	----	----	----	----	----	----				
	20000	0.0	0.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 17 of 20)

TAKE-OFF DISTANCE — FEET

MAXIMUM PERFORMANCE - BLEED-OFF TECHNIQUE - LIGHT ON SKIDS
TAKE-OFF POWER - ENGINE SPEED MAXIMUM 6400 RPM, MINIMUM 5800 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
7000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	262.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	20.0	238.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	20.0	194.	----	----	----	----				
	14000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	16000	0.0	0.	20.0	171.	----	----	----	----	----	----				
	18000	0.0	0.	----	----	----	----	----	----	----	----				
7500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	251.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	20.0	228.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	20.0	161.	----	----	----	----	----	----				
	16000	0.0	0.	----	----	----	----	----	----	----	----				
	18000	20.0	196.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 18 of 20)

TAKE-OFF DISTANCE – FEET

MAXIMUM PERFORMANCE - BLEED-OFF TECHNIQUE - LIGHT ON SKIDS
TAKE-OFF POWER - ENGINE SPEED MAXIMUM 6400 RPM, MINIMUM 5800 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
8000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	243.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	----	----	----	----	----	----	----	----				
	16000	20.0	179.	----	----	----	----	----	----	----	----				
8500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	20.0	224.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	20.0	201.	----	----	----	----	----	----				
	14000	20.0	159.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 19 of 20)

TAKE-OFF DISTANCE — FEET

MAXIMUM PERFORMANCE - BLEED-OFF TECHNIQUE - LIGHT ON SKIDS
TAKE-OFF POWER - ENGINE SPEED MAXIMUM 6400 RPM, MINIMUM 5800 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)		9			
		CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED TAS KNOTS	DIST TO CLEAR 50 FT.
9000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	20.0	247.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	20.0	201.	----	----	----	----				
	8000	0.0	0.	20.0	179.	----	----	----	----	----	----				
	10000	20.0	179.	20.0	180.	----	----	----	----	----	----				
	12000	20.0	181.	----	----	----	----	----	----	----	----				
9500	S.L.	0.0	0.	0.0	0.	0.0	0.	20.0	223.	----	----				
	2000	0.0	0.	0.0	0.	20.0	222.	----	----	----	----				
	4000	0.0	0.	20.0	222.	20.0	224.	----	----	----	----				
	6000	20.0	222.	20.0	224.	----	----	----	----	----	----				
	8000	20.0	224.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-32. Take-off distance chart — 48 rotor — T53-L-13 engine (Sheet 20 of 20)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

CONFIGURATION: CLEAN
WEIGHT: 5000

CONFIGURATION: CLEAN
WEIGHT: 5500

APPROXIMATE				TORQUE PRESS PSIG	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	TORQUE PRESS PSIG	APPROXIMATE			
RATE OF CLIMB FT/MIN	FROM SEA LEVEL								FROM SEA LEVEL			RATE OF CLIMB FT/MIN.
	DIST. N. MI.	TIME MIN.	FUEL LBS.						FUEL LBS.	TIME MIN.	DIST. N. MI.	
3074	0.0	0.0	24	40.1	51	S.L.	53	40.1	24	0.0	0.0	2668
3066	0.5	0.7	31	40.1	51	2000	52	40.1	32	0.7	0.6	2666
3060	0.9	1.3	37	40.1	50	4000	52	40.1	39	1.5	1.2	2670
3068	1.4	2.0	44	40.1	50	6000	52	40.1	47	2.2	1.8	2684
3082	1.9	2.6	50	40.1	50	8000	52	40.1	54	3.0	2.4	2694
3091	2.4	3.3	56	40.1	50	10000	52	40.1	61	3.7	3.1	2697
3094	3.0	3.9	62	40.1	50	12000	51	40.1	68	4.5	3.8	2694
3090	3.5	4.5	68	40.1	49	14000	51	40.1	74	5.2	4.5	2688
2927	4.1	5.2	74	38.8	49	16000	50	38.8	81	6.0	5.2	2541
2691	4.8	5.9	80	36.7	48	18000	49	36.7	88	6.8	6.0	2322
2449	5.6	6.7	86	34.6	47	20000	48	34.6	95	7.7	6.9	2087
2193	6.4	7.6	92	32.5	46	22000	46	32.5	103	8.7	8.0	1816
1912	7.4	8.5	99	30.4	44	24000	44	30.4	111	10.0	9.3	1440
1552	8.6	9.7	106	28.2	42	26000	41	28.2	122	11.8	11.2	780
952	10.3	11.3	116	26.0	40	28000						

REMARKS:

1. Fuel used for warm-up and take-off = 24 pounds.
2. Engine specification fuel flow increased 5% per MIL-M-7700A.

Chart 14-33. Climb chart — 48 foot rotor — T53-L-13 engine (Sheet 1 of 5)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

CONFIGURATION: CLEAN
WEIGHT: 6000

CONFIGURATION: CLEAN
WEIGHT: 6500

APPROXIMATE				TORQUE PRESS	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	TORQUE PRESS	APPROXIMATE			
RATE OF CLIMB FT/MIN	FROM SEA LEVEL								FROM SEA LEVEL			RATE OF CLIMB FT/MIN.
	DIST. N. MI.	TIME MIN.	FUEL LBS.	PSIG				PSIG	FUEL LBS.	TIME MIN.	DIST. N. MI.	
2340	0.0	0.0	24	40.1	55	S.L.	56	40.1	24	0.0	0.0	2070
2344	0.7	0.9	33	40.1	54	2000	56	40.1	34	1.0	0.9	2080
2355	1.4	1.7	42	40.1	54	4000	56	40.1	44	1.9	1.7	2091
2366	2.2	2.6	50	40.1	54	6000	55	40.1	53	2.9	2.6	2096
2370	3.0	3.4	58	40.1	54	8000	55	40.1	62	3.8	3.5	2094
2368	3.8	4.2	66	40.1	53	10000	54	40.1	71	4.8	4.5	2088
2362	4.6	5.1	74	40.1	53	12000	54	40.1	80	5.7	5.4	2079
2355	5.4	5.9	81	40.1	52	14000	53	40.1	89	6.7	6.4	2066
2217	6.3	6.8	89	38.8	51	16000	51	38.8	98	7.7	7.5	1918
1996	7.3	7.8	97	36.7	49	18000	49	36.7	107	8.8	8.7	1661
1732	8.4	8.8	105	34.6	48	20000	47	34.6	118	10.2	10.1	1286
1349	9.8	10.1	115	32.5	45	22000	44	32.5	133	12.3	12.3	631
672	11.8	12.1	128	30.4	43	24000						

REMARKS:

1. Fuel used for warm-up and take-off = 24 pounds.
2. Engine specification fuel flow increased 5% per MIL-M-7700A.

Chart 14-33. Climb chart — 48 foot rotor — T53-L-13 engine (Sheet 2 of 5)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

CONFIGURATION: CLEAN
WEIGHT: 7000

CONFIGURATION: CLEAN
WEIGHT: 7500

APPROXIMATE				TORQUE PRESS	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	TORQUE PRESS	APPROXIMATE			
RATE OF CLIMB FT/MIN	FROM SEA LEVEL								FROM SEA LEVEL			RATE OF CLIMB FT/MIN.
	DIST. N. MI.	TIME MIN.	FUEL LBS.	PSIG				PSIG	FUEL LBS.	TIME MIN.	DIST. N. MI.	
1844	0.0	0.0	24	40.1	58	S.L.	60	40.1	24	0.0	0.0	1653
1857	1.0	1.1	35	40.1	58	2000	59	40.1	37	1.2	1.2	1662
1863	2.0	2.2	46	40.1	57	4000	59	40.1	49	2.4	2.4	1661
1861	3.1	3.2	57	40.1	57	6000	58	40.1	61	3.6	3.6	1654
1855	4.2	4.3	67	40.1	56	8000	57	40.1	72	4.8	4.8	1642
1844	5.3	5.4	77	40.1	55	10000	56	40.1	84	6.1	6.1	1622
1828	6.4	6.5	87	40.1	54	12000	55	40.1	95	7.3	7.4	1585
1794	7.6	7.6	97	40.1	53	14000	53	40.1	107	8.6	8.8	1508
1606	8.8	8.8	108	38.8	51	16000	51	38.8	120	10.1	10.4	1235
1250	10.3	10.2	119	36.7	49	18000	48	36.7	137	12.1	12.6	702
646	12.5	12.3	136	34.6	46	20000						

REMARKS:

1. Fuel used for warm-up and take-off = 24 pounds.
2. Engine specification fuel flow increased 5% per MIL-M.7700A.

Chart 14-33. Climb chart — 48 foot rotor — T53-L-13 engine (Sheet 3 of 5)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-1
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

CONFIGURATION: CLEAN WEIGHT: 8000							CONFIGURATION: CLEAN WEIGHT: 8500					
APPROXIMATE				TORQUE PRESS PSIG	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	TORQUE PRESS PSIG	APPROXIMATE			
RATE OF CLIMB FT/MIN	FROM SEA LEVEL								FROM SEA LEVEL			RATE OF CLIMB FT/MIN.
	DIST. N. MI.	TIME MIN.	FUEL LBS.						FUEL LBS.	TIME MIN.	DIST. N. MI.	
1486	0.0	0.0	24	40.1	61	S.L.	62	40.1	24	0.0	0.0	1335
1487	1.3	1.3	38	40.1	61	2000	62	40.1	40	1.5	1.5	1327
1480	2.7	2.7	52	40.1	60	4000	61	40.1	55	3.0	3.1	1313
1466	4.1	4.1	65	40.1	59	6000	60	40.1	70	4.6	4.8	1289
1444	5.6	5.4	78	40.1	58	8000	59	40.1	85	6.1	6.5	1250
1405	7.1	6.8	92	40.1	57	10000	57	40.1	101	7.8	8.2	1177
1329	8.7	8.3	105	40.1	55	12000	55	40.1	118	9.6	10.2	1038
1178	10.4	9.9	119	40.1	53	14000	52	40.1	137	11.8	12.6	780
780	12.6	11.9	137	38.8	50	16000						

REMARKS:

1. Fuel used for warm-up and take-off = 24 pounds.
2. Engine specification fuel flow increased 5% per MIL-M-7700A.

Chart 14-33. Climb chart — 48 foot rotor — T53-L-13 engine (Sheet 4 of 5)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s):Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lbs/Gal

CONFIGURATION: CLEAN
WEIGHT: 9000

CONFIGURATION: CLEAN
WEIGHT: 9500

APPROXIMATE				TORQUE PRESS PSIG	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	TORQUE PRESS PSIG	APPROXIMATE			
RATE OF CLIMB FT/MIN	FROM SEA LEVEL								FROM SEA LEVEL			RATE OF CLIMB FT/MIN.
	DIST. N. MI.	TIME MIN.	FUEL LBS.						FUEL LBS.	TIME MIN.	DIST. N. MI.	
1193	0.0	0.0	24	40.1	64	S.L.	65	40.1	24	0.0	0.0	1059
1178	1.8	1.7	42	40.1	63	2000	64	40.1	44	1.9	2.0	1034
1153	3.6	3.4	59	40.1	62	4000	62	40.1	64	3.9	4.2	996
1114	5.5	5.2	76	40.1	61	6000	61	40.1	84	6.0	6.5	933
1046	7.5	7.0	94	40.1	59	8000	59	40.1	106	8.2	8.9	822
921	9.7	9.1	108	40.1	57	10000	56	40.1	132	11.0	12.0	624
693	12.4	11.5	136	40.1	54	12000	53	40.1	173	15.4	16.7	284
298	16.7	15.6	173	40.1	51	14000						

REMARKS:

1. Fuel used for warm-up and take-off = 24 pounds.
2. Engine specification fuel flow increased 5% per MIL-M-7700A.

Chart 14-33. Climb chart — 48 foot rotor — T53-L-13 engine (Sheet 5 of 5)

RANGE CHART
STANDARD DAY

ENGINE SPEED 6400 RPM

LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
5000	SL	34.2	584	120	120	294	288	247	205	164	123	82							
	2000	34.4	563	122	119	311	304	261	217	174	130	87							
	4000	32.4	524	121	114	330	323	277	231	185	139	92							
	6000	29.9	483	118	108	350	342	294	245	196	147	98							
	8000	27.2	445	114	101	367	359	308	257	205	154	103							
	10000	24.9	410	110	95	385	377	323	269	215	162	108							
	12000	22.8	377	107	89	405	396	340	283	227	170	113							
	14000	20.4	340	101	82	426	417	357	298	238	179	119							
	16000	18.0	305	94	74	442	433	371	309	247	186	124							
	18000	16.0	276	87	66	450	441	378	315	252	189	126							
5000	20000	14.6	253	79	58	447	438	375	313	250	188	125							
5500	SL	34.7	589	120	120	291	285	245	204	163	122	82							
	2000	35.4	572	123	120	308	302	259	216	173	129	86							
	4000	33.0	530	121	114	327	320	274	228	183	137	91							
	6000	30.6	490	118	108	345	337	289	241	193	145	96							
	8000	28.0	452	114	101	361	354	303	253	202	152	101							
	10000	25.8	419	110	95	377	369	317	264	211	158	106							
	12000	23.8	386	107	89	396	387	332	277	221	166	111							
	14000	21.4	350	101	82	414	405	348	290	232	174	116							
	16000	19.0	315	94	74	429	420	360	300	240	180	120							
	18000	17.3	288	87	66	432	423	362	302	242	181	121							
5500	20000	16.1	266	79	58	424	415	356	297	237	178	119							

REMARKS:

1. Clean Configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available)(TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-34. Range chart — 48 foot rotor — T53-L-13 engine (Sheet 1 of 5)

RANGE CHART
STANDARD DAY
ENGINE SPEED 6400 RPM

LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430	1400	1200	1000	800	600	400							
			FUEL FLOW	SPEED/KNTS		LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS	LBS
POUNDS	FEET	PSIG	LB/HR	TAS	CAS	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL
6000	SL	35.3	594	120	120	289	283	242	202	162	121	81							
	2000	36.1	579	123	120	305	298	256	213	170	128	85							
	4000	33.7	537	121	114	322	316	270	225	180	135	90							
	6000	31.5	498	118	108	339	332	285	237	190	142	95							
	8000	29.0	462	114	101	354	346	297	247	198	148	99							
	10000	26.8	428	110	95	369	361	310	258	207	155	103							
	12000	24.9	396	107	89	385	377	323	269	216	162	108							
	14000	22.6	361	101	82	401	393	337	281	225	168	112							
	16000	20.5	328	94	74	411	402	345	287	230	172	115							
	18000	19.1	305	87	66	408	399	342	285	228	171	114							
6000	20000	18.4	288	79	58	392	384	329	274	219	164	110							
6500	SL	36.1	602	120	120	285	279	239	199	160	120	80							
	2000	36.8	586	123	120	301	295	253	210	168	126	84							
	4000	34.7	546	121	114	317	310	266	222	177	133	89							
	6000	32.5	508	118	108	332	325	279	232	186	139	93							
	8000	30.1	472	114	101	346	339	291	242	194	145	97							
	10000	27.9	439	110	95	360	352	302	252	201	151	101							
	12000	26.2	409	107	87	373	366	313	261	209	157	104							
	14000	24.2	375	101	82	386	378	324	270	216	162	108							
	16000	22.6	348	94	74	387	379	325	271	217	162	108							
	18000	21.8	331	87	66	376	368	315	263	210	158	105							
6500	20000	22.4	327	79	58	346	339	290	242	194	145	97							

REMARKS:

1. Clean Configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-34. Range chart — 48 foot rotor — T53-L-13 engine (Sheet 2 of 5)

RANGE CHART

STANDARD DAY

ENGINE SPEED 6400 RPM

LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS· AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
7000	SL	36.9	609	120	120	282	276	236	197	158	118	79							
	2000	37.9	596	123	120	296	290	248	207	166	124	83							
	4000	35.8	556	121	114	311	304	261	217	174	130	87							
	6000	33.7	519	118	108	325	318	273	227	182	136	91							
	8000	31.3	483	114	101	338	331	284	236	189	142	95							
	10000	29.4	452	110	95	349	342	293	244	195	146	98							
	12000	27.8	424	107	89	360	352	302	252	201	151	101							
	14000	26.6	399	101	82	363	355	305	254	203	152	102							
	16000	25.7	378	94	74	357	349	299	249	200	150	100							
	18000	26.0	371	87	66	335	328	281	234	187	141	94							
7000	20000	33.8	444	79	58	255	249	214	178	142	107	71							
7500	SL	37.9	618	120	120	278	272	233	194	155	116	78							
	2000	39.0	607	123	120	291	285	244	203	163	122	81							
	4000	37.0	568	121	114	304	298	255	213	170	128	85							
	6000	34.9	532	118	108	318	311	267	222	178	133	89							
	8000	32.8	498	114	101	328	321	275	229	183	138	92							
	10000	31.0	468	110	95	337	330	283	236	189	142	94							
	12000	30.5	450	107	89	339	332	285	237	190	142	95							
	14000	30.0	432	101	82	335	328	281	234	187	141	94							
	16000	29.9	420	94	74	321	314	269	224	180	135	90							
7500	18000	36.7	483	82	62	243	238	204	170	136	102	68							

REMARKS:

1. Clean Configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available)(Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-34. Range chart — 48 foot rotor — T53-L-13 engine (Sheet 3 of 5)

RANGE CHART
STANDARD DAY

ENGINE SPEED 6400 RPM

LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: [illegible] Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRES.	APPROXIMATE FUEL FLOW	APPROXIMATE SPEED/KNTS		1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
8000	SL	37.4	614	117	117	274	268	230	191	153	115	77							
	2000	38.8	605	121	117	286	280	240	200	160	120	80							
	4000	36.7	566	118	111	299	293	251	209	167	125	84							
	6000	35.0	532	115	105	310	303	260	217	173	130	87							
	8000	33.1	501	112	99	319	312	267	223	178	134	89							
	10000	32.4	481	108	93	320	313	269	224	179	134	90							
	12000	32.5	470	104	86	316	310	265	221	177	133	88							
	14000	32.8	460	98	79	306	299	256	214	171	128	85							
8000	16000	38.8	513	85	66	237	232	199	166	132	99	66							
8500	SL	37.0	610	115	115	270	264	226	189	151	113	75							
	2000	38.5	602	118	115	281	275	236	197	157	118	79							
	4000	36.8	566	116	109	292	286	245	204	163	123	82							
	6000	35.1	533	112	103	302	296	253	211	169	127	84							
	8000	34.3	513	109	97	304	298	255	213	170	128	85							
	10000	34.1	498	105	90	302	295	253	211	169	127	84							
	12000	35.1	496	101	84	292	286	245	204	163	122	82							
8500	14000	40.1	537	88	71	234	229	197	164	131	98	66							

REMARKS:

1. Clean Configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available)(TAS)}}{\text{Fuel Flow}}$ = (Fuel Available)(Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-34. Range chart — 48 foot rotor — T53-L-13 engine (Sheet 4 of 5)

RANGE CHART
STANDARD DAY
ENGINE SPEED 6400 RPM

LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles														
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS																
POUNDS	FEET	PSIG	LB/HR	TAS	CAS															
9000	SL	36.6	606	112	112	265	260	223	186	148	111	74								
	2000	38.4	601	116	112	275	270	231	193	154	116	77								
	4000	36.8	566	113	106	285	279	239	200	160	120	80								
	6000	35.9	542	110	100	290	284	243	203	162	122	81								
	8000	35.7	527	106	94	289	283	242	202	161	121	81								
	10000	36.4	521	102	88	281	275	236	196	157	118	79								
9000	12000	40.1	547	90	75	235	230	197	165	132	99	66								
9500	SL	36.4	605	110	110	260	255	218	182	145	109	73								
	2000	38.3	601	113	110	270	264	226	189	151	113	75								
	4000	37.5	573	110	104	275	270	231	193	154	116	77								
	6000	36.9	551	107	98	277	272	233	194	155	116	78								
	8000	37.8	548	104	92	271	265	227	189	151	114	76								
9500	10000	40.1	558	93	80	239	234	201	167	134	100	67								

REMARKS:

1. Clean Configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available)(TAS)}}{\text{Fuel Flow}}$ = (Fuel Available)(Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-34. Range chart — 48 foot rotor — T53-L-13 engine (Sheet 5 of 5)

MAXIMUM ENDURANCE

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNOTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
5000	S.L.	13.5	398.4	51	51	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	2000	13.6	376.1	52	50	3.8	3.7	3.2	2.7	2.1	1.6	1.1	0.5						
	4000	13.6	355.2	53	50	4.0	3.9	3.4	2.8	2.3	1.7	1.1	0.6						
	6000	13.5	336.0	55	50	4.3	4.2	3.6	3.0	2.4	1.8	1.2	0.6						
	8000	13.4	318.9	56	50	4.5	4.4	3.8	3.1	2.5	1.9	1.3	0.6						
	10000	13.3	302.1	58	50	4.7	4.6	4.0	3.3	2.6	2.0	1.3	0.7						
	12000	13.3	288.4	59	49	5.0	4.9	4.2	3.5	2.8	2.1	1.4	0.7						
	14000	13.4	275.3	61	49	5.2	5.1	4.4	3.6	2.9	2.2	1.5	0.7						
	16000	13.4	263.9	62	49	5.4	5.3	4.5	3.8	3.0	2.3	1.5	0.8						
	18000	13.4	252.9	63	48	5.7	5.5	4.7	4.0	3.2	2.4	1.6	0.8						
5000	20000	13.4	242.3	64	47	5.9	5.8	5.0	4.1	3.3	2.5	1.7	0.8						
5500	S.L.	14.7	408.8	53	53	3.5	3.4	2.9	2.4	2.0	1.5	1.0	0.5						
	2000	14.7	386.3	54	52	3.7	3.6	3.1	2.6	2.1	1.6	1.0	0.5						
	4000	14.7	364.3	55	52	3.9	3.8	3.3	2.7	2.2	1.6	1.1	0.5						
	6000	14.5	344.5	57	52	4.2	4.1	3.5	2.9	2.3	1.7	1.2	0.6						
	8000	14.5	327.9	58	52	4.4	4.3	3.7	3.0	2.4	1.8	1.2	0.6						
	10000	14.4	311.9	60	51	4.6	4.5	3.8	3.2	2.6	1.9	1.3	0.6						
	12000	14.5	298.7	61	51	4.8	4.7	4.0	3.3	2.7	2.0	1.3	0.7						
	14000	14.5	285.7	63	50	5.0	4.9	4.2	3.5	2.8	2.1	1.4	0.7						
	16000	14.6	274.0	64	50	5.2	5.1	4.4	3.6	2.9	2.2	1.5	0.7						
	18000	14.6	263.5	65	49	5.4	5.3	4.6	3.8	3.0	2.3	1.5	0.8						
5500	20000	14.7	254.2	65	47	5.6	5.5	4.7	3.9	3.1	2.4	1.6	0.8						

REMARKS:

1. Engine specification fuel flow increased 5% per MIL-M-7700A.
2. Endurance not shown where power required exceeds power available.

Chart 14-35. Maximum endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 1 of 5)

MAXIMUM ENDURANCE
STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNOTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
6000	S.L.	15.8	418.6	54	54	3.4	3.3	2.9	2.4	1.9	1.4	1.0	0.5						
	2000	15.8	395.4	56	54	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	4000	15.6	372.5	57	54	3.8	3.8	3.2	2.7	2.1	1.6	1.1	0.5						
	6000	15.5	352.9	59	54	4.1	4.0	3.4	2.8	2.3	1.7	1.1	0.6						
	8000	15.5	337.1	60	53	4.2	4.2	3.6	3.0	2.4	1.8	1.2	0.6						
	10000	15.5	322.0	62	53	4.4	4.3	3.7	3.1	2.5	1.9	1.2	0.6						
	12000	15.6	308.9	63	52	4.6	4.5	3.9	3.2	2.6	1.9	1.3	0.6						
	14000	15.6	295.9	64	52	4.8	4.7	4.1	3.4	2.7	2.0	1.4	0.7						
	16000	15.7	284.5	65	51	5.0	4.9	4.2	3.5	2.8	2.1	1.4	0.7						
	18000	16.0	275.9	65	49	5.2	5.1	4.3	3.6	2.9	2.2	1.4	0.7						
6000	20000	16.6	271.4	65	48	5.3	5.2	4.4	3.7	2.9	2.2	1.5	0.7						
6500	S.L.	16.8	427.5	56	56	3.3	3.3	2.8	2.3	1.9	1.4	0.9	0.5						
	2000	16.7	403.7	58	56	3.5	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	4000	16.6	330.5	59	56	3.8	3.7	3.2	2.6	2.1	1.6	1.1	0.5						
	6000	16.5	361.5	61	55	4.0	3.9	3.3	2.8	2.2	1.7	1.1	0.6						
	8000	16.5	346.6	62	55	4.1	4.0	3.5	2.9	2.3	1.7	1.2	0.6						
	10000	16.6	332.2	63	54	4.3	4.2	3.6	3.0	2.4	1.8	1.2	0.6						
	12000	16.7	319.3	64	54	4.5	4.4	3.8	3.1	2.5	1.9	1.3	0.6						
	14000	16.9	307.0	65	52	4.7	4.6	3.9	3.3	2.6	2.0	1.3	0.7						
	16000	17.2	297.7	66	51	4.8	4.7	4.0	3.4	2.7	2.0	1.3	0.7						
	18000	18.0	294.8	65	49	4.9	4.7	4.1	3.4	2.7	2.0	1.4	0.7						
6500	20000	20.1	304.5	65	47	4.7	4.6	3.9	3.3	2.6	2.0	1.3	0.7						

REMARKS:

1. Engine specification fuel flow increased 5% per MIL-M-7700A.
2. Endurance not shown where power required exceeds power available.

Chart 14-35. Maximum endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 2 of 5)

MAXIMUM ENDURANCE

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE			1430 LBS	1400 LBS	1200 LBS	1000 LBS	800 LBS	600 LBS	400 LBS	200 LBS	LBS	LBS	LBS	LBS	LBS	LBS
			FUEL FLOW	SPEED/KNOTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL
7000	S.L.	17.8	435.9	58	58	3.3	3.2	2.8	2.3	1.8	1.4	0.9	0.5						
	2000	17.6	411.6	59	58	3.5	3.4	2.9	2.4	1.9	1.5	1.0	0.5						
	4000	17.5	388.8	61	57	3.7	3.6	3.1	2.6	2.1	1.5	1.0	0.5						
	6000	17.5	370.4	62	57	3.9	3.8	3.2	2.7	2.2	1.6	1.1	0.5						
	8000	17.6	356.4	63	56	4.0	3.9	3.4	2.8	2.2	1.7	1.1	0.6						
	10000	17.8	342.9	64	55	4.2	4.1	3.5	2.9	2.3	1.7	1.2	0.6						
	12000	18.0	330.9	65	54	4.3	4.2	3.6	3.0	2.4	1.8	1.2	0.6						
	14000	18.4	320.8	66	53	4.5	4.4	3.7	3.1	2.5	1.9	1.2	0.6						
	16000	19.3	317.3	66	51	4.5	4.4	3.8	3.2	2.5	1.9	1.3	0.6						
	18000	21.5	328.3	65	49	4.4	4.3	3.7	3.0	2.4	1.8	1.2	0.6						
7000	20000	26.8	370.0	63	46	3.9	3.8	3.2	2.7	2.2	1.6	1.1	0.5						
7500	S.L.	18.6	443.8	59	59	3.2	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	2000	18.5	419.7	61	59	3.4	3.3	2.9	2.4	1.9	1.4	1.0	0.5						
	4000	18.5	397.4	62	59	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	6000	18.6	379.8	64	58	3.8	3.7	3.2	2.6	2.1	1.6	1.1	0.5						
	8000	18.8	366.9	65	57	3.9	3.8	3.3	2.7	2.2	1.6	1.1	0.5						
	10000	19.0	355.0	65	56	4.0	3.9	3.4	2.8	2.3	1.7	1.1	0.6						
	12000	19.5	345.5	66	55	4.1	4.1	3.5	2.9	2.3	1.7	1.2	0.6						
	14000	20.5	340.9	66	53	4.2	4.1	3.5	2.9	2.3	1.8	1.2	0.6						
	16000	22.7	349.5	65	51	4.1	4.0	3.4	2.9	2.3	1.7	1.1	0.6						
7500	18000	27.6	387.4	64	48	3.7	3.6	3.1	2.6	2.1	1.5	1.0	0.5						

REMARKS:

1. Engine specification fuel flow increased 5% per MIL-M-7700A.
2. Endurance not shown where power required exceeds power available.

Chart 14-35. Maximum endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 3 of 5)

MAXIMUM ENDURANCE

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE FUEL FLOW	SPEED/KNOTS		1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
8000	S.L.	19.5	451.6	61	61	3.2	3.1	2.7	2.2	1.8	1.3	0.9	0.4						
	2000	19.5	428.4	62	60	3.3	3.3	2.8	2.3	1.9	1.4	0.9	0.5						
	4000	19.6	406.8	64	60	3.5	3.4	2.9	2.5	2.0	1.5	1.0	0.5						
	6000	19.8	390.2	65	59	3.7	3.6	3.1	2.6	2.1	1.5	1.0	0.5						
	8000	20.1	378.9	65	58	3.8	3.7	3.2	2.6	2.1	1.6	1.1	0.5						
	10000	20.6	370.0	66	57	3.9	3.8	3.2	2.7	2.2	1.6	1.1	0.5						
	12000	21.7	365.9	66	55	3.9	3.8	3.3	2.7	2.2	1.6	1.1	0.5						
	14000	23.8	371.6	65	53	3.8	3.8	3.2	2.7	2.2	1.6	1.1	0.5						
8000	16000	28.0	400.5	64	50	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
8500	S.L.	20.5	460.0	62	62	3.1	3.0	2.6	2.2	1.7	1.3	0.9	0.4						
	2000	20.6	437.8	64	61	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	4000	20.8	417.1	65	61	3.4	3.4	2.9	2.4	1.9	1.4	1.0	0.5						
	6000	21.1	402.0	66	60	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	8000	21.7	393.7	66	59	3.6	3.6	3.0	2.5	2.0	1.5	1.0	0.5						
	10000	22.8	390.2	66	57	3.7	3.6	3.1	2.6	2.1	1.5	1.0	0.5						
	12000	24.8	395.5	66	55	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
8500	14000	28.6	418.4	64	52	3.4	3.3	2.9	2.4	1.9	1.4	1.0	0.5						

REMARKS:

1. Engine specification fuel flow increased 5% per MIL-M-7700A.
2. Endurance not shown where power required exceeds power available.

Chart 14-35. Maximum endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 4 of 5)

MAXIMUM ENDURANCE
STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: AFFTC Category II (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNOTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
9000	S.L.	21.5	469.5	63	63	3.0	3.0	2.6	2.1	1.7	1.3	0.9	0.4						
	2000	21.8	448.3	65	63	3.2	3.1	2.7	2.2	1.8	1.3	0.9	0.4						
	4000	22.1	429.0	66	62	3.3	3.3	2.8	2.3	1.9	1.4	0.9	0.5						
	6000	22.7	416.4	66	60	3.4	3.4	2.9	2.4	1.9	1.4	1.0	0.5						
	8000	23.8	413.0	66	59	3.5	3.4	2.9	2.4	1.9	1.5	1.0	0.5						
	10000	25.8	418.2	66	57	3.4	3.3	2.9	2.4	1.9	1.4	1.0	0.5						
	12000	29.3	438.5	65	54	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
9000	14000	35.5	487.4	63	51	2.9	2.9	2.5	2.1	1.6	1.2	0.8	0.4						
9500	S.L.	22.7	480.1	65	65	3.0	2.9	2.5	2.1	1.7	1.2	0.8	0.4						
	2000	23.1	460.2	65	64	3.1	3.0	2.6	2.2	1.7	1.3	0.9	0.4						
	4000	23.7	443.2	66	62	3.2	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	6000	24.8	434.8	66	61	3.3	3.2	2.8	2.3	1.8	1.4	0.9	0.5						
	8000	26.6	438.9	66	59	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	10000	29.8	457.0	65	56	3.1	3.1	2.6	2.2	1.8	1.3	0.9	0.4						
9500	12000	35.4	499.1	63	53	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						

REMARKS:

1. Engine specification fuel flow increased 5% per MIL-M-7700A.
2. Endurance not shown where power required exceeds power available.

Chart 14-35. Maximum endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 5 of 5)

HOVERING ENDURANCE

STANDARD DAY

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s):Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROX. FUEL FLOW	APPROX. SPEED/KNTS		1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
5000	2000	23.3	476.1	0	0	3.0	2.9	2.5	2.1	1.7	1.3	0.8	0.4						
	4000	23.2	453.4	0	0	3.2	3.1	2.6	2.2	1.8	1.3	0.9	0.4						
	6000	23.2	433.9	0	0	3.3	3.2	2.8	2.3	1.8	1.4	0.9	0.5						
	8000	23.1	417.8	0	0	3.4	3.4	2.9	2.4	1.9	1.4	1.0	0.5						
	10000	23.1	402.2	0	0	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	12000	23.2	389.6	0	0	3.7	3.6	3.1	2.6	2.1	1.5	1.0	0.5						
	14000	23.4	378.0	0	0	3.8	3.7	3.2	2.6	2.1	1.6	1.1	0.5						
	16000	23.7	369.2	0	0	3.9	3.8	3.3	2.7	2.2	1.6	1.1	0.5						
	18000	24.2	363.3	0	0	3.9	3.9	3.3	2.8	2.2	1.7	1.1	0.6						
5000	20000	24.7	358.5	0	0	4.0	3.9	3.3	2.8	2.2	1.7	1.1	0.6						
5500	SL	25.6	520.9	0	0	2.7	2.7	2.3	1.9	1.5	1.2	0.8	0.4						
	2000	25.5	496.4	0	0	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	4000	25.5	474.3	0	0	3.0	3.0	2.5	2.1	1.7	1.3	0.8	0.4						
	6000	25.4	455.7	0	0	3.1	3.1	2.6	2.2	1.8	1.3	0.9	0.4						
	8000	25.5	440.8	0	0	3.2	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	10000	25.7	426.8	0	0	3.4	3.3	2.8	2.3	1.9	1.4	0.9	0.5						
	12000	25.9	415.9	0	0	3.4	3.4	2.9	2.4	1.9	1.4	1.0	0.5						
	14000	26.3	406.4	0	0	3.5	3.4	3.0	2.5	2.0	1.5	1.0	0.5						
	16000	26.8	399.8	0	0	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	18000	27.4	396.3	0	0	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
5500	20000	28.2	393.9	0	0	3.6	3.6	3.0	2.5	2.0	1.5	1.0	0.5						

REMARKS:

1. Engine Specification fuel flow increased 5% per MIL-M-7700A
2. Endurance data not shown where power required exceeds normal rated power available.

Chart 14-36. Hovering endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 1 of 5)

HOVERING ENDURANCE

STANDARD DAY

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROX. FUEL FLOW	APPROX. SPEED/KNTS		1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
6000	SL	27.8	540.9	0	0	2.6	2.6	2.2	1.8	1.5	1.1	0.7	0.4						
	2000	27.7	517.1	0	0	2.8	2.7	2.3	1.9	1.5	1.2	0.8	0.4						
	4000	27.8	496.2	0	0	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	6000	27.9	479.1	0	0	3.0	2.9	2.5	2.1	1.7	1.3	0.8	0.4						
	8000	28.1	466.0	0	0	3.1	3.0	2.6	2.1	1.7	1.3	0.9	0.4						
	10000	28.4	454.2	0	0	3.1	3.1	2.6	2.2	1.8	1.3	0.9	0.4						
	12000	28.9	445.5	0	0	3.2	3.1	2.7	2.2	1.8	1.3	0.9	0.4						
	14000	29.5	438.1	0	0	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	16000	30.2	434.0	0	0	3.3	3.2	2.8	2.3	1.8	1.4	0.9	0.5						
	18000	31.0	432.7	0	0	3.3	3.2	2.8	2.3	1.8	1.4	0.9	0.5						
6000	20000	31.8	432.1	0	0	3.3	3.2	2.8	2.3	1.9	1.4	0.9	0.5						
6500	SL	30.1	561.5	0	0	2.5	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
	2000	30.1	538.9	0	0	2.7	2.6	2.2	1.9	1.5	1.1	0.7	0.4						
	4000	30.3	519.8	0	0	2.8	2.7	2.3	1.9	1.5	1.2	0.8	0.4						
	6000	30.5	504.7	0	0	2.8	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	8000	30.9	493.8	0	0	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	10000	31.4	484.5	0	0	3.0	2.9	2.5	2.1	1.7	1.2	0.8	0.4						
	12000	32.1	478.1	0	0	3.0	2.9	2.5	2.1	1.7	1.3	0.8	0.4						
	14000	32.9	473.2	0	0	3.0	3.0	2.5	2.1	1.7	1.3	0.8	0.4						
	16000	33.7	471.2	0	0	3.0	3.0	2.5	2.1	1.7	1.3	0.8	0.4						
	18000	34.6	471.6	0	0	3.0	3.0	2.5	2.1	1.7	1.3	0.8	0.4						
6500	20000	33.6	451.7	15	11	3.2	3.1	2.7	2.2	1.8	1.3	0.9	0.4						

REMARKS:
1. Engine Specification fuel flow increased 5% per MIL-M-7700A
2. Endurance data not shown where power required exceeds normal rated power available.

Chart 14-36. Hovering endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 2 of 5)

HOVERING ENDURANCE

STANDARD DAY

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s):Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROX. FUEL FLOW	APPROX. SPEED/KNTS		1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
7000	SL	32.5	583.5	0	0	2.5	2.4	2.1	1.7	1.4	1.0	0.7	0.3						
	2000	32.6	562.4	0	0	2.5	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
	4000	32.9	545.3	0	0	2.6	2.6	2.2	1.8	1.5	1.1	0.7	0.4						
	6000	33.4	532.5	0	0	2.7	2.6	2.3	1.9	1.5	1.1	0.8	0.4						
	8000	34.0	524.1	0	0	2.7	2.7	2.3	1.9	1.5	1.1	0.8	0.4						
	10000	34.7	517.2	0	0	2.8	2.7	2.3	1.9	1.5	1.2	0.8	0.4						
	12000	35.5	513.4	0	0	2.8	2.7	2.3	1.9	1.6	1.2	0.8	0.4						
	14000	36.4	510.9	0	0	2.8	2.7	2.3	2.0	1.6	1.2	0.8	0.4						
	16000	37.4	510.8	0	0	2.8	2.7	2.3	2.0	1.6	1.2	0.8	0.4						
	18000	35.6	482.4	15	11	3.0	2.9	2.5	2.1	1.7	1.2	0.8	0.4						
7000	20000	33.6	451.7	15	11	3.2	3.1	2.7	2.2	1.8	1.3	0.9	0.4						
7500	SL	35.0	607.1	0	0	2.4	2.3	2.0	1.6	1.3	1.0	0.7	0.3						
	2000	35.4	587.9	0	0	2.4	2.4	2.0	1.7	1.4	1.0	0.7	0.3						
	4000	35.9	573.1	0	0	2.5	2.4	2.1	1.7	1.4	1.0	0.7	0.3						
	6000	36.5	562.7	0	0	2.5	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
	8000	37.3	556.7	0	0	2.6	2.5	2.2	1.8	1.4	1.1	0.7	0.4						
	10000	38.2	551.9	0	0	2.6	2.5	2.2	1.8	1.4	1.1	0.7	0.4						
	12000	39.1	550.6	0	0	2.6	2.5	2.2	1.8	1.5	1.1	0.7	0.4						
	14000	39.5	543.7	15	12	2.6	2.6	2.2	1.8	1.5	1.1	0.7	0.4						
	16000	37.5	512.7	15	12	2.8	2.7	2.3	2.0	1.6	1.2	0.8	0.4						
	18000	35.6	482.4	15	11	3.0	2.9	2.5	2.1	1.7	1.2	0.8	0.4						
7500	2000	33.6	451.7	15	11	3.2	3.1	2.7	2.2	1.8	1.3	0.9	0.4						

REMARKS:
1. Engine Specification fuel flow increased 5% per MIL-M-7700A
2. Endurance data not shown where power required exceeds normal rated power available.

Chart 14-36. Hovering endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 3 of 5)

HOVERING ENDURANCE

STANDARD DAY

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROX. FUEL FLOW	APPROX. SPEED/KNTS		1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
8000	SL	37.8	632.6	0	0	2.3	2.2	1.9	1.6	1.3	0.9	0.6	0.3						
	2000	38.3	615.5	0	0	2.3	2.3	1.9	1.6	1.3	1.0	0.6	0.3						
	4000	39.0	603.3	0	0	2.4	2.3	2.0	1.7	1.3	1.0	0.7	0.3						
	6000	39.8	595.3	0	0	2.4	2.4	2.0	1.7	1.3	1.0	0.7	0.3						
	8000	40.7	591.2	0	0	2.4	2.4	2.0	1.7	1.4	1.0	0.7	0.3						
	10000	41.7	587.9	0	0	2.4	2.4	2.0	1.7	1.4	1.0	0.7	0.3						
	12000	41.4	574.7	15	12	2.5	2.4	2.1	1.7	1.4	1.0	0.7	0.3						
	14000	39.5	543.7	15	12	2.6	2.6	2.2	1.8	1.5	1.1	0.7	0.4						
	16000	37.5	512.7	15	12	2.8	2.7	2.3	2.0	1.6	1.2	0.8	0.4						
8000	18000	35.6	482.4	15	11	3.0	2.9	2.5	2.1	1.7	1.2	0.8	0.4						
8500	SL	40.7	660.1	0	0	2.2	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	2000	41.4	645.7	0	0	2.2	2.2	1.9	1.5	1.2	0.9	0.6	0.3						
	4000	42.3	635.9	0	0	2.2	2.2	1.9	1.6	1.3	0.9	0.6	0.3						
	6000	43.3	630.0	0	0	2.3	2.2	1.9	1.6	1.3	1.0	0.6	0.3						
	8000	44.3	627.4	0	0	2.3	2.2	1.9	1.6	1.3	1.0	0.6	0.3						
	10000	43.3	604.1	15	13	2.4	2.3	2.0	1.7	1.3	1.0	0.7	0.3						
	12000	41.4	574.7	15	12	2.5	2.4	2.1	1.7	1.4	1.0	0.7	0.3						
	14000	39.5	543.7	15	12	2.6	2.6	2.2	1.8	1.5	1.1	0.7	0.4						
8500	16000	37.5	512.7	15	12	2.8	2.7	2.3	2.0	1.6	1.2	0.8	0.4						

REMARKS:

1. Engine Specification fuel flow increased 5% per MIL-M-7700A
2. Endurance data not shown where power required exceeds normal rated power available.

Chart 14-36. Hovering endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 4 of 5)

HOVERING ENDURANCE

STANDARD DAY

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s):Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROX.			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
9000	SL	43.8	689.9	0	0	2.1	2.0	1.7	1.4	1.2	0.9	0.6	0.3						
	2000	44.7	678.4	0	0	2.1	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	4000	45.7	671.1	0	0	2.1	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	6000	46.8	667.2	0	0	2.1	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	8000	45.3	637.2	15	13	2.2	2.2	1.9	1.6	1.3	0.9	0.6	0.3						
	10000	43.3	604.1	15	13	2.4	2.3	2.0	1.7	1.3	1.0	0.7	0.3						
	12000	41.4	574.7	15	12	2.5	2.4	2.1	1.7	1.4	1.0	0.7	0.3						
9000	14000	39.5	543.7	15	12	2.6	2.6	2.2	1.8	1.5	1.1	0.7	0.4						
9500	SL	47.1	721.9	0	0	2.0	1.9	1.7	1.4	1.1	0.8	0.6	0.3						
	2000	47.5	707.0	15	15	2.0	2.0	1.7	1.4	1.1	0.8	0.6	0.3						
	4000	47.5	689.8	15	14	2.1	2.0	1.7	1.4	1.2	0.9	0.6	0.3						
	6000	47.1	670.4	15	14	2.1	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	8000	45.3	637.2	15	13	2.2	2.2	1.9	1.6	1.3	0.9	0.6	0.3						
	10000	43.3	604.1	15	13	2.4	2.3	2.0	1.7	1.3	1.0	0.7	0.3						
9500	12000	41.4	574.7	15	12	2.5	2.4	2.1	1.7	1.4	1.0	0.7	0.3						

REMARKS:

1. Engine Specification fuel flow increased 5% per MIL-M-7700A
2. Endurance data not shown where power required exceeds normal rated power available.

Chart 14-36. Hovering endurance chart — 48 foot rotor — T53-L-13 engine (Sheet 5 of 5)

LANDING DISTANCE — FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	−25° C (−13° F)		−5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.				
5000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	10.3	11.				
	14000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	15.4	24.				
	16000	0.0	0.	0.0	0.	0.0	0.	8.9	8.	19.9	69.				
	18000	0.0	0.	0.0	0.	0.0	0.	14.8	22.	24.2	89.				
5000	20000	0.0	0.	0.0	0.	0.0	0.	19.8	69.	29.1	115.				
5500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	11.1	14.				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	16.2	29.				
	14000	0.0	0.	0.0	0.	0.0	0.	10.0	11.	20.7	77.				
	16000	0.0	0.	0.0	0.	0.0	0.	15.5	27.	25.1	100.				
	18000	0.0	0.	0.0	0.	7.0	5.	20.4	76.	30.2	131.				
5500	20000	0.0	0.	0.0	0.	14.3	23.	25.8	103.	37.9	188.				

REMARKS:

1. No wind.
2. Clean configuration.
3. Distance to clear 50 feet are given as zero when the helicopter can hover OGE. When the helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.
4. Ground roll is limited to 30 feet by the skid gear if helicopter cannot hover IGE.
5. Landing distances are not shown above 20,000 feet or cruise ceiling.

Chart 14-37. Landing distance chart — power on — 48 foot rotor — T53-L-13 engine (Sheet 1 of 5)

LANDING DISTANCE – FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	–25° C (–13° F)		–5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.				
6000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	11.3	15.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	16.5	33.				
	12000	0.0	0.	0.0	0.	0.0	0.	10.4	13.	21.0	83.				
	14000	0.0	0.	0.0	0.	0.0	0.	15.8	30.	25.5	108.				
	16000	0.0	0.	0.0	0.	7.7	7.	20.6	81.	30.8	144.				
	18000	0.0	0.	0.0	0.	14.7	26.	26.0	111.	38.7	210.				
6000	20000	0.0	0.	6.8	6.	21.0	83.	34.6	173.	----	----				
6500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	10.9	16.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	16.2	34.				
	10000	0.0	0.	0.0	0.	0.0	0.	10.3	14.	20.9	87.				
	12000	0.0	0.	0.0	0.	0.0	0.	15.6	32.	25.4	114.				
	14000	0.0	0.	0.0	0.	7.5	7.	20.5	85.	30.8	153.				
	16000	0.0	0.	0.0	0.	14.6	28.	25.8	117.	38.6	224.				
	18000	0.0	0.	6.8	6.	20.8	86.	34.1	181.	----	----				
6500	20000	0.0	0.	16.1	34.	29.9	146.	----	----	----	----				

REMARKS:

1. No wind.
2. Clean configuration.
3. Distance to clear 50 feet are given as zero when the helicopter can hover OGE. When the helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.
4. Ground roll is limited to 30 feet by the skid gear if helicopter cannot hover IGE.
5. Landing distances are not shown above 20,000 feet or cruise ceiling.

Chart 14-37. Landing distance chart — power on — 48 foot rotor — T53-L-13 engine (Sheet 2 of 5)

LANDING DISTANCE — FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	−25° C (−13° F)		−5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)	
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.
7000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	10.2	14.
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	15.5	34.
	8000	0.0	0.	0.0	0.	0.0	0.	9.8	13.	20.3	88.
	10000	0.0	0.	0.0	0.	0.0	0.	15.3	33.	25.0	117.
	12000	0.0	0.	0.0	0.	6.8	6.	20.1	86.	30.3	159.
	14000	0.0	0.	0.0	0.	14.0	28.	25.3	120.	38.0	232.
	16000	0.0	0.	5.3	4.	20.2	57.	33.0	182.	----	----
	18000	0.0	0.	15.4	33.	28.7	146.	----	----	----	----
7000	20000	13.0	24.	24.7	85.	----	----	----	----	----	----
7500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	9.2	13.
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	14.7	32.
	6000	0.0	0.	0.0	0.	0.0	0.	8.9	12.	19.4	86.
	8000	0.0	0.	0.0	0.	0.0	0.	14.5	32.	24.1	117.
	10000	0.0	0.	0.0	0.	0.0	0.	19.4	86.	29.3	159.
	12000	0.0	0.	0.0	0.	13.2	26.	24.5	120.	36.5	230.
	14000	0.0	0.	0.0	0.	19.4	56.	31.3	177.	----	----
	16000	0.0	0.	14.3	31.	27.2	141.	----	----	----	----
	18000	11.5	20.	23.3	81.	----	----	----	----	----	----
7500	20000	22.2	74.	----	----	----	----	----	----	----	----

REMARKS:

1. No wind.
2. Clean configuration.
3. Distance to clear 50 feet are given as zero when the helicopter can hover OGE. When the helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.
4. Ground roll is limited to 30 feet by the skid gear if helicopter cannot hover IGE.
5. Landing distances are not shown above 20,000 feet or cruise ceiling.

Chart 14-37. Landing distance chart — power on — 48 foot rotor — T53-L-13 engine (Sheet 3 of 5)

LANDING DISTANCE – FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s):Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.				
8000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	8.4	11.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	13.7	30.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	18.4	54.				
	6000	0.0	0.	0.0	0.	0.0	0.	13.6	29.	23.0	114.				
	8000	0.0	0.	0.0	0.	0.0	0.	18.5	55.	28.0	156.				
	10000	0.0	0.	0.0	0.	12.0	23.	23.4	118.	34.7	222.				
	12000	0.0	0.	0.0	0.	18.2	53.	29.6	170.	----	----				
	14000	0.0	0.	12.7	26.	25.4	133.	----	----	----	----				
	16000	9.2	14.	21.5	74.	----	----	----	----	----	----				
8000	18000	20.0	64.	----	----	----	----	----	----	----	----				
8500	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	12.8	28.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	17.2	50.				
	4000	0.0	0.	0.0	0.	0.0	0.	12.3	26.	21.8	110.				
	6000	0.0	0.	0.0	0.	0.0	0.	17.4	52.	26.5	149.				
	8000	0.0	0.	0.0	0.	10.4	18.	22.1	113.	32.5	209.				
	10000	0.0	0.	0.0	0.	16.7	47.	27.7	160.	43.8	356.				
	12000	0.0	0.	10.5	19.	23.3	122.	----	----	----	----				
	14000	4.9	4.	19.1	62.	----	----	----	----	----	----				
8500	16000	17.3	51.	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Clean configuration.
3. Distance to clear 50 feet are given as zero when the helicopter can hover OGE. When the helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.
4. Ground roll is limited to 30 feet by the skid gear if helicopter cannot hover IGE.
5. Landing distances are not shown above 20,000 feet or cruise ceiling.

Chart 14-37. Landing distance chart — power on — 48 foot rotor — T53-L-13 engine (Sheet 4 of 5)

LANDING DISTANCE — FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	−25° C (−13° F)		−5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)	
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.
9000	S.L.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	16.2	48.
	2000	0.0	0.	0.0	0.	0.0	0.	10.7	21.	20.4	105.
	4000	0.0	0.	0.0	0.	0.0	0.	16.1	47.	24.9	141.
	6000	0.0	0.	0.0	0.	7.9	11.	20.7	107.	30.5	198.
	8000	0.0	0.	4.5	4.	14.9	40.	25.9	151.	39.2	306.
	10000	3.8	3.	7.5	10.	20.9	109.	34.3	242.	----	----
	12000	7.7	11.	16.3	48.	29.6	189.	----	----	----	----
9000	14000	13.9	35.	----	----	----	----	----	----	----	----
9500	S.L.	0.0	0.	0.0	0.	0.0	0.	8.7	14.	19.3	101.
	2000	0.0	0.	0.0	0.	8.7	14.	14.5	40.	23.4	134.
	4000	0.0	0.	8.7	14.	9.8	18.	19.3	101.	28.4	184.
	6000	8.7	14.	10.0	19.	12.8	31.	24.3	142.	35.6	271.
	8000	10.4	20.	11.5	25.	19.0	69.	30.9	211.	----	----
	10000	12.1	28.	13.9	37.	26.7	166.	----	----	----	----
	12000	14.6	40.	22.6	97.	----	----	----	----	----	----
9500	14000	21.0	84.	----	----	----	----	----	----	----	----

REMARKS:

1. No wind.
2. Clean configuration.
3. Distance to clear 50 feet are given as zero when the helicopter can hover OGE. When the helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.
4. Ground roll is limited to 30 feet by the skid gear if helicopter cannot hover IGE.
5. Landing distances are not shown above 20,000 feet or cruise ceiling.

Chart 14-37. Landing distance chart — power on — 48 foot rotor — T53-L-13 engine (Sheet 5 of 5)

LANDING DISTANCE — FEET

POWER OFF

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	BEST APPROACH IAS	−25° C (−13° F)		−5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
		KNOTS	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL		
5000	S.L.	46	---	--	---	--	---	--	307	30	320	30		
	2000	46	---	--	---	--	314	30	322	30	337	30		
	4000	46	---	--	339	30	331	30	339	30	355	30		
	6000	47	359	30	353	30	348	30	358	30	374	30		
	8000	46	371	30	368	30	368	30	378	30	395	30		
	10000	46	384	30	385	30	388	30	399	30	418	30		
	12000	45	399	30	402	30	409	30	422	30	440	30		
	14000	44	414	30	421	30	431	30	445	30	463	30		
	16000	44	430	30	439	30	452	30	468	30	483	30		
	18000	43	445	30	457	30	471	30	487	30	500	30		
5000	20000	43	459	30	472	30	487	30	501	30	---	--		
5500	S.L.	46	---	--	---	--	348	30	357	30	373	30		
	2000	48	---	--	374	30	366	30	376	30	393	30		
	4000	49	395	30	390	30	386	30	396	30	415	30		
	6000	49	409	30	407	30	407	30	418	30	438	30		
	8000	48	423	30	425	30	429	30	442	30	462	30		
	10000	47	439	30	444	30	452	30	467	30	487	30		
	12000	46	456	30	464	30	475	30	492	30	511	30		
	14000	46	473	30	484	30	498	30	516	30	532	30		
	16000	45	489	30	502	30	519	30	536	30	549	30		
	18000	44	503	30	519	30	535	30	550	30	---	--		
5500	20000	43	514	30	529	30	543	30	554	30	---	--		

REMARKS:

1. No wind.
2. Clean configuration.
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-38. Landing distance chart — power off — 48 foot rotor — T53-L-13 engine (Sheet 1 of 5)

LANDING DISTANCE — FEET
POWER OFF

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s):Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	BEST APPROACH IAS - KNOTS	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
			CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL		
6000	S.L.	52	418	30	409	30	401	30	411	30	431	30		
	2000	52	431	30	426	30	422	30	434	30	454	30		
	4000	51	446	30	444	30	445	30	458	30	479	30		
	6000	50	461	30	464	30	469	30	483	30	505	30		
	8000	49	478	30	484	30	494	30	510	30	532	30		
	10000	49	496	30	506	30	519	30	537	30	557	30		
	12000	48	515	30	527	30	543	30	562	30	580	30		
	14000	47	532	30	547	30	565	30	584	30	597	30		
	16000	46	547	30	564	30	582	30	598	30	---	--		
	18000	45	558	30	575	30	590	30	601	30	---	--		
6000	20000	43	562	30	576	30	586	30	---	--	---	--		
6500	S.L.	54	466	30	460	30	457	30	470	30	492	30		
	2000	53	482	30	480	30	481	30	496	30	519	30		
	4000	52	499	30	501	30	507	30	523	30	547	30		
	6000	52	517	30	523	30	534	30	551	30	575	30		
	8000	51	536	30	546	30	560	30	580	30	602	30		
	10000	50	555	30	569	30	586	30	607	30	626	30		
	12000	49	574	30	590	30	609	30	630	30	645	30		
	14000	48	590	30	608	30	627	30	645	30	---	--		
	16000	47	602	30	620	30	637	30	649	30	---	--		
	18000	45	606	30	622	30	633	30	---	--	---	--		
6500	20000	43	599	30	609	30	---	--	---	--	---	--		

REMARKS:

1. No wind.
2. Clean configuration.
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-38. Landing distance chart — power off — 48 foot rotor — T53-L-13 engine (Sheet 2 of 5)

LANDING DISTANCE — FEET

POWER OFF

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s):Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	BEST APPROACH IAS	−25° C (−13° F)		−5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
		KNOTS	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL		
7000	S.L.	55	517	30	515	30	517	30	532	30	557	30		
	2000	55	535	30	538	30	544	30	561	30	587	30		
	4000	54	554	30	561	30	572	30	591	30	617	30		
	6000	53	574	30	585	30	601	30	621	30	646	30		
	8000	52	595	30	609	30	628	30	650	30	671	30		
	10000	51	615	30	632	30	653	30	675	30	691	30		
	12000	51	632	30	652	30	672	30	692	30	---	--		
	14000	49	645	30	665	30	683	30	697	30	---	--		
	16000	47	651	30	668	30	680	30	---	--	---	--		
	18000	44	644	30	656	30	658	30	---	--	---	--		
7000	20000	42	623	30	625	30	---	--	---	--	---	--		
7500	S.L.	57	570	30	573	30	579	30	597	30	625	30		
	2000	56	590	30	597	30	609	30	629	30	656	30		
	4000	55	612	30	623	30	639	30	661	30	687	30		
	6000	54	633	30	648	30	668	30	692	30	715	30		
	8000	53	654	30	673	30	695	30	718	30	736	30		
	10000	52	673	30	694	30	716	30	738	30	---	--		
	12000	51	688	30	709	30	729	30	745	30	---	--		
	14000	49	695	30	714	30	728	30	---	--	---	--		
	16000	45	690	30	704	30	708	30	---	--	---	--		
7500	18000	45	671	30	675	30	---	--	---	--	---	--		

REMARKS:

1. No wind.
2. Clean configuration.
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-38. Landing distance chart — power off — 48 foot rotor — T53-L-13 engine (Sheet 3 of 5)

LANDING DISTANCE — FEET
POWER OFF

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-13
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	BEST APPROACH IAS	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
		KNOTS	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL		
8000	S.L.	58	625	30	632	30	644	30	665	30	694	30		
	2000	57	647	30	659	30	676	30	699	30	727	30		
	4000	56	670	30	686	30	706	30	732	30	757	30		
	6000	55	693	30	712	30	735	30	761	30	781	30		
	8000	55	713	30	735	30	759	30	782	30	---	--		
	10000	52	730	30	752	30	774	30	792	30	---	--		
	12000	51	739	30	759	30	776	30	785	30	---	--		
	14000	49	736	30	753	30	760	30	---	--	---	--		
	16000	47	719	30	726	30	---	--	---	--	---	--		
8000	18000	44	683	30	---	--	---	--	---	--	---	--		
8500	S.L.	59	682	30	693	30	710	30	735	30	765	30		
	2000	58	706	30	722	30	743	30	770	30	797	30		
	4000	57	730	30	749	30	774	30	801	30	823	30		
	6000	56	752	30	774	30	800	30	825	30	840	30		
	8000	55	770	30	794	30	818	30	839	30	---	--		
	10000	52	782	30	804	30	824	30	836	30	---	--		
	12000	51	782	30	801	30	812	30	---	--	---	--		
	14000	49	769	30	779	30	---	--	---	--	---	--		
8500	16000	47	736	30	---	--	---	--	---	--	---	--		

REMARKS:

1. No wind.
2. Clean configuration.
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-38. Landing distance chart — power off — 48 foot rotor — T53-L-13 engine (Sheet 4 of 5)

LANDING DISTANCE — FEET
POWER OFF

Model(s): UH-1D
Data as of: November, 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-1
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

GROSS WEIGHT	PRESS. ALT	BEST APPROACH IAS KNOTS	−25° C (−13° F)		−5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)	
			CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL
9000	S.L.	60	740	30	756	30	778	30	805	30	835	30
	2000	59	765	30	785	30	810	30	839	30	864	30
	4000	58	789	30	812	30	839	30	867	30	885	30
	6000	57	809	30	834	30	861	30	884	30	---	--
	8000	55	824	30	848	30	871	30	886	30	---	--
	10000	53	828	30	849	30	864	30	---	--	---	--
	12000	51	818	30	832	30	---	--	---	--	---	--
9000	14000	49	790	30	---	--	---	--	---	--	---	--
9500	S.L.	61	800	30	819	30	845	30	876	30	904	30
	2000	60	825	30	848	30	876	30	906	30	928	30
	4000	59	847	30	873	30	901	30	928	30	---	--
	6000	57	864	30	890	30	916	30	935	30	---	--
	8000	55	872	30	896	30	914	30	---	--	---	--
	10000	53	867	30	884	30	890	30	---	--	---	--
9500	12000	51	844	30	850	30	---	--	---	--	---	--

REMARKS:

1. No wind.
2. Clean configuration.
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-38. Landing distance chart — power off — 48 foot rotor — T53-L-12 engine (Sheet 5 of 5)

ALPHABETICAL INDEX

Asterisk (*) preceding Page Number denotes Illustration or Chart

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CHANGE }
No. 3 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *20 September 1966*

Operator's Manual

ARMY MODEL UH-1D HELICOPTER

TM 55-1520-210-10, 28 December 1965, is changed as follows:

1. Remove and insert pages as indicated below:

	Remove pages	Insert pages
Chapter 2, section II	2-33 and 2-34	2-33, 2-34 and 2-34A
Chapter 14, section II		14-10A

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:

To be distributed in accordance with DA Form 12-31 requirements for Operator and Crew Maintenance Instructions for UH-1D aircraft.

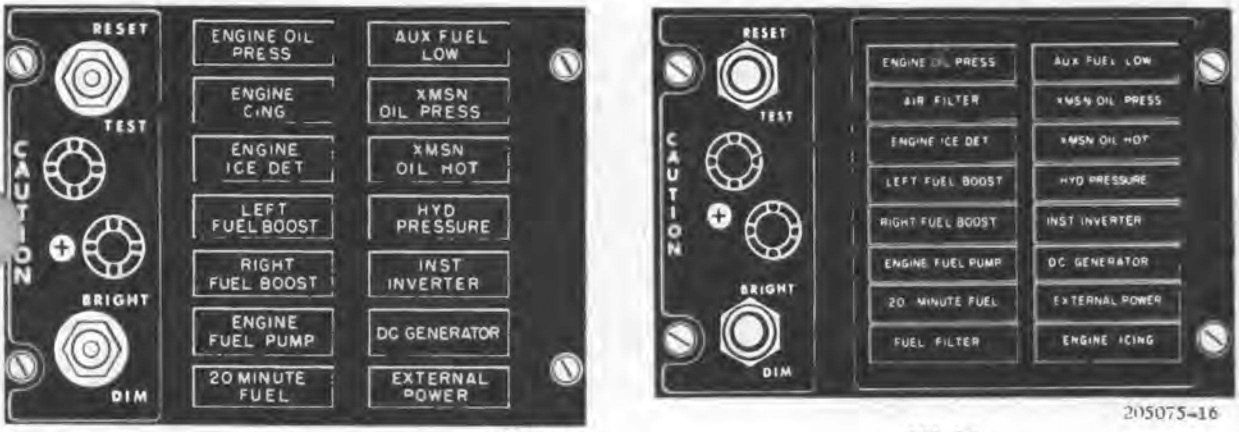
contains only the rotating grip-type throttle, starter switch, and governor rpm increase-decrease switch.

Note

> The collective pitch control system has a built-in friction of eight to ten pounds with manual friction control in full decrease position.

2-97. ***Tail Rotor Pitch Control Pedals.*** The directional (tail rotor pitch) control pedals (see 14, figure 2-4) are similar to and react in the same manner as fixed-wing aircraft rudder pedals. The pedals (through push-pull tubes, bellcranks, quadrant, cables and pulleys, and chain and sprocket) alter the pitch of the tail rotor blades; and thereby provide the means of directional control. This literally allows the helicopter to be pivoted about its own vertical axis at slow or zero airspeeds. Pedal adjusters are located below the floor aft of the cyclic control sticks and forward of the pilot and copilot positions. Adjuster knobs (see 11, figure 2-4) extend above the floor to enable adjustment of pedal distance for individual comfort. The force trim system is connected to the directional controls and is operated by the force trim switch on the cyclic control stick grip. The copilot's directional control pedals, when installed, are identical to the pilot's pedals.

2-98. ***Synchronized Elevator.*** The synchronized elevator (see 15, figure 2-1) is located near the aft end of the tail boom and is connected



204075-19

YUH-1D

205075-16

UH-1D

UH-1D

204075-105

204075-105B

Figure 2-15. Caution panel — typical

by control tubes and mechanical linkage to the fore and aft cyclic control system. Fore and aft movement of the cyclic control stick produces a change in the synchronized elevator attitude, thus increasing controllability and lengthening cg range.

2-99. Landing Gear System. The helicopter's landing gear system is a skid type consisting of two laterally mounted arched crosstubes attached to two formed longitudinal skid tubes. The landing gear structure members are made from formed aluminum alloy tubing with full length steel skid shoes to minimize skid wear. The gear assembly is attached with clamps at four points of the fuselage structure; therefore, gear removal for maintenance can be easily accomplished. Two manually retractable and quickly removable wheel assemblies have been provided to facilitate helicopter ground handling operations.

2-100. *Tail Skid.* A tubular steel tail skid is attached to the lower aft section of the tail boom assembly and acts as a warning to the pilot upon an inadvertent tail-low landing.

2-101. Flight Instruments. The flight instruments installed in the helicopter consist of the pilot's and copilot's airspeed indicators, turn and slip indicator, vertical velocity indicator, and the pilot's and copilot's attitude indicators.

2-102. *Airspeed Indicators*. Two airspeed indicators (see 9, figure 2-5) have been provided; one is mounted on the pilot's section of the instrument panel and the other is mounted on the copilot's section of the instrument panel. The single-scale indicators are calibrated in knots and provide an indicated airspeed of the helicopter at any time during flight, by measuring the difference between impact air pressure from the pitot tube and the static vent. The pitot tube is mounted on the left metal nose section of the cabin. Static air pressure for instrument operation is derived from the two static vents located in the side cabin skins near the forward edges of the crew doors.

2-103. *Turn and Slip Indicator.* The turn and slip indicator (4 MIN TURN) (see 39, figure 2-5) is controlled by an electrically actuated gyro. The instrument has a needle (turn indicator) and a ball (slip indicator). Although the needle and ball are combined in one instrument and are normally read and interpreted together, each has its own specific function and operates independently of the other. The ball indicates when the helicopter is in directional balance, either in a turn or in straight and level flight. In the event of yawing or slipping by the helicopter, the ball will be off center. The needle indicates in which direction and at what rate the helicopter is turning. The electrical circuit is supplied power by the 28-volt DC essential bus and is protected by TURN & SLIP IND circuit breaker on the DC circuit breaker panel (see figure 2-12).

2-104. *Vertical Velocity Indicator.* Two vertical velocity (rate of climb) indicators (see 20, figure 2-5) (one for pilot and one for copilot) are front-mounted on the instrument panel. These indicators register ascent and descent of the helicopter in feet per minute. The instruments are actuated by the rate of atmospheric pressure change and are vented to the static air system.

2-104A. *Altimeter.* The altimeter (ALT) furnishes direct readings of height above sea level and is actuated by the pitot static system. UH-1D helicopters are equipped with two altimeters, one for the pilot and one for the copilot.

Caution

> Due to forward velocities encountered in flight, altimeter readings as shown on Chart 14-2A, Chapter 14 must be utilized.

2-105. *Pilot's Attitude Indicator*. The pilot's attitude indicator is located on the pilot's section of the instrument panel (see 10, figure 2-5). This indicator provides the pilot with a visual indication of the pitch and roll attitude of the helicopter in relation to the earth's horizontal plane. The attitude indicator system is operated by three-phase 115-volt AC electrical power, supplied by the inverter, and is protected by PILOT ATTD circuit breakers on the AC circuit breaker panel (see figure 2-13). Integral lighting, operated by 28-volt DC from the essential bus, is incorporated in the indicator. An OFF warning flag in the indicator is exposed when electrical power is removed from the system; however, the OFF flag will not indicate internal system failure which may occur in the control or indicator. The flag disappears approximately two minutes after electrical power is supplied to the control.

2-106. The attitude indicator has been specifically designed for the flight characteristics of helicopters by incorporating an electrical trim in the roll axis in addition to the standard pitch trim. Degrees of pitch and roll are indicated by a universally mounted sphere. The horizon is represented as a white bar on the sphere; horizontal markings indicate the degree of dive or climb; while bank (roll) angles are read from the semicircular scale located on the upper half of the indicator face.

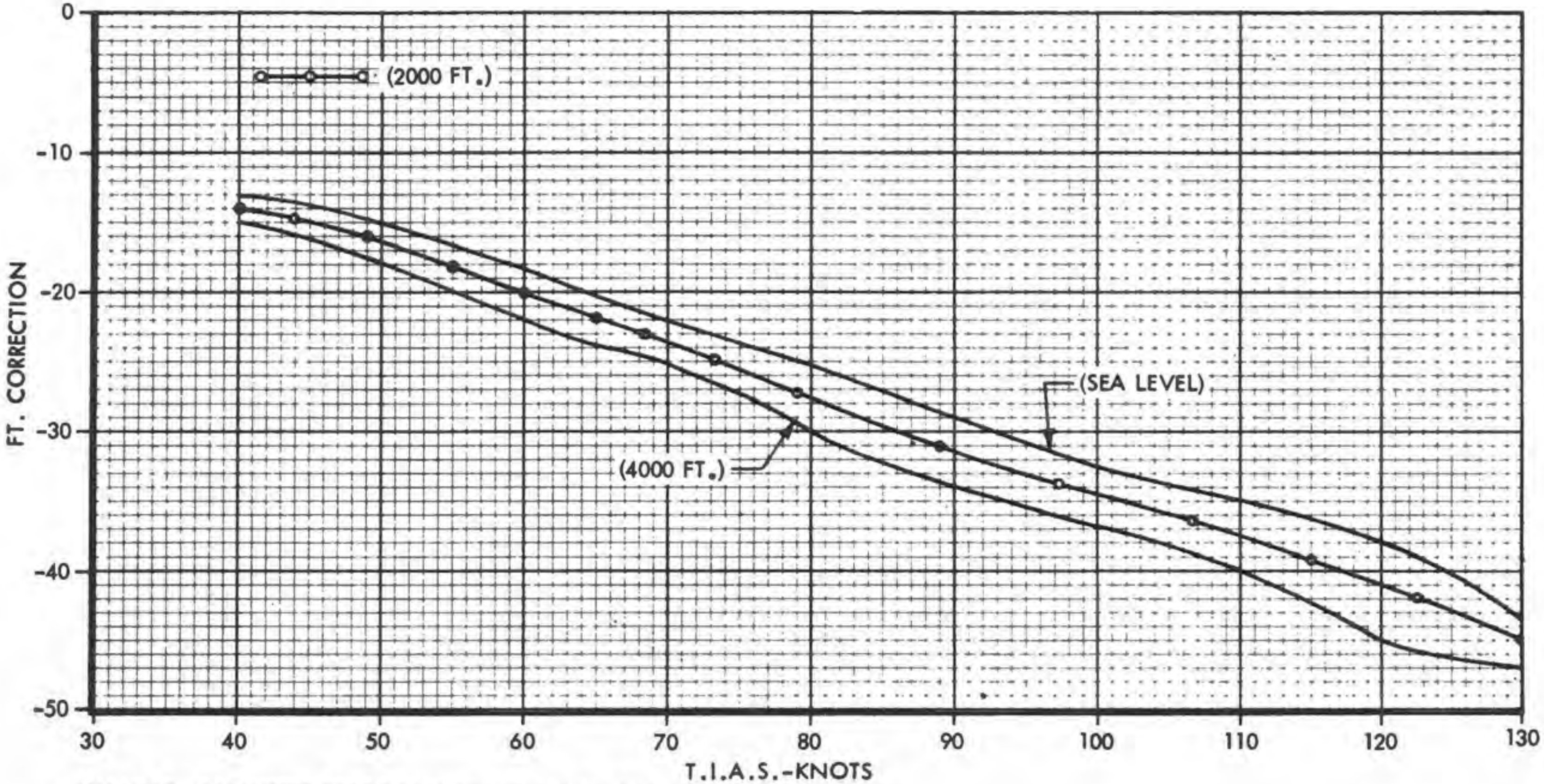
2-107. The pitch trim knob, located on the lower right corner of the indicator, is adjusted

MODEL: UH-1D 48 FT.

CONDITION: CRUISE FLT

DATA AS OF: AUG 1966

DATA BASIS: 81:JAB:eh 625



EXAMPLE: ALTIMETER READS 2000 FT. AT 120 KNOTS.
ACTUAL 2041 FT.

CHART 14-2A ALTIMETER CORRECTION TABLE
UH-1D (48 FT. ROTOR)

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *13 June 1966*

OPERATOR'S MANUAL
ARMY MODEL UH-1D HELICOPTER

TM 55-1520-210-10, 28 December 1965, is changed as follows:

		Remove pages:	Remove pages:
Chapter 1	Section I	1-1 and 1-2	1-1 and 1-2
Chapter 2	Section II	2-3 thru 2-14	2-3 thru 2-14
		2-23 thru 2-28	2-23 thru 2-28
			2-32A
		2-33 and 2-34	2-33 and 2-34
		2-37 and 2-38	2-37 thru 2-38A
		2-41 and 2-42	2-41 and 2-42
Chapter 3	Sections I, II	3-1 and 3-2	3-1 and 3-2
		3-5 thru 3-8	3-5 thru 3-8
		3-13 and 3-14	3-13 and 3-14
Chapter 4	Sections II, IV	4-3 and 4-4	4-3 and 4-4
	Sections V, VI	4-7 and 4-8	4-7 and 4-8
	Section X	4-11 and 4-12	4-11 and 4-12
Chapter 5	Sections I, II	5-1 thru 5-6	5-1 thru 5-6
	Sections II, III	5-9 thru 5-12	5-9 thru 5-12
			5-22A
		5-23 thru 5-26	5-23 thru 5-26A
	Section VI	5-31 thru 5-38	5-31 thru 5-38
Chapter 6	Sections I, II, III	6-1 thru 6-4	6-1 thru 6-4
	Sections VII, X	6-17 thru 6-24	6-17 thru 6-24
Chapter 7	Sections I, II	7-1 thru 7-8	7-1 thru 7-8
		7-11 and 7-12	7-11 and 7-12
Chapter 8	Sections I, II, III	8-1 and 8-2	8-1 and 8-2
Chapter 9	Sections I, II	9-1 and 9-2	9-1 and 9-2
Chapter 10	Section II	10-3 thru 10-6	10-3 thru 10-6
	Section III	10-9 thru 10-18	10-9 thru 10-18
Chapter 11	Sections I, II	11-1 and 11-2	11-1 and 11-2
Chapter 12	Sections III, IV	12-3 and 12-4	12-3 and 12-4
		12-27 and 12-28	12-27 and 12-28
Chapter 13	Sections I, II, III, IV, V	13-1 thru 13-8	13-1 thru 13-8
Chapter 14	Sections I, II	14-1 thru 14-4	14-1 thru 14-4
		14-73 thru 14-134	14-73 thru 14-134
Index		1 thru 10	1 thru 10

Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-31 requirements for Operators Instructions for UH-1 aircraft.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1966—204448/303

CHAPTER 1

INTRODUCTION

Section I Scope

IMPORTANT

In order to obtain complete information and derive maximum benefits from this manual it is necessary to read this chapter carefully and thoroughly.

1-1. Purpose. This manual, issued expressly for operators, is an official document for Army Models YUH-1D and UH-1D helicopters. Serial numbers of the applicable helicopters are as follows:

ARMY MODEL	SERIAL NO.
YUH-1D	60-6028 through 60-6034
UH-1D	62-2106 through 62-2113
	62-12351 through 62-12372
	63-8739 through 63-8859
	63-12956 through 63-13002
	64-13492 through 64-13901
	65-9565 through 65-10135
	65-12773 through 65-12776
	65-12847 through 65-12852
	65-12857 through 65-12895
	66-746 and subsequent

The purpose of this manual is to supply you with the latest information and performance data derived from flight test programs and operational experience. The study and use of this manual will enable you to perform the assigned duties and missions with maximum efficiency and safety.

1-2. Your ability and experience are recognized. It is not the function of this manual to teach the pilot how to fly; basic flight principals and elementary instructions are not included. The contents of this manual will provide you with a general knowledge of Army Models YUH-1D and UH-1D helicopters, their flight characteristics and specific normal and emergency operating procedures.

1-3. Reports necessary to comply with the Army Safety Program are described in detail in AR 385-40.

Note

Do not destroy any page in this manual unless the data contained thereon has been replaced, superseded, or included in the manual by change or revision.

1-4. Appendix I. This appendix consists of a list of references applicable and available to the operator. The list includes publications directly applicable to the Operator's manual. All references called out in the text are reflected in this appendix.

1-5. Appendix II. This appendix consists of a page titled Appendix II, Maintenance Allocation Chart, and references the Maintenance Allocation Chart contained in TM 55-1520-210-20.

1-6. Appendix III. This appendix consists of a page titled Appendix III, Aircraft Inventory Master Guide, and references Appendix III, TM 55-1520-210-20.

1-7. Appendix IV. This appendix consists of a page titled, Appendix IV Operator's and Crewmember's Checklist. The checklist contains normal and emergency procedures to be performed by the pilot (and/or crewmember). The applicable checklist is not presented in this manual but is printed as a separate publication.

1-8. Index. The index lists, in alphabetical order every important subject under the topic which may be of significance to the operator. This listing is not a repetition of paragraph titles, but an extensive listing of subjects which will aid the operator in his use of the manual.

Section II — General

1-9. Scope. The contents of this manual are arranged under chapters and sections as indicated in the Table of Contents. A brief description of each chapter is provided in Section I of the applicable chapters.

1-10. Distribution and Revision System. a. Distribution, revision, and mandatory requirements are accomplished in accordance with AR-310-1.

b. Authorization for issue is accomplished in accordance with AR 310-3.

c. Notes, cautions, and warnings shall be used to emphasize important and critical instructions and shall be used for the following conditions:

Note

> An operating procedure, condition, etc. which must be emphasized.

Caution

> An operating procedure, practice, etc., which, if not strictly observed, will result in damage to or destruction of equipment.

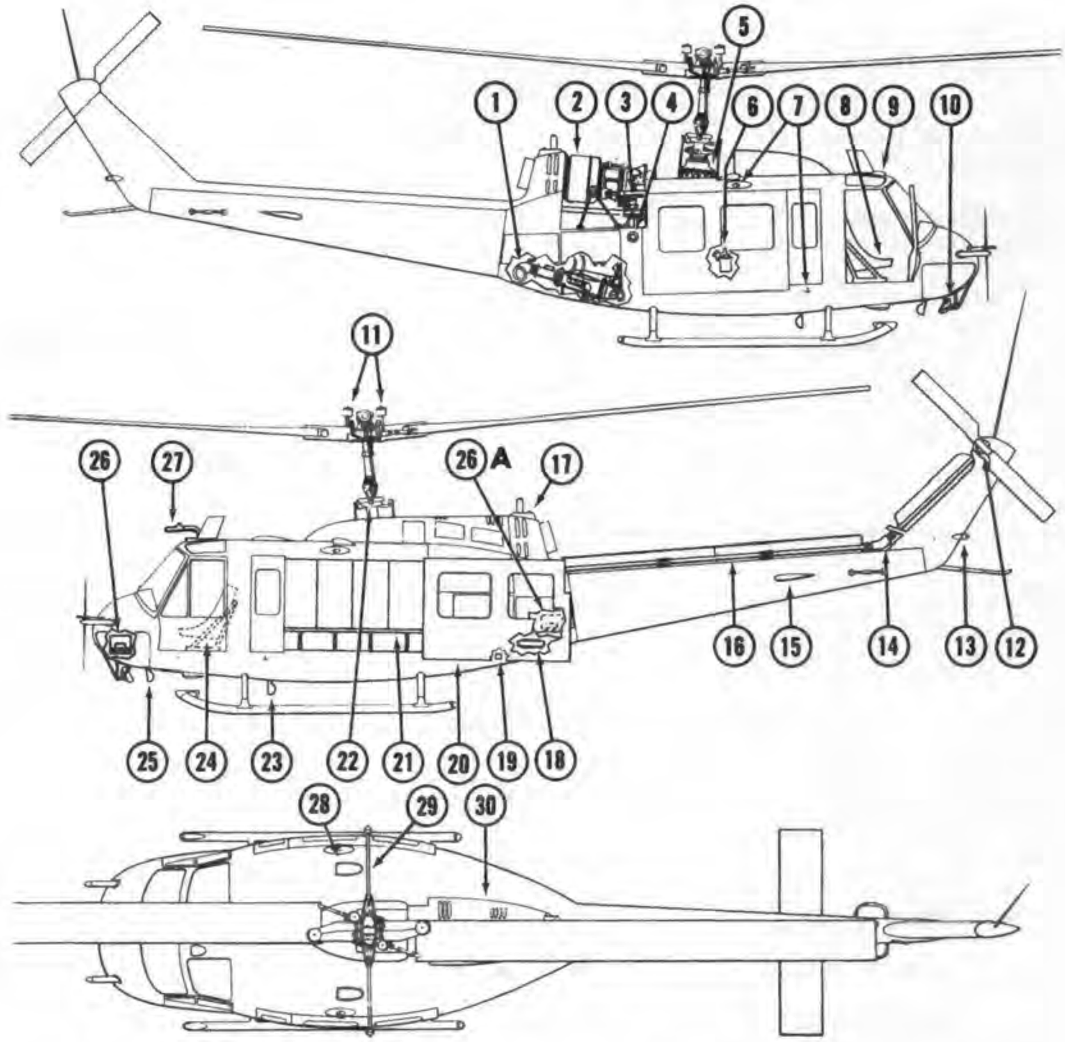
Warning

> An operating procedure, practice, etc., which if not correctly followed, will result in personal injury or loss of life.

1-11. Definitions. Refer to AR 310-3.

1-12. Reporting of Recommendations and Comments. The direct reporting of errors, omissions, and recommendations for improving this Equipment Manual by the individual user is authorized and encouraged. DA Form 2028 will be used for reporting these improvements. This form may be completed using pencil, pen or typewriter. DA Form 2028 will be completed by the individual user and forwarded directly to: Commanding General, USAAVCOM, P. O. Box 209, Main Office, St. Louis, Mo. 63166.

1-13. Revisions to this manual shall be published when necessary to add, delete, revise, or change. Frequency of revisions will be based on factual data accumulated as a result of maintenance experience. Data, will be gathered by field studies, from equipment improvement recommendations, and from any other communications pertaining to the manual and its requirements.



1. Heating Burner and Blower Unit
2. Engine
3. Oil Tank Filler
4. Fuel Tank Filler
5. Transmission
6. Hydraulic Reservoir
7. Forward Navigation Lights (4)
8. Pilot's Station
9. Forward Cabin Ventilator (2)
10. Cargo Suspension Mirror
11. Collective Counterweights (44 Ft Rotor Only)
12. Tail Rotor (90°) Gear Box
13. Aft Navigation Light
14. Tail Rotor Intermediate (45°) Gear Box
15. Synchronized Elevator
16. Tail Rotor Drive Shaft
17. Anti-Collision Light
18. Oil Cooler
19. External Power Receptacle
20. Cargo-Passenger Door
21. Passenger Seats Installed
22. Swashplate Assembly
23. Landing Light
24. Copilot's Station
25. Search Light
26. Battery

26A. Alternate Battery Location (Armor Protection Kit)

27. Pitot Tube
28. Aft Cabin Ventilators (2)
29. Stabilizer Bar
30. Engine Cowling

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Figure 2-1. General arrangement diagram

Table 2-1. Principal dimensions

LENGTH:	44 FOOT ROTOR	48 FOOT ROTOR
Overall (main rotor fore and aft and tail rotor horizontal)	53 ft. 1.1 in.	57 ft. 1.1 in.
Overall (main rotor fore and aft and tail rotor vertical) to end of tail skid	50 ft. 2.35 in.	54 ft. 1.92 in.
Nose of cabin to aft end of vertical fin	39 ft. 5.09 in.	41 ft. 11.15 in.
Nose of cabin to aft end of tail rotor (rotor horizontal)	42 ft. 10.1 in.	44 ft. 10.1 in.
Nose of cabin to center line of main rotor	11 ft. 8.66 in.	11 ft. 8.66 in.
Skid gear	12 ft. 2.0 in	12 ft. 2.0 in.
WIDTH:		
Synchronized elevator	9 ft 4.3 in.	9 ft. 4.3 in.
Skid Gear	8 ft. 6.6 in.	8 ft. 6.6 in.
Stabilizer bar	9 ft. 0.4 in.	9 ft. 0.4 in.
HEIGHT: (To static ground line.)		
Tip of main rotor forward blade:		
Secured aft	17 ft. 2.5 in.	17 ft. 1.49 in.
Pressed down forward	7 ft. 7.0 in.	7 ft. 0.69 in.
Top tip of tail rotor vertical position	14 ft. 3.75 in.	14 ft. 8.20 in.
Top of stabilizer Chinese weights	13 ft. 4.0 in.	13 ft. 4.0 in.
Top of cabin	7 ft. 8.4 in.	7 ft. 8.4 in.
Bottom of cabin	1 ft. 3.0 in.	1 ft. 3.48 in.
Tail rotor clearance (ground to tip, rotor turning)	5 ft. 9.75 in.	5 ft. 11.5 in.
Tail skid to ground	4. ft. 5.0 in.	4 ft. 9.0 in.
DIAMETER (Swept circle):	4 ft. 5.0 in.	4 ft. 9.0 in.
Main rotor	44 ft. 3.2 in.	48 ft. 3.2 in.
Tail rotor	8 ft. 6.0 in.	8 ft. 6.0 in.
Stabilizer bar	9 ft. 0.4 in.	9 ft. 0.4 in.
Turning Radius		34 ft. 0.4 in.

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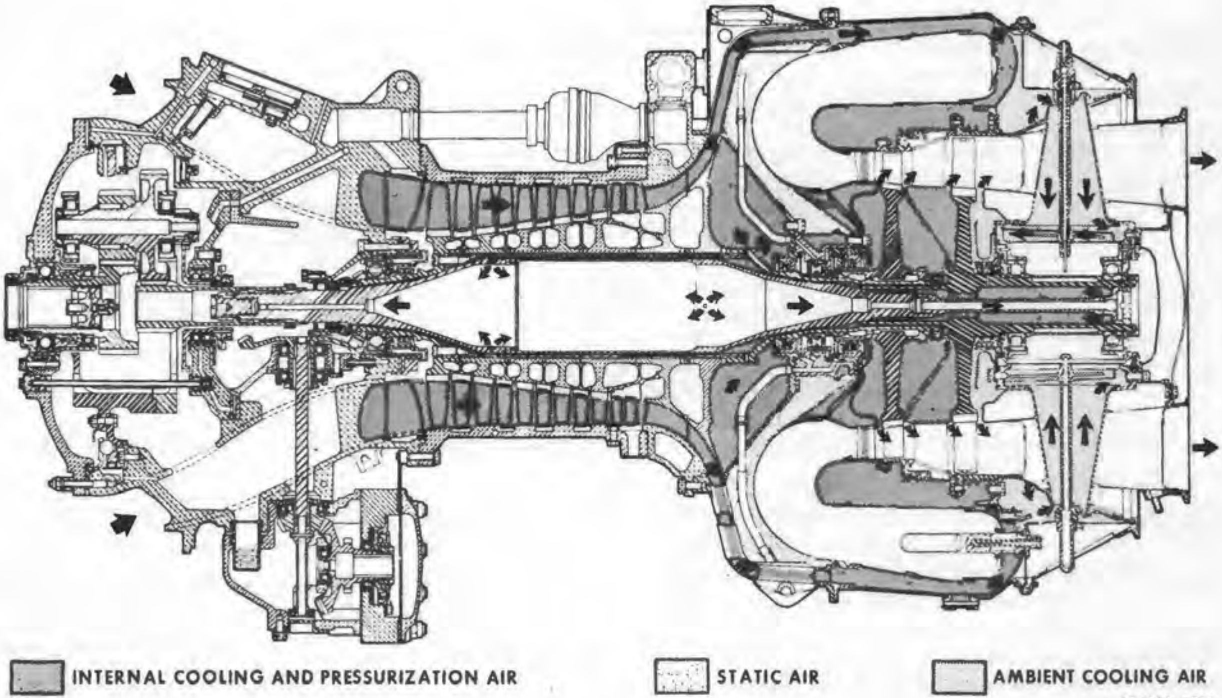

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Figure 2–2. Engine installation and engine airflow

Table 2-2. Comparison of T53-L-9, -9A and -11 engines

	T53-L-9	T53-L-9A	T53-L-11
*Power Rating in Shaft hp (min)			
Take-off	1100	1100	1100
Military	1000	1000	1000
Normal	900	900	900
75% Normal	675	675	675
*Fuel Consumption in lbs/hr			
Take-off	750.2	750.2	750.2
Military	690	690	690
Normal	631.8	631.8	631.8
75% Normal	514.4	514.4	514.4
JP-5 Fuel Use	***Emergency	***Emergency	Alternate
Dry Weight	485 lbs	490 lbs	505 lbs
Ignition Nozzles	5	5	2
Combustor	Scoops Coated	Scoops Coated	Scoopless Uncoated
Bleed Air Extraction Point	Compressor	Diffuser	Diffuser
Fuel Control Assembly (connection to interstage airbleed assembly)	No	No	Yes
Interstage Airbleed System (Acceleration)	Yes	Yes	**Yes
Acceleration - 60 to 90% nI	5 sec (max)	5 sec (max)	4 sec (max)

*Horsepower and Fuel Consumption ratings are based on sea level standard day conditions (plus 59°F, 29.92 inches Hg).

**Also responds to transient speed changes in operating range.

***Grade JP-5 as alternate only after incorporation of the Scoopless Combustor.

-9A engines) or two (T-53-L-11 engine) igniter nozzle assemblies. Two igniter plugs initiate the flame. After combustion occurs and the ignition system is de-energized, the solenoid valve shuts off the starting fuel flow. Main fuel is delivered to the main fuel system when the engine rpm is great enough to deliver minimum fuel pressure. Main fuel flow is maintained as the engine flame is propagated. After an engine shutdown, a pressure-actuated valve automatically drains any remaining unburned fuel from the combustion chamber. Engine fuel control is accomplished by a hydro-mechanical type fuel control system consisting of a fuel regulator assembly and overspeed governor assembly. An emergency fuel metering system is also provided as an integral part of the fuel control system. The fuel control regulator assembly supplies metered fuel to the solenoid valve and to the engine starting and main fuel manifolds by means of a fuel metering pump. A main governor, incorporated in the regulator assembly, determines the rate at which metered fuel is supplied to the engine in relation to the gas producer turbine speed (nI), altitude, compressor inlet temperature, and manual throttle selection. The regulator assembly limits engine fuel flow to the maximum permissible rate under all operating conditions. The overspeed governor assembly is mounted on the fuel control regulator assembly and functions to reduce the fuel flow when power turbine speed (nII) exceeds the selected rpm.

2-15. Fuel Control System Operation. Fuel flow control is accomplished by operation of switches located on the pedestal-mounted ENGINE control panel (see figure 2-3). The panel contains two FUEL switches (MAIN ON/OFF and START ON/OFF), two INT FUEL TRANS PUMP switches (LEFT/OFF and RIGHT/OFF), and a GOV AUTO/EMER switch. The engine fuel and power control system permits the pilot to obtain maximum performance from the engine with a minimum of attention.

2-16. Emergency Fuel Flow. The switchover to emergency fuel flow is accomplished by retarding the power control (throttle) to flight idle, moving the GOV AUTO/EMER switch on the ENGINE panel to EMER, and then advancing the power control to operational rpm. The emergency control manually meters fuel to the engine without the incorporation of any automatic features. It is possible to fly the helicopter by uitlizing smooth, coordinated use of the rotating power control. When operating on emergency control, it is possible to overspeed the gas producer turbine and the power turbine, and to exceed redline tailpipe temperature.

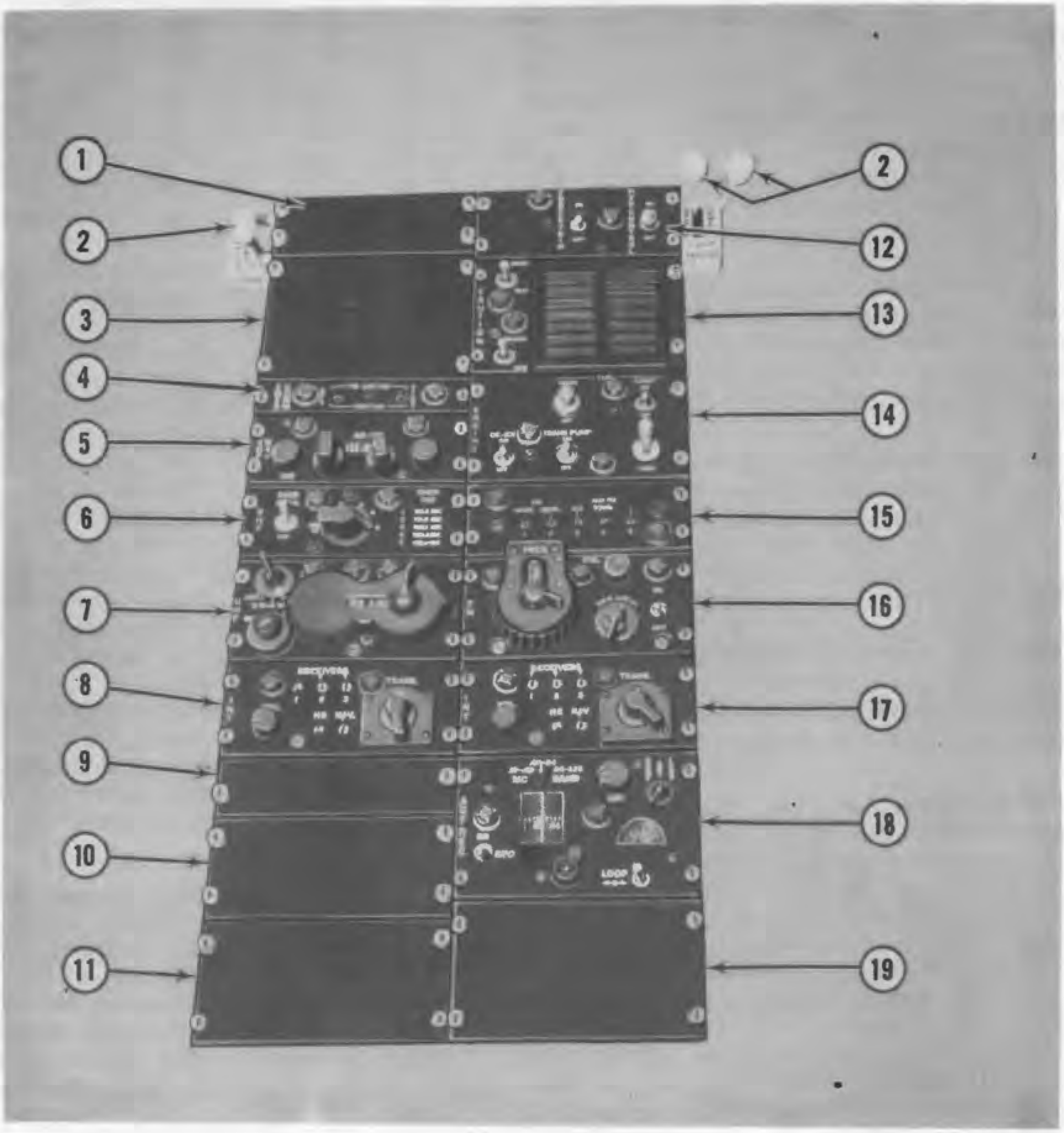
(Deleted)

2-17. Power Control (Throttle). The rotating grip-type power controls (see 28, figure 2-4) are located on the collective pitch control levers (pilot and copilot). The power control is a simple single throttle grip which is used for starting engine, adjusting to flight idle, autorotational landings, and in full decrease serves as idle cutoff. The throttle grip is rotated to the left to increase or to the right to decrease power. Friction can be induced into the throttle grip by rotating the ring at the upper end of the throttle grip. Rotating the ring to the left increases friction in the system and prevents grip creepage during long flights. A 28-volt DC powered solenoid-operated idle detent is incorporated in the throttle to prevent inadvertent closing of the throttle during flight or ground run. To bypass the idle detent, depress and hold the engine idle release switch until gas producer speed of 40 to 44 percent rpm is obtained, then release switch and close throttle. The idle detent limits only the decrease rotation of the rotating grip. Under normal flight conditions the power plant free power turbine rpm speed is controlled by the power turbine speed governor. The gas producer speed governor safeguards the engine against overloading: and on acceleration and deceleration, the control prevents engine damage or combustion blowout due to sudden changes in power selection made at any rate and in any sequence.

2-18. Starter — Ignition System. Combination starter-ignition trigger-actuated snap switches (see 31, figure 2-4) (pilot and copilot) are mounted on the undersides of the collective pitch control lever switch boxes. Both the starter and ignition unit circuits are wired to these trigger switches, as the engine ignition will only be required while accomplishing engine starts.

2-19. Power Supply. The circuits are supplied power from the 28-volt DC essential bus. The starter circuit is actuated when the STARTER/GEN switch is in START position and the trigger switch (see 31, figure 2-4) is pulled. The ignition circuit is actuated when the FUEL MAIN ON/OFF switch on the ENGINE control panel is ON and the trigger switch is pulled.

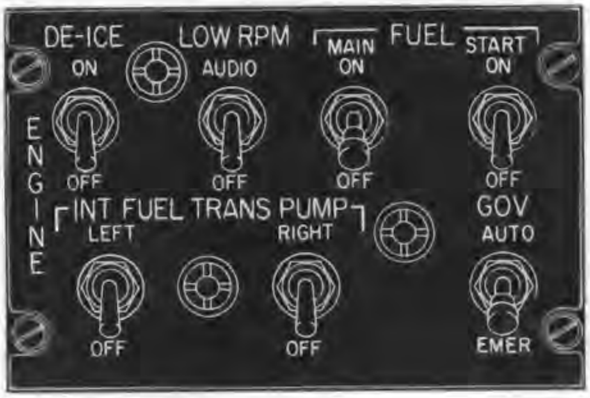
2-20. Governor RPM Switch. The GOV RPM INCR/DECR switch is mounted in a switch box attached to the end of the collective pitch control lever (figure 2-4). The switch (30) is a



1.	Cover Plate	11.	Cover Plate
2.	Manual Heater Controls	12.	Hydraulic Control Panel
3.	Cover Plate	13.	Caution Panel
4.	Emergency Communication Switch Panel	14.	Engine Control Panel
5.	VHF Navigation Control Panel	15.	Switch Panel Assembly
6.	VHF Emergency Transmitter Control Panel	16.	FM Control Panel
7.	UHF Transceiver Control Panel	17.	Signal Distribution Panel
8.	Signal Distribution Panel	18.	ADF Receiver Panel
9.	Cover Plate	19.	Cover Plate
10.	Cover Plate		

205075-7A

Figure 2-3. Pedestal panel installation — typical (Sheet 1 of 2) three-position momentary type and is held up in INCR position to increase the power turbine (nII) speed or down to DECR position to decrease the power turbine (nII) speed. Regulated power turbine speed may be adjusted in flight, through the operating range of 6000 to 6700 rpm, by movement of the switch as required. Electrical power for circuit operation is supplied by the 28-volt DC essential bus.



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205075-19

205075-22

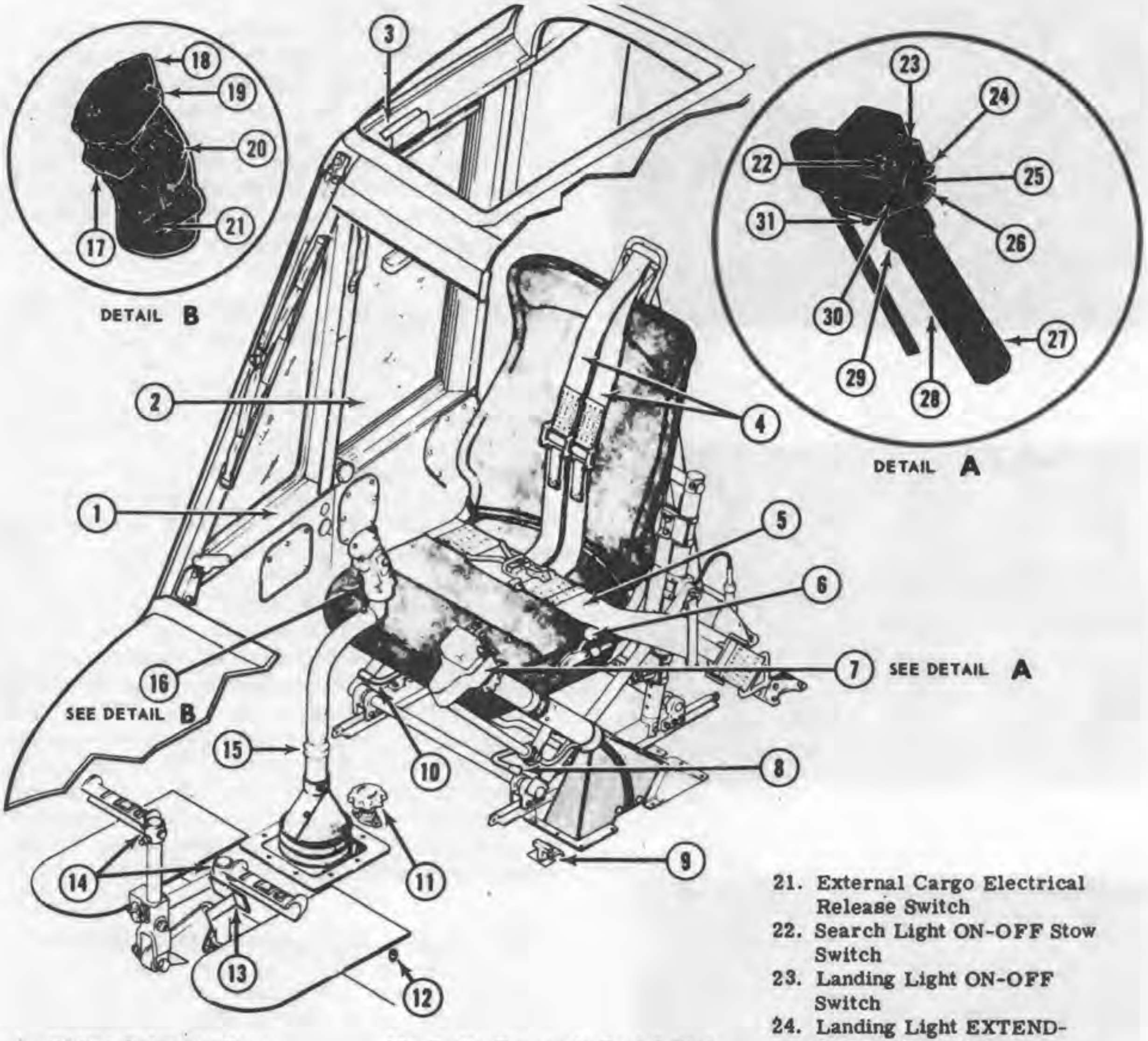
Figure 2-3. Pedestal panel installation — typical (Sheet 2 of 2)

2-21. Droop Compensator. A droop compensator is installed on the governor control to maintain nII speed, as power is increased, to the rpm value selected by the pilot. (Refer to Chapter 9). Governor droop should not be confused with rpm variations due to the acceleration-deceleration limiters (transient droop), or exceeding maximum power limits. Rapid movements of the collective control stick may require power changes at a rate in excess of the capabilities of the engine.

2-22. Engine Idle Release Switch. The ENGINE IDLE REL switch (see 26, figure 2-4) is pushbutton momentary-on type switch mounted in a switch box attached to the end of the collective pitch control lever. The pushbutton switch operates on electrical solenoid with a retractable plunger. The solenoid is mounted so that the plunger acts as a stop in the power control system linkage. The stop prevents the pilot from accidentally retarding the power control beyond the flight idle position. This acts as a safety feature by preventing inadvertent engine shutdown. The switch need not be depressed when performing an engine start or runup; however, the switch must be depressed when accomplishing an engine shutdown or when it is desired to retard the power control below the flight idle position. Electrical power for circuit operation is supplied by the 28-volt DC essential bus. Circuit protection is provided by IDLE STOP REL circuit breaker on the DC circuit breaker panel (see figure 2-12).

2-23. Engine Instruments and Indicators. All engine instruments and indicators are mounted in the instrument panel (see figure 2-5). The engine instruments and indicators consist of the following: torquemeter, exhaust gas temperature indicator, dual tachometer, gas producer tachometer indicator, engine oil pressure indicator, engine oil pressure low caution light, engine oil temperature indicator, fuel quantity indicator, fuel gage test switch, fuel quantity caution light, fuel pressure indicator, and engine fuel pump caution light.

2-24. *Torquemeter.* The pressure torquemeter indicator (see 24, figure 2-5) is located in the center area of the instrument panel. This indicator is connected to a transmitter which is part of the engine oil system. The torquemeter indicates torque pressure in pounds per square inch readings of torque imposed upon the engine output shaft. The torquemeter electrical



1. Pilot's Entrance Door
2. Sliding Window Panel
3. Hand Hold
4. Shoulder Harness
5. Safety Belt
6. Shoulder Harness Lock-Unlock Control
7. Collective Pitch Control Lever
8. Seat Adjustment Fore and Aft
9. Collective Pitch Down Lock
10. Seat Adjustment Vertical
11. Directional control Pedal Adjuster
12. Radio Transmit Foot Switch
13. External Cargo Mechanical Release
14. Directional Control Pedals
15. Cyclic Control Friction Adjuster
16. Cyclic Control Stick
17. Radio Transmit, ICS Trigger Switch
18. ASW-12 Directional Switch
19. Force Trim Switch
20. Armament Fire Control Switch
21. External Cargo Electrical Release Switch
22. Search Light ON-OFF Stow Switch
23. Landing Light ON-OFF Switch
24. Landing Light EXTEND-RETRACT Switch
25. Search Light EXTEND-RETRACT LEFT-RIGHT Control Switch
26. Engine Idle Release Switch
27. Collective Pitch Control Friction Adjuster
28. Throttle Twist Grip
29. Throttle Friction Adjuster
30. Governor RPM INCREASE-DECREASE Switch
31. Starter Ignition Trigger Switch

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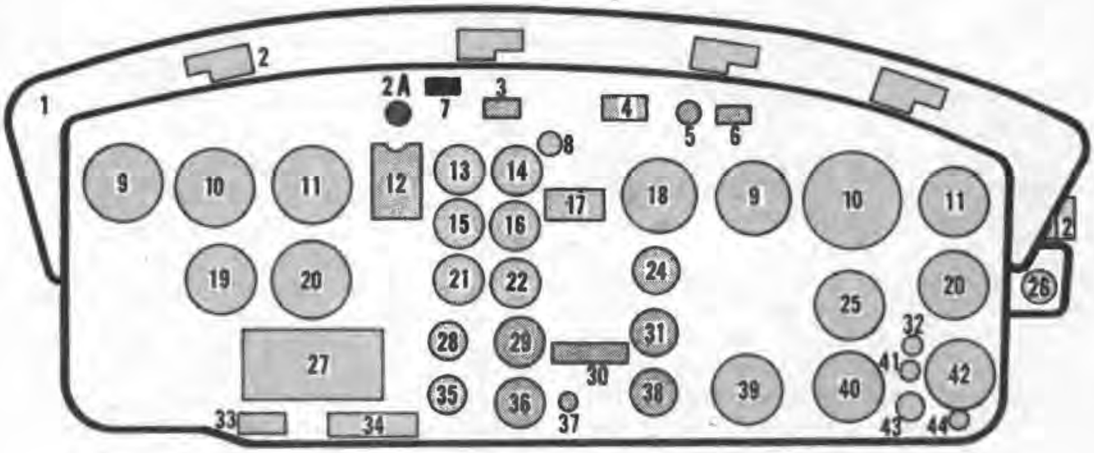
Figure 2-4. Pilot's station — typical



1. Glare Shield
2. Secondary Lights
2A. Engine Air Filter Light
3. Master Caution
4. RPM Warning Light
5. Fire Detector Test Switch
6. Fire Warning Indicator Light
7. Radio Call Designator
8. Fuel Gage Test Switch
9. Airspeed Indicator
10. Attitude Indicator
11. Altimeter Indicator
12. Compass Correction Card Holder
13. Fuel Pressure Indicator
14. Fuel Quantity Indicator
15. Engine Oil Pressure Indicator
16. Engine Oil Temperature Indicator
17. Cargo Caution Decal
18. Dual Tachometer
19. Radio Compass Indicator
20. Vertical Velocity Indicator
21. Transmission Oil Pressure Indicator
22. Transmission Oil Temperature Indicator
23. Deleted
24. Torquemeter Indicator
25. Radio Compass Indicator
26. Standby Compass
27. Operating Limits Decal
28. Main Generator Loadmeter
29. DC Voltmeter
30. Engine Caution Decal
31. Gas Producer Tachometer Indicator
32. Marker Beacon Light
33. Engine Installation Decal
34. Transmitter Selector Decal
35. Standby Generator Loadmeter
36. AC Voltmeter
37. Compass Slaving Switch
38. Exhaust Gas Temperature Indicator
39. Turn and Slip Indicator
40. Omni Indicator
41. Marker Beacon Sensing Switch
42. Clock
43. Marker Beacon Volume Control
44. Cargo Release Armed Light

205070-8C

Figure 2-5. Instrument panel — typical

circuit is powered by 28-volt AC and is protected by a circuit breaker labeled TORQUE in the AC circuit breaker panel on the right side of the pedestal (see figure 2-13).

2-25. *Exhaust Gas Temperature Indicator.* The exhaust gas temperature indicator (see 38, figure 2-5) is located in the center area of the instrument panel. The indicator receives temperature indications from the bayonet type thermocouples which are mounted in the forward section of the tailpipe. The temperature indications on the indicator are in degrees centigrade multiplied by 100. Electrical power is not required as the system is self-generating.

2-26. *Dual Tachometer.* The dual tachometer is located in the center area of the instrument panel and indicates both the engine and main rotor rpm (see figure 2-5). The outer scale of the indicator is for power turbine (engine) rpm. Power for operation of the indicators is provided by tachometer generators mounted on the engine and transmission. These systems are self-generating; therefore, an electrical connection to the helicopter's electrical system is not required. Normal operation of the helicopter is evident when the power turbine (engine) and rotor rpm indicator needles are in synchronization.

2-27. *Gas Producer Tachometer Indicator.* The gas producer tachometer indicator is located on the instrument panel in front of the pilot (see 31, figure 2-5). This indicator registers the rpm of the gas producer turbine and is powered by a tachometer generator which is geared to the engine rotor shaft; therefore, a connection to the helicopter's electrical system is not required. The indicator readings are in percent rpm of gas producer turbine speed. The gas producer tachometer, when used in conjunction with the exhaust gas temperature indicator, permits engine power to be accurately set without exceeding engine limitations.

2-28. *Engine Oil Pressure Indicator.* The engine oil pressure indicator is located in the center area of the instrument panel (see 15, figure 2-5). The indicator receives pressure indications from the engine oil pressure transmitter and provides readings in pounds per square inch (psi). Electrical power for oil pressure indicator and transmitter operation is supplied by the 28-volt AC system. Circuit operation is provided by the ENG circuit breaker on the AC circuit breaker panel (see figure 2-13).

2-29. *Engine Oil Pressure Low Caution Light.* The ENGINE OIL PRESS caution light is located on the pedestal-mounted CAUTION panel (see figure 2-15). The light is connected to a low pressure switch which, when pressure drops below a safe limit, closes an electrical circuit, causing the caution light to illuminate. The circuit is supplied power by the 28-volt DC essential bus.

2-30. *Engine Oil Temperature Indicator.* The engine oil temperature indicator is located in the center area of the instrument panel (see 16, figure 2-5). This indicator is connected to an electrical resistance-type thermocouple and indicates the temperature of the engine oil at the engine oil inlet. Electrical power to operate this circuit is supplied by the 28-volt DC essential bus. Circuit protection is provided by the TEMP IND ENG & XMSN circuit breaker on the DC circuit breaker panel (see figure 2-12).

2-31. *Fuel Quantity Indicator.* The fuel quantity indicator is located in the upper center area of the instrument panel (see 14, figure 2-5). This instrument is a transistorized electrical receiver which continuously indicates the quantity of fuel in pounds. The fuel quantity indicator is connected to two capacitor-type fuel transmitters mounted in the interconnected fuel cells (one in the right-hand forward cell and one in the center aft cell). The advantage of this indicator system is that quantity volumes are more correctly indicated and not materially affected by varying temperatures. The indicator readings shall be multiplied by 100 to obtain fuel quantity in pounds. Electric power for operation is supplied by the 115-volt AC system. Circuit protection is provided by the FUEL QTY circuit breaker on the AC circuit breaker panel (see figure 2-13).

2-32. *Fuel Gage Test Switch.* The fuel gage test switch is located above the fuel quantity indicator on the instrument panel. This switch is a pushbutton momentary-on type and functions to provide a means of testing the indicator and circuit for operation. When the switch is depressed and held in, the fuel quantity indicator pointer moves from the actual quantity reading towards a lesser quantity reading. Upon release of the test switch, the indicator needle will return to the actual fuel reading.

2-33. *Fuel Quantity Caution Light.* The TWENTY MINUTE FUEL caution light is located on the pedestal mounted CAUTION panel (see figure 2-15). The light switch assembly is a float switch type and is located in the left-hand fuel cell. The switch functions to close the circuit and illuminates the light when there is approximately enough fuel remaining for 20 minutes flight time at cruise power. Electrical power for circuit operation is supplied by the 28-volt DC essential bus.

2-34. *Fuel Pressure Indicator.* The fuel pressure indicator (see 13, figure 2-5) is located in the upper center area of the instrument panel. This indicator provides pounds per square inch (psi) readings of the fuel as delivered from the tank-mounted fuel boost pumps to the engine driven pump. The fuel pressure indicator is connected to a pressure transmitter, powered by 28-volt AC, which electrically transmits the actual psi fuel pressure reading to the fuel pressure indicator.

2-35. *Engine Fuel Pump Caution Light.* The engine fuel pump caution light is located on the pedestal-mounted CAUTION panel (see figure 2-15). The light is connected electrically to a fuel differential pressure switch at the engine driven dual element fuel pump. (See the fuel system schematic diagram, figure 2-8.) A failure of either engine fuel pressure pump element will cause a differential fuel pressure which is at once sensed by the differential pressure switch thus closing the electrical circuit and illuminating the caution light. When illuminated, the caution light segment wording will read ENGINE FUEL PUMP providing visual indication of an engine driven fuel pump failure. The caution light and pressure switch are supplied power by the 28-volt DC essential bus.

2-35A. ***Chip Detector Warning Light.*** Magnetic inserts are installed in the drain plugs of the transmission sump, the intermediate (42°) tail rotor gear box and the tail rotor (90°) gear box. These plugs provide a means of inspection for metal particles. Indication of particles present is given by the illumination of the CHIP DETECTOR caution light. These plugs can be removed without loss of oil by means of a self-closing spring loaded valve in the drain plug which seats when magnetic insert is removed. CHIP DETECTOR switch on the pedestal panel

"GO NO GO" TAKE-OFF DATA PLACARD

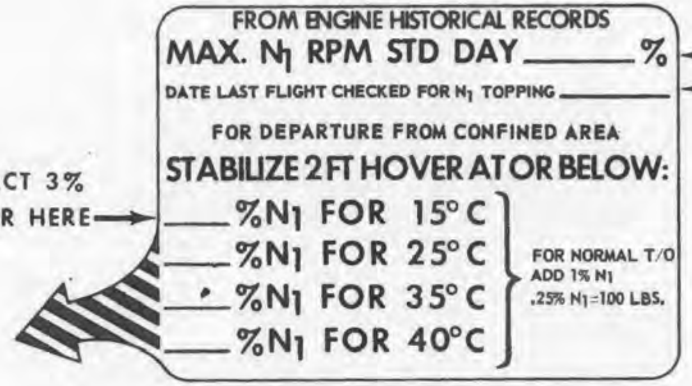
FOR ALL UH-1 SERIES HELICOPTERS WITH LYCOMING T53 SERIES ENGINES

INSTRUCTIONS

① OBTAIN MAXIMUM N_1 FOR STANDARD DAY FROM ENGINE HISTORICAL RECORDS AND ENTER HERE (USE PENCIL)

ENTER DATE AIRCRAFT WAS LAST FLIGHT CHECKED FOR N_1 TOPPING

② FOR N_1 AT 15°C SUBTRACT 3% FROM ① AND ENTER HERE



FROM ENGINE HISTORICAL RECORDS

MAX. N_1 RPM STD DAY ____%

DATE LAST FLIGHT CHECKED FOR N_1 TOPPING ____

FOR DEPARTURE FROM CONFINED AREA

STABILIZE 2 FT HOVER AT OR BELOW:

____%N_1 FOR 15°C
____%N_1 FOR 25°C
____%N_1 FOR 35°C
____%N_1 FOR 40°C

FOR NORMAL T/O ADD 1% N_1
.25% N_1=100 LBS.

③ FOR N_1 AT 25°C SUBTRACT 3.6% FROM ① AND ENTER

④ FOR N_1 AT 35°C SUBTRACT 4.4% FROM ① AND ENTER

⑤ FOR N_1 AT 40°C SUBTRACT 4.8% FROM ① AND ENTER

⑥ CUT OUT PLACARD, PEEL OFF BACK AND APPLY TO INSTRUMENT PANEL SO THAT ARROW POINTS TO N_1 GAUGE.

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Figure 2-5A. "Go No Go" take-off data placard is labeled BOTH, XMSN and TAIL ROTOR. The switch is normally in BOTH position, if the CHIP DETECTOR caution light illuminates RESET to extinguish and move switch to XMSN and TAIL ROTOR to determine the trouble area.

2-36. Rotor System. The rotor system consists of a main rotor, antitorque tail rotor and a rotor system indicator.

2-37. ***Main Rotor.*** The main rotor is a two-bladed, semi-rigid see-saw type employing preconing and underslinging to insure smooth operation. The assemblies consist of two all-metal bonded blades with corrosion and scuff resistant leading edges, blade grips, yoke, mast, stabilizer bar, and rotating controls. Each blade is connected to a common yoke by means of blade grip and pitch change bearings with tension straps to carry centrifugal forces. The rotor assembly is attached to the mast with a cordan type universal joint and secured to the mast with a cap fitting which incorporates provisions for attaching a cable hoist to the helicopter. A stabilizer bar, mounted on the mast in a parallel plane above and at 90 degrees to the main rotor blades, provides the helicopter with an additional amount of stability (see 29, figure 2-1). The stabilizer bar is partially restrained in its movement by hydraulic-type dampers. Blade pitch change is accomplished by movements of the collective pitch control lever (see 7, figure 2-4) and a series of mixing levers terminating at the blade grip. Movement of the collective control lever UP increases the angle of attack of the rotor blades and causes the helicopter to ascend, and movement of the control lever DOWN decreases the angle of attack of the rotor blades, allowing the helicopter to descend. Tilting of the rotor is accomplished by movement of the cyclic control stick (see 16, figure 2-4) which, when moved, results in a corresponding change in the plane of rotation of the rotor. Power to drive the rotor is from the two-stage planetary transmission into which the main rotor is mounted.

2-38. ***Rotor System Indicator.*** The main rotor rpm indicator is part of the dual tachometer (see figure 2-5) and is located on the instrument panel in front of the pilot's station. The rotor rpm reading is indicated on the inner scale markings and the pointer needle is marked with an R. The indicator is powered by a tachometer generator, mounted on and driven by the transmission. The indicator and generator operate independently of the helicopter's electrical system. The tachometer generator is a variable electrical output type. The current output of the generator varies as rpm change. The variable electrical output power from the generator operates the motor in the indicator, thus providing a direct reading of the rotor rpm.

2-39. ***Tail Rotor.*** The tail rotor is a two-bladed, semi-rigid delta-hinged type employing preconing and underslinging. Each blade is connected to a common yoke by means of a grip and pitch change bearing. The blade and yoke assembly is mounted on the tail rotor shaft by means of a delta hinge trunnion to minimize rotor flapping. Blade pitch change is accomplished by movement of the pilot's or copilot's directional control pedals which are connected to a pitch control assembly in the tail rotor (90-degree) gear box. This blade pitch change provides control of torque and change of directional heading. Power to drive the tail rotor is from a take-off on the lower end of the main rotor transmission.

2-40. Transmission System. The transmission (see 5, figure 2-1) is mounted forward of the engine and coupled to the power turbine shaft at the cool end of the engine by means of a short drive shaft. The transmission is basically a reduction gear box functioning to transmit engine power at a reduced rpm to the main rotor and tail rotor. The transmission incorporates a freewheeling unit at the input drive and two-stage planetary gear train. This freewheeling unit provides a quick-disconnect from the engine if a power failure occurs and permits the main rotor and tail rotor to rotate in order to accomplish safe autorotational landings. The tail rotor is powered by a take-off on the lower aft section of the transmission. Accessory mounting pads and drives are included on the transmission for the rotor tachometer generator, hydraulic pump, and the electrical system direct current generator. Quick-disconnect couplings are used on the drive shaft and electrical connections which permit rapid removal or replacement of the transmission as an assembly.

2-41. ***Transmission Oil System.*** Transmission lubrication is accomplished by means of a self-contained pressure oil system, with the oil pump immersed in the wet sump located at the lower end of the transmission unit. Oil specification, grade, and capacity for the transmission are specified in the servicing diagram (see figure 2-9).

2-42. *Transmission Oil Cooler.* A transmission oil cooler is incorporated in the transmission oil system. The transmission oil cooler is attached to the lower end of the engine oil cooler; and the same turbine fan that cools engine oil also functions to cool the transmission oil. Independent thermostatic valves and bypass provisions are a part of the transmission oil cooling system. (See figure 2-6.)

2-43. Transmission Indicators. The transmission indicators provided consist of a transmission, oil pressure indicator, caution light-transmission oil pressure, transmission oil temperature indicator, and caution light-transmission oil temperature.

2-44. *Transmission Oil Pressure Indicator.* The TRANS OIL pressure indicator (see 21, figure 2-5) is located in the center area of the instrument panel. This instrument receives pressure indications from the transmission oil pressure transmitter. Readings on the indicator are provided in pounds per square inch (psi). Electrical power for the TRANS OIL pressure indicator and transmission oil pressure transmitter operation is supplied by the 28-volt AC circuit, and circuit protection is provided by the XMSN circuit breaker on the AC circuit breaker panel (see figure 2-13).

2-45. *Caution Light — Transmission Oil Pressure.* A caution light marked XMSN OIL PRESS is located on the pedestal-mounted CAUTION panel (see figure 2-15). This caution light is electrically connected to a transmission-mounted pressure switch which is actuated by a drop

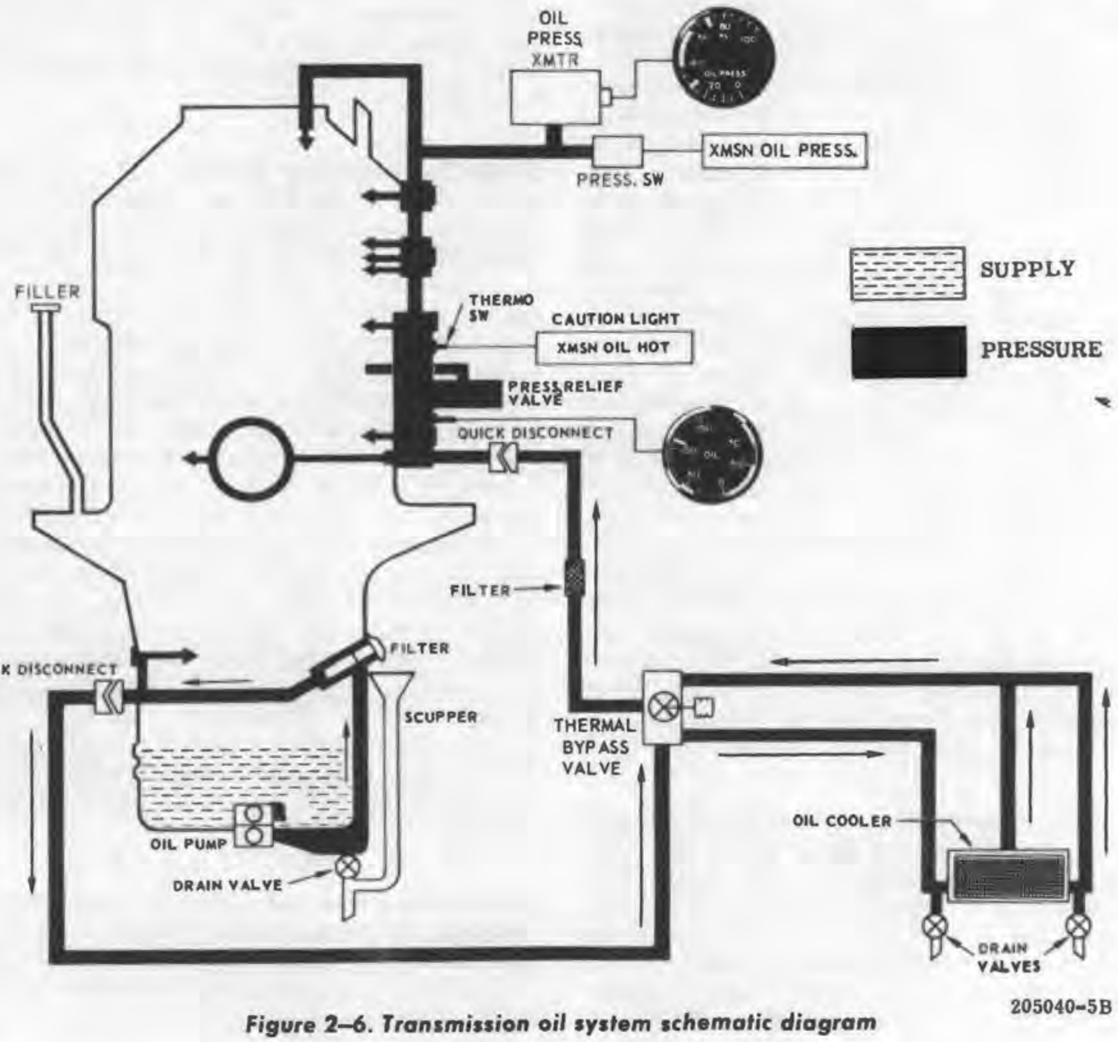

Figure 2–6. Transmission oil system schematic diagram

28-VOLT DC NONESSENTIAL BUS

Nonessential Bus Voltmeter
Heated Blankets
Auxiliary Circuit Breaker Bus

28-VOLT DC ESSENTIAL BUS

Generator and Bus Reset
Main Inverter Power
Inverter Control
Spare Inverter Power
Starter Relay
Ignition System and Igniter Solenoid
Fuel Valve
Fuel Transfer Pump
Fuel Tank Sump Pump
Idle Stop Release
Governor Control
Cargo Hook Release
Fire Detection
Pilot's Windshield Wiper
Copilot's Windshield Wiper
Engine Anti-Ice
Utility Lights
Engine Air Filter (If Installed)

Dome Lights
Force Trim
Armament Circuit
RPM Limit Warning
Hydraulic Control
Instrument Secondary Lights
Turn and Slip Indicator
Instrument Panel Lights
Temperature Indicator-Engine and Transmission
Console and Pedestal Lights
Navigation Lights
Fuselage Lights
Caution Lights
Anti-Collision Light
Landing Light Power
Search Light Power
Landing and Search Light Control
VHF Receiver AN/ARC-73
VHF Transmitter AN/ARC-73
UHF Transceiver AN/ARC-51BX
FM Transceiver AN/ARC-54
J-2 Compass
Heater Control
External Stores Control
Intercom C-1611/AIC Copilot and Crew-L
Intercom C-1611/AIC Pilot and Crew-R
Direction Finder AN/ARN-83
Omni Receiver AN/ARN-82
Marker Beacon Receiver R-1041
HF Transceiver AN/ARC-102
VHF Transmitter T-366/ARC
Pitot Tube Heater
Rescue Hoist Cable Cut
Rescue Hoist Control
Hoist Power
IFF Transponder AN/APX-44
FM Transceiver AN/ARC-44 (If Installed)
Intercom SB-329/AR (If Installed)
UHF Transceiver AN/ARC-55 (If Installed)

115-VOLT AC SPARE INVERTER

AC Failure Relay
Fuel Quantity Indicator and Tank Unit
Attitude Indicator - Pilot
Attitude Indicator - Copilot
J-2 Compass
IFF Transponder AN/APX-68

28-VOLT AC

Course Indicator
Torque Pressure Instruments
Transmission Oil Pressure Transmitter and Indicator
Engine Oil Pressure Transmitter and Indicator
Fuel Pressure Transmitter and Indicator

115-VOLT AC MAIN INVERTER

AC Failure Relay
Fuel Quantity Indicator and Tank Unit
Attitude Indicator - Pilot
Attitude Indicator - Copilot
J-2 Compass
IFF Transponder AN/APX-68

▬	D-C Control
▦	Power from Battery
░	Power from Generator
▮▮▮	D-C Load Distribution
////	A-C Load Distribution on Main Inverter
▨	A-C Load Distribution on Spare Inverter

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Figure 2-10. Electrical system schematic diagram (Sheet 2 of 2) power is provided and battery drain prevented when autorotational landings are being performed. A standby starter-generator, rated at 200 ampere output and mounted on the helicoper's engine accessory drive section, is provided to furnish 28-volt DC power in the event of a main generator failure.

2-63. *Direct Current Power Control.* Direct current power control is accomplished from the DC POWER control panel on the overhead console (see figure 2-11).

2-64 *DC Power Control Panel.* The DC POWER control panel (see 8, figure 2-11) is located on the overhead console. The DC POWER control panel consists of the MAIN GEN RESET/OFF/ON switch, BAT ON/OFF switch, STARTER GEN START/STBY GEN switch, DC VM (voltmeter) selector switch, and an NON-ESS BUS MANUAL ON/NORMAL ON switch. Panel illumination is provided by three lights controlled by a switch on the instrument lights control panel (see 6, figure 2-11).

2-65. *Main Genetrator Switch.* The main generator switch is a three-position type equipped with a guard and is located on the left area of the DC POWER control panel (see 8, figure 2-11). This switch is labeled MAIN GEN, RESET in the aft position, OFF in the center position, and ON in the forward position. The RESET position is spring-loaded to return to OFF position when released; therefore, to reset the generator the switch must be held in RESET position momentarily and then moved to the ON position.

2-66. *Battery Switch.* The battery switch is located on the lower left area of the DC POWER control panel below the main generator switch. This is a two-position switch labeled BAT OFF in the aft position and ON in the forward position. When the switch is placed in ON position, it closes the circuit to the actuating coil of the battery relay and 24-volt DC is then being delivered from the battery to the primary bus. When the switch is placed in OFF position, it opens the circuit to the actuating coil of the battery relay and no current is delivered from the battery.

2-67. *Starter-Generator Switch.* The starter-generator switch is located in the center area of the DC POWER control panel. This switch is a two-position type and is labeled STARTER GEN START in the aft position, and STBY (standby) GEN in the forward position. The START position of the switch actuates the electrical circuits for starter functions of the starter-generator. The STBY GEN position actuates the generator unit of the starter-generator, and 28-volt DC is supplied to the primary bus of the helicopter's electrical system in the event of a main generator failure.

2-68. *Nonessential Bus Control Switch.* The nonessential bus control switch is located in the lower area of the DC POWER control panel. This is a two-position switch labeled NON-ESS BUS, MANUAL ON in the aft position and NORMAL ON in the forward position. The function of the switch is to permit the pilot, in the event of a generator failure, to override the automatic action when the nonessential bus is dropped by the electrical system's bus control relay and nonessential bus relay. Moving the switch to MANUAL ON overrides the action of the bus control relay and nonessential bus. Normally the switch will be positioned forward to NORMAL ON.

2-69. *Direct Current Voltmeter Selector Switch.* The direct current voltmeter selector switch is located in the upper right-hand area of the DC POWER control panel. The switch can be easily identified by the VM label on panel face. This switch functions to monitor voltage being delivered from any of the following: BAT, MAIN GEN, STBY GEN, ESS BUS, and NON-ESS BUS. The switch is actuated by means of a knob permitting the selection of any one of the five positions. Voltage will be indicated on the DC voltmeter.

2-70. *Direct Current Voltmeter.* The direct current voltmeter (see 29, figure 2-5) is mounted in the center area of the instrument panel and is labeled VOLT DC. Generator voltage output is indicated by this instrument. Voltage indications will not be shown when the generator is not furnishing electrical power because the direct current voltmeter is connected to the generator side of the reverse current relay.

2-71. *Direct Current Loadmeters — Main and Standby.* Two direct current loadmeters are mounted in the lower center area of the instrument panel (see 28 and 35, figure 2-5). One is labeled MAIN GEN and indicates the percentage of total electrical system amperage being used by the helicopter's electrical system ~~when main generator is operating~~. The other loadmeter is labeled STBY GEN and indicates

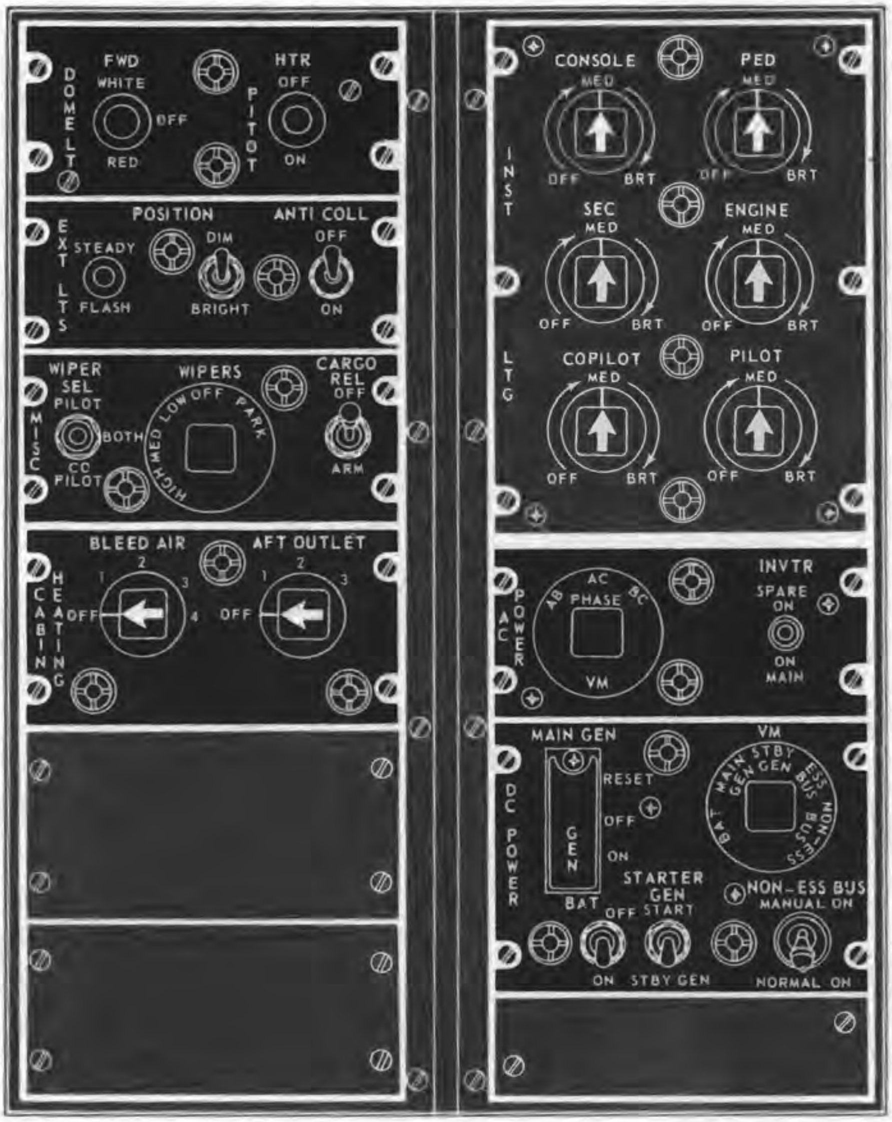

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Figure 2-11. Overhead console — typical the percentage of total electrical system amperage being used by the helicopter's electrical system when standby generator is operating. Loadmeters will not indicate this percentage when the generators are inoperative.

2-72. Alternating Current Power Supply System. The alternating current is supplied by two 250 volt-ampere, three-phase inverters (main and spare) which convert the 28-volt DC to 115-volt AC. The main and spare inverters are interchangeable in power output. Selection control, MAIN ON/OFF and SPARE ON, is accomplished from the AC POWER control panel (see 7, figure 2-11). Either inverter (at pilot's option) will supply 115-volt AC to attitude indicator system, AC failure relay, fuel quantity indicator and tank units, gyro magnetic compass system, and the 28-volt AC transformer. The 28-volt AC transformer, in turn, supplies 28-volt AC to the following: torque pressure transmitter and torquemeter, transmission oil pressure transmitter and indicator, engine oil pressure transmitter and indicator, and fuel pressure transmitter and indicator, and the course indicator.

2-73. Alternating Current Power Control. Alternating current power control is accomplished from the AC POWER control panel (see figure 2-11).

2-74. AC Power Control Panel. The AC POWER control panel (see 7, figure 2-11) is located on the overhead console. This panel is labeled AC POWER and contains the inverter (INVTR MAIN ON/SPARE ON) switch, the AC voltmeter (AC VM) selector switch, and two panel lights.

2-75. Inverter Switch — Main and Spare. The inverter switch, labeled INVTR, is located on the AC POWER control panel (see 7, figure 2-11). This is a three-position switch labeled SPARE ON/OFF/MAIN ON. For normal flight the inverter switch is in the MAIN ON position. The SPARE ON position is used to put the spare inverter into operation in the event of a main inverter failure. Inverter switch is supplied power by the 28-volt DC essential bus. Circuit protection is provided by the INVTR CONT circuit breaker (see figure 2-12).

2-76. AC Voltmeter Selector Switch. The AC VM (voltmeter selector switch is located on the left half of the AC POWER control panel (see 7, figure 2-11). The rotatable switch can easily be identified by the VM label on the round switch dial. The switch is used to monitor voltage between any of the three phases of the 115-volt alternating current electrical system. Actuation of switch is accomplished by a knob which has three (phase monitoring) positions labeled: AB, AC, and BC. When the selector switch is in AB position, the voltage indicated on instrument panel-mounted AC voltmeter is the voltage between phases A and B. In like manner, with selector switch in AC position, the voltage indicated on voltmeter is the voltage between phases A and C; with selector switch in BC position, the voltage indicated on voltmeter is the voltage between phases B and C.

2-77. Alternating Current Voltmeter. The AC voltmeter is mounted in the central area of the instrument panel directly under the DC voltmeter (see 36, figure 2-5). The alternating current voltage output from the inverter (main or spare) is indicated on this instrument. The voltage indicated between any two of the three selected positions (phases) should be 115 (±2.5) volts AC.

2-78. Circuit Breaker Panels. Three circuit breaker panels are provided consisting of a direct current circuit breaker panel, alternating current circuit breaker panel, and an auxiliary circuit breaker panel.

2-79. DC Circuit Breaker Panel. The direct current circuit breaker panel is located on the overhead console within easy reach of the pilot's and copilot's positions (see figure 2-12). Each individual breaker is clearly labeled for the particular electrical circuit protected. In the event a circuit is overloaded, the circuit breaker protecting that circuit will pop out, de-energizing the circuit. The circuit is reset or actuated by pushing the circuit breaker in.

2-80. AC Circuit Breaker Panel. The alternating current circuit breaker panel is located on the right-hand side of the pedestal base, visible and within easy reach of the pilot (see figure 2-13). The upper and center panel plate, labeled AC 115V contains the circuit breakers which provide the circuit protection for the 115-volt AC electrical circuits. The lower panel plate, labeled AC 28V, contains the circuit breakers which provide circuit protection for the 28-volt AC electrical circuits. In the event a circuit is overloaded, the circuit breaker protecting that particular circuit will pop out, de-energizing the

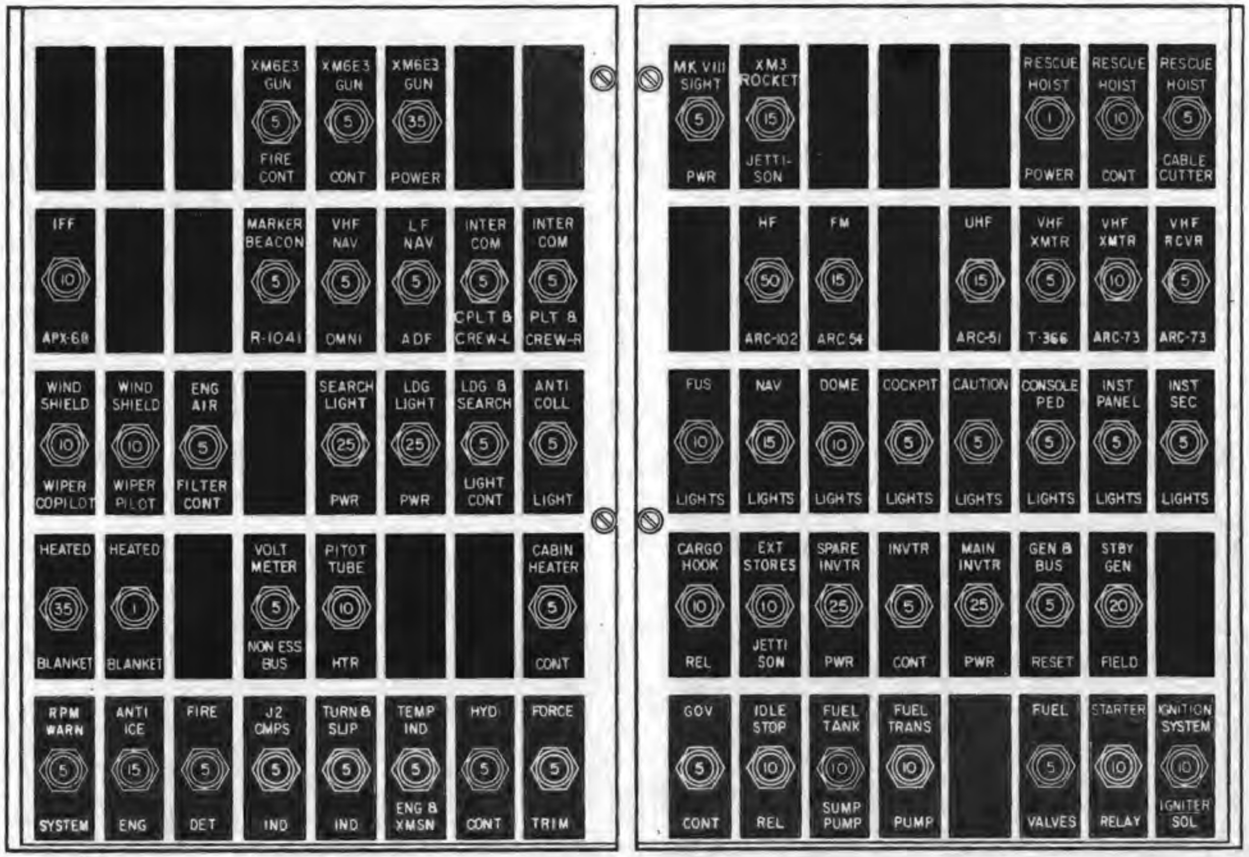

Figure 2–12. DC circuit breaker panel (typical)

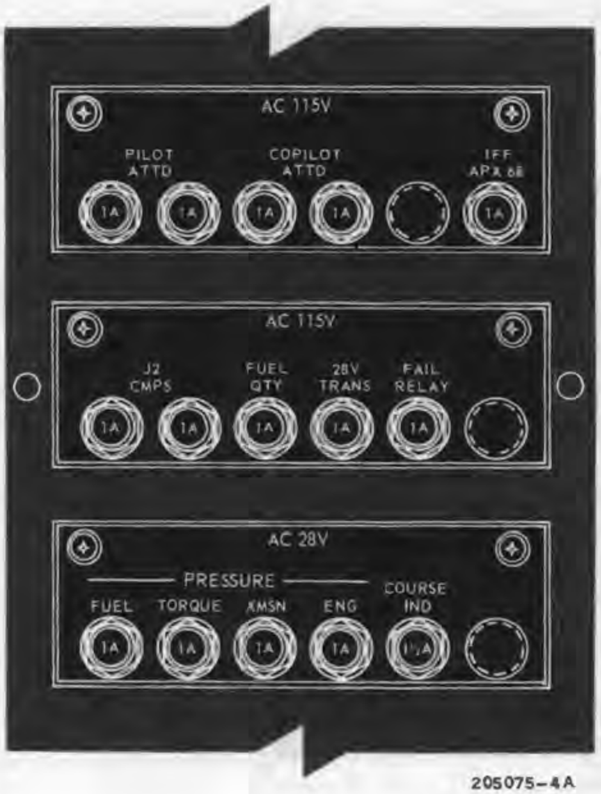

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Figure 2-13. AC circuit breaker panel (typical)

Deleted

circuit. The circuit is reset or actuated by pushing the circuit breaker in.

2-81. ***Auxiliary Circuit Breaker Panel.*** The auxiliary circuit breaker panel is mounted at the right-hand side of the overhead console. This panel contains provisions for twelve circuit breakers to be used when auxiliary equipment, requiring circuit breakers, is installed.

2-82. External Power Receptacle. The external power receptable is located on the left side of the helicopter's fuselage, aft of cabin bulkhead (see 19, figure 2-1). When a 28-volt DC auxiliary power unit plug is securely inserted in the receptacle, the external power relay in the helicopter's electrical system is energized and 28-volt DC electrical power is supplied to the primary bus for distribution. When external power is connected or the receptacle door is left open, the EXTERNAL POWER caution light on the CAUTION panel will illuminate.

NOTE

> The battery switch shall be in OFF position when APU is being used. Reverse polarity between helicopter's electrical system and APU can occur.

NOTE

> A 650-800 ampere auxiliary power unit is required when making an external power start.

2-83. Hydraulic Power Supply System. The hydraulic power supply system functions to reduce the operational loads of the cyclic, collective, and directional control systems (see figure 2-14). This system consists of the variable output hydraulic pump, power cylinders, irreversible valves, relief and check values, a solenoid valve, a system filter, a vent filter, "boot strap" reservoir, bleed air valve, pressure switch, ground test couplings and connecting hardware. The hydraulic pump is mounted on and driven by the transmission and supplies pressure to the power cylinders and to the boot strap reservoir when this type reservoir is installed.

NOTE

> Helicopters with serial Nos. 65-9565 and subsequent have a gravity feed reservoir which is not under pressure and feeds the hydraulic fluid to pump by gravity.

2-96. *Collective Pitch Control Lever.* The collective pitch control lever (see 7, figure 2-4) is located to the left of the pilot's position and controls the vertical mode of flight. When the lever is in full down position, the main rotor is in minimum pitch. When the lever is in full up position, the main rotor is in maximum pitch. The amount of lever movement determines the angle of attack and lift developed by the main rotor, and results in ascent or descent of the helicopter. Desired operating friction can be induced into the control lever by hand tightening the friction adjuster (see 27, figure 2-4). A rotating grip-type throttle and a switch box assembly are located on the upper end of the collective pitch control lever. The switch box assembly contains the starter switch, governor rpm increase-decrease switch, engine idle stop release switch, and landing light and searchlight switches. A springloaded pitch lever down lock (see 9, figure 2-4) is located on the floor at the approximate center and inboard of the pitch control lever. The copilot's collective pitch control lever, when installed, contains only the rotating grip-type throttle, starter switch, and governor rpm increase-decrease switch.

Note

> The collective pitch control system has a built-in friction of eight to ten pounds with manual friction control in full decrease position.

2-97. *Tail Rotor Pitch Control Pedals.* The directional (tail rotor pitch) control pedals (see 14, figure 2-4) are similar to and react in the same manner as fixed-wing aircraft rudder pedals. The pedals (through push-pull tubes, bellcranks, quadrant, cables and pulleys, and chain and sprocket) alter the pitch of the tail rotor blades; and thereby provide the means of directional control. This literally allows the helicopter to be pivoted about its own vertical axis at slow or zero airspeeds. Pedal adjusters are located below the floor aft of the cyclic control sticks and forward of the pilot and copilot positions. Adjuster knobs (see 11, figure 2-4) extend above the floor to enable adjustment of pedal distance for individual comfort. The force trim system is connected to the directional controls and is operated by the force trim switch on the cyclic control stick grip. The copilot's directional control pedals, when installed, are identical to the pilot's pedals.

2-98. *Synchronized Elevator.* The synchronized elevator (see 15, figure 2-1) is located near the aft end of the tail boom and is connected

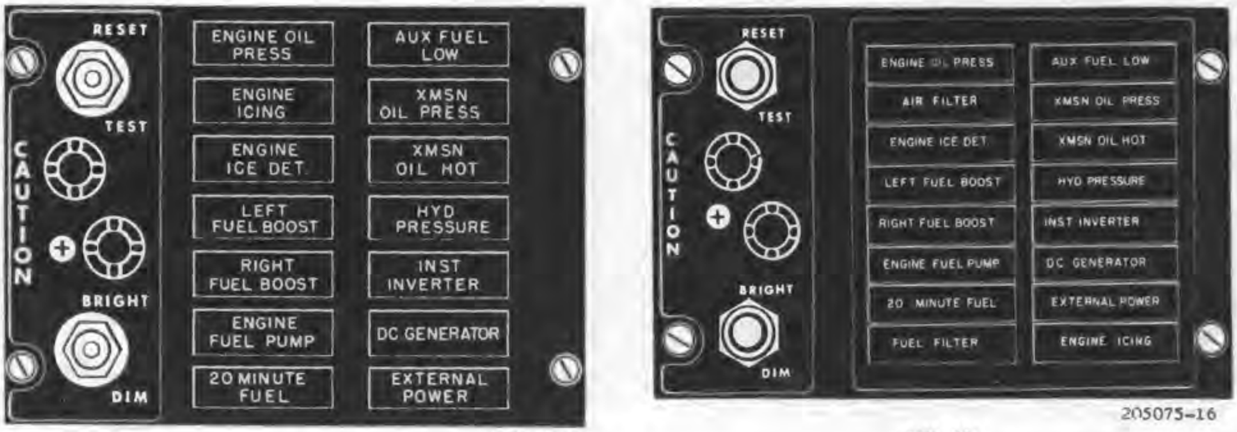

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Figure 2-15. Caution panel — typical

by control tubes and mechanical linkage to the fore and aft cyclic control system, Fore and aft movement of the cyclic control stick produces a change in the synchronized elevator attitude, thus increasing controllability and lengthening cg range.

2-99. Landing Gear System. The helicopter's landing gear system is a skid type consisting of two laterally mounted arched crosstubes attached to two formed longitudinal skid tubes. The landing gear structure members are made from formed aluminum alloy tubing with full length steel skid shoes to minimize skid wear. The gear assembly is attached with clamps at four points of the fuselage structure; therefore, gear removal for maintenance can be easily accomplished. Two manually retractable and quickly removable wheel assemblies have been provided to facilitate helicopter ground handling operations.

2-100. ***Tail Skid.*** A tubular steel tail skid is attached to the lower aft section of the tail boom assembly and acts as a warning to the pilot upon an inadvertent tail-low landing.

2-101. Flight Instruments. The flight instruments installed in the helicopter consist of the pilot's and copilot's airspeed indicators, turn and slip indicator, vertical velocity indicator, and the pilot's and copilot's attitude indicators.

2-102. ***Airspeed Indicators.*** Two airspeed indicators (see 9, figure 2-5) have been provided; one is mounted on the pilot's section of the instrument panel and the other is mounted on the copilot's section of the instrument panel. The single-scale indicators are calibrated in knots and provide an indicated airspeed of the helicopter at any time during flight, by measuring the difference between impact air pressure from the pitot tube and the static vent. The pitot tube is mounted on the left metal nose section of the cabin. Static air pressure for instrument operation is derived from the two static vents located in the side cabin skins near the forward edges of the crew doors.

2-103. ***Turn and Slip Indicator.*** The turn and slip indicator (4 MIN TURN) (see 39, figure 2-5) is controlled by an electrically actuated gyro. The instrument has a needle (turn indicator) and a ball (slip indicator). Although the needle and ball are combined in one instrument and are normally read and interpreted together, each has its own specific function and operates independently of the other. The ball indicates when the helicopter is in directional balance, either in a turn or in straight and level flight. In the event of yawing or slipping by the helicopter, the ball will be off center. The needle indicates in which direction and at what rate the helicopter is turning. The electrical circuit is supplied power by the 28-volt DC essential bus and is protected by TURN & SLIP IND circuit breaker on the DC circuit breaker panel (see figure 2-12).

2-104. ***Vertical Velocity Indicator.*** Two vertical velocity (rate of climb) indicators (see 20, figure 2-5) (one for pilot and one for copilot) are front-mounted on the instrument panel. These indicators register ascent and descent of the helicopter in feet per minute. The instruments are actuated by the rate of atmospheric pressure change and are vented to the static air system.

2-105. ***Pilot's Attitude Indicator.*** The pilot's attitude indicator is located on the pilot's section of the instrument panel (see 10, figure 2-5). This indicator provides the pilot with a visual indication of the pitch and roll attitude of the helicopter in relation to the earth's horizontal plane. The attitude indicator system is operated by three-phase 115-volt AC electrical power, supplied by the inverter, and is protected by PILOT ATTD circuit breakers on the AC circuit breaker panel (see figure 2-13). Integral lighting, operated by 28-volt DC from the essential bus, is incorporated in the indicator. An OFF warning flag in the indicator is exposed when electrical power is removed from the system; however, the OFF flag will not indicate internal system failure which may occur in the control or indicator. The flag disappears approximately two minutes after electrical power is supplied to the control.

2-106. The attitude indicator has been specifically designed for the flight characteristics of helicopters by incorporating an electrical trim in the roll axis in addition to the standard pitch trim. Degrees of pitch and roll are indicated by a universally mounted sphere. The horizon is represented as a white bar on the sphere; horizontal markings indicate the degree of dive or climb; while bank (roll) angles are read from the semicircular scale located on the upper half of the indicator face.

2-107. The pitch trim knob, located on the lower right corner of the indicator, is adjusted

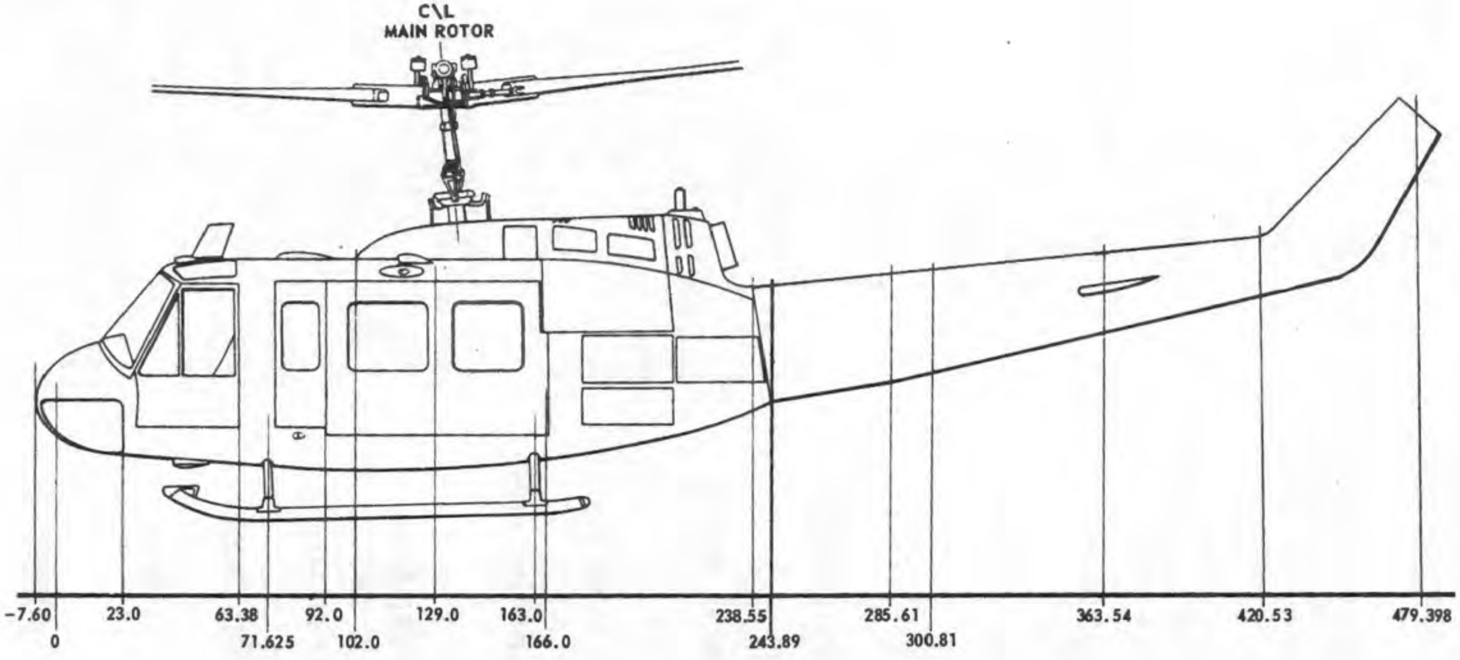

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Figure 2-16. Stations diagram 48 ft. rotor (Sheet 2 of 2) top center of the instrument panel (see 3, figure 2-5). When this light illuminates, the pilot is alerted to check the CAUTION panel (see figure 2-15) for the fault condition or conditions that have occurred.

2-115. *Caution Panel*. The CAUTION panel (see figure 2-15) is mounted in the instrument pedestal. When illuminated, the worded segment lettering in the panel will be aviation yellow; however, when not illuminated, segment lettering will not be visible. This panel functions to provide the pilot visual indicatons (day or night) of the fault conditions as follows:

FAULT CONDITION	CAUTION PANEL SEGMENT
Engine Oil Pressure Low	ENGINE OIL PRESS
Engine Icing Indicator	ENGINE ICING
Engine Ice Detector Disarmed	ENGINE ICE DET.
Left Fuel Boost Pump Inoperative	LEFT FUEL BOOST
Right Fuel Boost Pump OFF	RIGHT FUEL BOOST
Engine Fuel Pump Inoperative	ENGINE FUEL PUMP
Fuel Quantity Low	20 MINUTE FUEL
Auxiliary Fuel Tank Empty	AUX FUEL LOW
Transmission Oil Pressure Low	XMSN OIL PRESS
Transmission Oil Temperature High	XMSN OIL HOT
Hydraulic Pressure Low	HYD PRESSURE
AC Bus Failure (Inverter Failure)	INST INVERTER
DC Generator Failure	DC GENERATOR
External Power Plug	EXTERNAL POWER
Fuel Filter Clogged	FUEL FILTER
Engine air filter clogged	AIR FILTER
Metal particles present in 42° or 90° gear box	CHIP DETECTOR
Emergency fuel control	GOV EMER
IFF system inoperative	AN/APX-68

2-116. Illumination of any of the worded segments on the CAUTION panel alerts the pilot to a fault condition or conditions. The panel is equipped with a RESET/TEST switch, a BRIGHT/DIM switch and two edge lights for illuminating the switches. Electrical power to the CAUTION panel is supplied by the 28-volt DC essential bus. Circuit protection is provided by the CAUTION LIGHTS circuit breaker on the DC circuit breaker panel (see figure 2-12).

2-117. *BRIGHT/DIM Switch — Caution Panel*. The BRIGHT/DIM switch on the CAUTION panel (see figure 2-15) permits the pilot to manually select a bright or dimmed condition for all the individual worded segments and the master caution indicator light (see 3, figure 2-5) on the instrument panel. After each initial application of power, the lamps will come on in the bright condition. Momentarily placing the switch in up position selects the BRIGHT condition, down position selects the DIM condition.

2-118. *Reset/Test Switch — Caution Panel*. The caution panel is provided with a reset/test switch enabling the pilot to manually reset and test the master caution system (see figure 2-15). This switch is labeled RESET in up position and TEST in the down position. Momentarily placing the reset/test switch in RESET position extinguishes and resets the master caution light on the instrument panel so it will again light should another fault condition occur. Momentarily placing the reset/test switch in TEST position will cause the illumination of all individually worded segments and also the master caution indicator light. Testing of the system will not change any particular combination of fault indications which might exist prior to testing.

Note

> The worded segments will remain lighted so long as fault condition or conditions exist.

Caution

The press-to-test switch should not be depressed for more than 15 seconds to prevent overheating the detector elements.

2-126. Entrance Doors. The helicopter's entrance doors consist of the pilot's and copilot's doors and the two cargo-passenger doors with forward hinged door post panels.

2-127. Pilot's and Copilot's Doors. The pilot's and copilot's entrance doors (see 1, figure 2-4) are formed aluminum frames with transparent plastic windows in the upper section. Ventilation is supplied by sliding panels in the windows. Cam-type door latches are used and doors are equipped with jettisonable door releases to allow release in flight.

2-128. Cargo-Passenger Doors. The two cargo-passenger doors are formed aluminum frames with transparent plastic windows in the upper section (see 20, figure 2-1). These doors are on rollers and slide off to the open position allowing access to the cargo area. The helicopter can be flown at 120 knots with the doors locked in full open position.

2-129. Hinged Door Post Panels. The door post panels forward of the cargo door are hinged to provide a larger entrance to the cargo-passenger area. These panels are formed aluminum frames with transparent plastic windows in the upper panel area. The panels may be quickly removed by removing the special hinge pins.

2-130. Pilot's and Co-pilot's Seats. The pilot's and co-pilot's seats (see figure 2-4) are the adjustable non-reclining type, and each seat is mounted, on two fixed tracts. A lever for vertical adjustment is on the right side of each seat and the fore and aft lock is on the left side of each seat. Each seat is equipped with a lap safety belt and inertia-reel shoulder harness. Webbing on the back of the seat can be removed to accept use of a back-pack parachute.

Note

Armored seats (pilot and co-pilot) are installed on helicopters serial numbers 65-9565 through 65-12895.

Caution

Upward force of springs located on seats may cause rapid vertical movement.

2-131. Shoulder Harness. Inertia-reel shoulder harnesses are incorporated in the pilot's and copilot's seats and are equipped with manual lock-unlock handles on the left sides of the seats (see 6, figure 2-4). By pushing down on the top of the handle the latch is released and the control handle may be moved freely from one position to the other. When the control handle is in the unlocked position, the reel cable will extend to allow the pilot to lean forward; however, the reel will automatically lock when the helicopter encounters an impact force of two or three G's deceleration. Locking of the reel will automatically take up the slack in the harness. To release the lock, it is necessary to lean back slightly to release tension on the lock and move the control handle to the lock and then the unlock position. It is possible to have pressure against the seat back, whereby no additional movement can be accomplished and the lock cannot be released. If this condition occurs, it will be necessary to release the safety belt buckle. Manual locking of the reel should be accomplished for emergency landings.

2-132. Auxiliary Equipment. The following systems and equipment are covered in Chapter 6.

Ventilating System
Heating and Defrosting System
Engine Anti-Icing System
Pitot Heater
Navigation Lights
Anti-Collision Light
Landing Light
Searchlight
Dome Lights
Cockpit Lights
Transmission Oil Level Light
Instrument Lights
Armament System Provisions
Windshield Wiper
Casualty Carrying Equipment
Heated Blanket Receptacles
Check List Holder
Data Case

Mooring Fittings

Tow Rings

Ground Handling Wheels

Blackout Curtains

Blood Bottle Hangers

Main and Tail Rotor Tie-Downs

Cargo Tie-Down Fittings

External Cargo Rear View Mirror

Paratroop Static Line

Electrical Provisions for Engine Vibration Check Equipment

Auxiliary Fuel Equipment

CHAPTER 3

NORMAL PROCEDURES

Section I — Scope

3-1. Purpose. This chapter contains instructions and the steps of procedure that must be followed from the time flight is planned until the flight is completed and the helicopter is properly parked. It covers flights of a nontactical nature performed under normal conditions.

3-2. Sequence of phases and actions is arranged chronologically and designed to avoid requiring that the operator retrace any steps. So far as possible checks are grouped to keep control manipulation and ground operating time to an absolute minimum.

3-3. A condensed version of these procedures is contained in the condensed check list Technical Manual TM 55-1520-210-10CL.

Section II — Flight Procedures

3-4. Preparation For Flight. This period should be devoted to matters of general mission planning and a study of special problems involved in operating the aircraft for mission completion.

3-5. ***Flight Restrictions.*** The minimum, normal, maximum, and cautionary operation ranges for the helicopter and the engine are indicated by instrument markings and placards. These instrument markings and placards represent careful aerodynamic calculations, substantiated by flight test data. Refer to Chapter 7, Operating Limitations, for a detailed description of helicopter and engine restrictions.

3-6. ***Flight Planning.*** Required fuel, airspeed, power settings, take-off, climb, cruising flight, and landing data should be determined by use of the performance data charts in Chapter 14.

3-7. ***Take-Off and Landing Data Cards.*** Take-off and landing data cards in format for local reproduction are contained in TM 55-1520-210-10CL. Consult Chapter 14, Performance Data, for detail operating information when planning various type of missions that require use of the data cards.

3-8. ***Weight And Balance.*** Take-off and anticipated gross weight and balance should be obtained before take-off and checked against weight limitations in Chapter 7. For each specific helicopter, reference should be made to the Weight and Balance Computation, Chapter 12, and DD Form 365F for information.

3-9. Pre-Flight Check. The amplified preflight check includes the exterior and interior checks as outlined.

3-10. ***Before Exterior Check.*** a. DA Form 2408-13 —Check.

b. Battery Switch — OFF.

3-11. ***Exterior Check (All Flights).*** Perform exterior check as shown in Exterior Check Diagram. (See figure 3-1.)

Caution

> Before first flight each day, drain fuel sumps, main fuel filter, fuel boost pumps, and defueling valve to minimize the possibility of fuel contamination. Precaution shall be taken to prevent contamination of fuel by water, other liquids, or solids.

3-12. ***Fuselage — Front, Area 1.*** a. Main Rotor Blade — Visually CHECK CONDITION AND CLEANLINESS.

b. Static Ports — Visually CHECK.

c. Battery — CHECK.

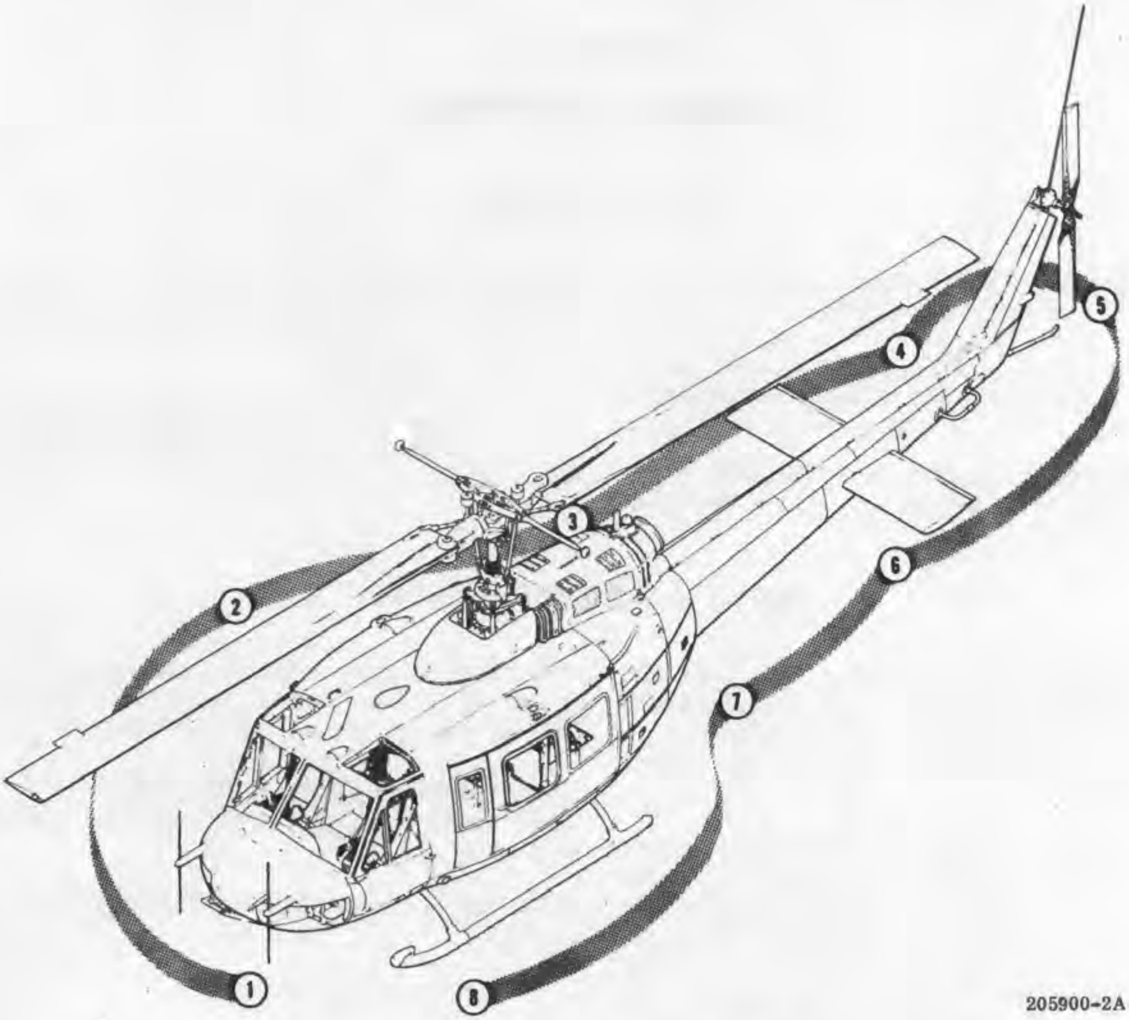


Figure 3–1. Exterior check diagram

d. Radio Door — SECURE.

e. Antennas — SECURITY and CONDITION.

f. Pitot Tube — UNCOVERED and CLEAN.

g. Cargo Hook-up Mirror — SECURE, CLEAN, UNCOVERED (COVERED for night flights).

h. Cabin Area — Lower area and all glass CLEAN.

i. Searchlight — STOWED (underside of cabin).

3-13. Forward Fuselage — Cabin Right Side And Top, Area 2. a. Entrance Doors — CONDITION, CLEAN GLASS, OPERATION.

b. Landing Gear — CONDITION, HANDLING WHEELS REMOVED.

c. Cargo Suspension Unit — CENTERING CABLES and SPRINGS ATTACHED.

Note

Use the steps on right-hand door post for access to the cabin top.

d. Cabin Top Ventilators — UNOBSTRUCTED.

mm. BATtery — ON (OFF for APU starts).

nn. FIRE DETECTOR Light — TEST (15 Seconds MAXIMUM).

oo. MARKER BEACON Light — TEST.

pp. CARGO RELEASE ARMED Warning Light — TEST.

qq. CAUTION Panel and MASTER CAUTION — TEST.

rr. GOVernor R P M INCRease DECRease Switch — Decrease 8 to 10 seconds.

ss. Search Light Switch — STOW.

tt. LanDinG Light Switches — OFF and RETRact.

uu. Throttle — Position the throttle just below the ENGINE IDLE Stop Release (for abort start purposes).

3-22. Starting Engine. a. Fire Guard Posted.

b. Check Rotor Blades Clear.

c. Energize Starter and Start Clock. (Start fuel flow and ignition occur simultaneously.)

Caution

Check DC Voltmeter, if voltage drops below 14 volts, abort start.

d. Start Fuel Switch — OFF at 400°C.

Caution

Monitor EGT to avoid a hot start. If uneven or intermittent acceleration is accompanied by a rapid rise in EGT, shut down engine and immediately investigate. During starting or acceleration, the MAXIMUM allowable EGT is 760°C. If this limit is exceeded, perform a hot end inspection. If during the start operation of T53-L-9 or T53-L-9A engines, EGT exceeds 620°C for more than five seconds, record a hot start on DA Form 2408-13, and three such hot starts shall require a hot end inspection. If during the start operation of the T53-L-11 engine, EGT exceeds 650°C for more than five seconds, perform a hot end inspection.

e. Release Starter Switch at 40 percent nI speed.

Caution

Limit starter energize time to 40 seconds. If engine does not start, a three minute cooling period is recommended after which a second starting cycle may be attempted. Only three forty-second starting attempts are permissible in any one hour period.

f. Slowly advance the throttle over the ENGINE IDLE stop.

g. INVERTER — Spare ON.

h. ENGINE and TRANSMISSION OIL PRESSURES — CHECK.

Caution

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

i. START FUEL SWITCH — ON.

j. Radios and headsets — ON.

3-23. Engine Run-Up. Retard the throttle to the ENGINE IDLE Stop and check the following:

a. GAS PRODUCER, 56 percent to 58 percent RPM.

b. ENGINE and TRANSmission OIL PRESSures — in the green.

c. FUEL PRESSURE — in the green.

d. CAUTION Panel and MASTER CAUTION — all lights OFF.

e. LOW RPM Switch — AUDIO then OFF.

f. Co-Pilot's Attitude Indicator — CAGE.

g. FUEL (QUANTITY) GAGE TEST SWITCH — TEST.

h. PITOT HeaTeR — ON — note LOADmeter increase — then OFF.

i. AC POWER VoltMeter — CHECK all PHASES for 115 (plus or minus 3) VOLTS (on SPARE INVeRteR).

j. INVerTeR — MAIN ON.
k. AC POWER VoltMeter — CHECK all PHASES for 115 (plus or minus 3) VOLTS.

l. DC POWER VoltMeter — CHECK all positions and leave in NON-ESSential BUS position.

m. STARTER GENerator—STandBY GENerator.

n. MAIN GENerator — OFF — note that MAIN GENerator LOADmeter zeros and STandBY GENerator LOAD meter registers.

o. DC POWER VoltMeter — CHECK voltage zero (with NON-ESSential BUS power off).

p. NON-ESSential BUS — MANUAL ON (Note voltage restored).

q. NON-ESSential BUS — NORMAL ON.

r. DC POWER VoltMeter — MAIN GENerator.

s. MAIN GENerator — ON — note that MAIN GENerator LOADmeter registers and STandBY GENerator LOADmeter zeroes.

t. STandBY GENerator — START.

u. Pilot's Attitude Indicator — SET.

v. All engine and transmission instruments — Normal or in the green.

w. DE-ICE Switch — ON — note EGT rise.

x. DE-ICE Switch — OFF — note EGT decrease.

y. GOVernor RPM INCRease — DECRease Switch — Actuate thru full range (6000 to 6700 plus or minus 50 RPM) and leave at 6600 RPM. Check that light goes out.

z. LOW RPM Switch — AUDIO.

aa. FORCE TRIM — OFF — Check control freedom — then ON (if to be used).

bb. HYDraulic CONTROL — OFF — CAREFULLY check for control freedom then ON.

cc. ANTI-COLLision Light — ON.

3-24. Before Take-Off. Just prior to take-off perform the following checks:

Note

> Taxiing, as literally interpreted, is not applicable for the reason of the skid type landing gear. Movement of the helicopter from one ground position to another can be accomplished by the ground personnel, when the rotors are not turning, with the use of quickly-installed ground handling wheels, or by the pilot flying the helicopter from spot to spot at an altitude in close proximity to ground surface.

a. Collective Pitch Lever — MINIMUM PITCH and ADJUST FRICTION as desired.

b. Cyclic Control — NEUTRAL or slightly into the wind and ADJUST FRICTION as desired.

c. Flight Instruments — CHECK operation and settings.

d. Pitot Heater — ON (if required).

e. Cabin Heater — AS REQUIRED.

f. Throttle — FULL OPEN.

g. Dual Tachometer — CHECK synchronization of needles.

Warning

> Suspend operation immediately if engine or transmission oil pressure and temperatures are not within operating limits.

h. Engine Oil Pressure, 60 to 80 PSI.

i. Engine Oil Temperature, 93°C MAXIMUM.

j. Transmission Oil Pressure, 45 to 55 PSI.

k. Transmission Oil Temperature, 110°C MAXIMUM.

l. Fuel Pressure, 20 PSI (approximately).

3-25. Deleted.

3-26. Take-Off. Because of the versatility of helicopters and their ability to take off from small areas, conditions at the time of take-off are the governing factors in the type of take-off to be accomplished. The factors governing the type of take-off to be accomplished are the gross weight of the helicopter, the pressure altitude, outside air temperature, the size of the take-off area, and the tactical situation. There are many possible variations in take-off procedures. The normal take-off procedure is to lift off vertically to a skid height of four feet, accelerate forward at a four foot skid height until translational lift is evident, then initiate climb and continue to accelerate to 60 knots. The maximum power take-off procedure is similar except that full power is applied at the start, and the helicopter is rotated to a 40 knot attitude immediately after lift-off. Either of these two procedures will result in a safe take-off and airspeeds and altitudes within the safe operating areas of the height velocity diagram. (See figure 7-3.) They should be used whenever the take-off flight path is free of obstacles, and when adequate power is available to hover with the skids four feet off the ground. Other types of take-offs are possible and will generally result in less distance to clear an obstacle. They are: (1) vertical take-off and climb when the helicopter can hover out-of-ground effect; (2) take-off from a hover at a two-foot skid height; (3) light on skids take-off with no rpm bleed-off; (4) light on skids take-off with rpm bleed-off. These techniques can be used by experienced pilots when conditions warrant their use. They will result in maximum utilization of the helicopter and are called maximum performance take-offs.

Warning

> Obstacles, such as trees, hills, buildings, wires, etc., must be considered prior to attempting operation from any unprepared area. In many instances, a crosswind or 180-degree downwind approach may be advisable to avoid such obstructions on the approach to an area. In order to allow for gustiness, sudden reversal of direction of light winds, power plant performance, cg location, and variations in pilot technique, the obstacle height on take-off or landing must be carefully evaluated.

3-27. *Take-Off Performance.* A normal take-off can be accomplished whenever the helicopter is capable of hovering with the skids four feet off the ground and up to and above 35 feet off the ground (out-of-ground effect). The hovering charts and the take-off charts in Chapter 14 can be used to determine if the helicopter can hover out-of-ground effect. Take-off distances given in Chapter 14 are for maximum performance take-off procedures only.

3-28. *Normal Take-Off To Hover.* (Four feet skid height.) 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 altitudes and with normal gross weights. In this type take-off, the safety factor is high as the helicopter is lifted from ground vertically to a height of four 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 RPM INCR/DECR switch. Place cyclic control in neutral position, and increase collective pitch control slowly and smoothly until hovering altitude of four feet is reached. Apply directional control 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 directional pedals to maintain heading.

Figure 3-2. Deleted

3-29. *Normal Take-Off From Hover.* (Four feet skid height.) Hover briefly to determine if engine and flight controls are operating properly. From a normal hover at four feet altitude, apply forward cyclic pressure to accelerate smoothly and effective translational lift; maintain hovering altitude with collective pitch, and maintain heading with directional control pedals, until effective translational lift has been obtained and the ascent has begun. Then, smoothly lower nose of helicopter to an attitude that will result in an increase of airspeed to 60 knots. Adjust power as required to establish a desired rate of climb. Stabilize airspeed and torque pressure as soon as a smooth rate of acceleration will permit.

Figure 3-4. Deleted

a. Throttle — CLOSED.

Caution

> If a rapid rise in exhaust gas temperature is noted, motor the engine (with throttle CLOSED and starter fuel OFF) to allow temperature to stabilize within limits. Do not exceed 40 seconds continuous starter application.

b. Fuel Main Switch — OFF.

c. EGT — NOTE for DECREASE.

Note

> After stopping the engine, a fuel pressure indication in excess of 30 psig may be observed due to the expansion of fuel trapped between the fuel control and fuel shut-off valve. This expansion is caused by heat radiating from the engine, resulting in fuel pressure indication. Check valves located in the fuel system relieve pressure exceeding 40 to 45 psig and permit fuel to bleed into fuel cells.

3-52. Before Leaving The Helicopter. Perform the following steps before leaving the helicopter:

a. All Electrical Switches — OFF.

b. Radio Switches — OFF.

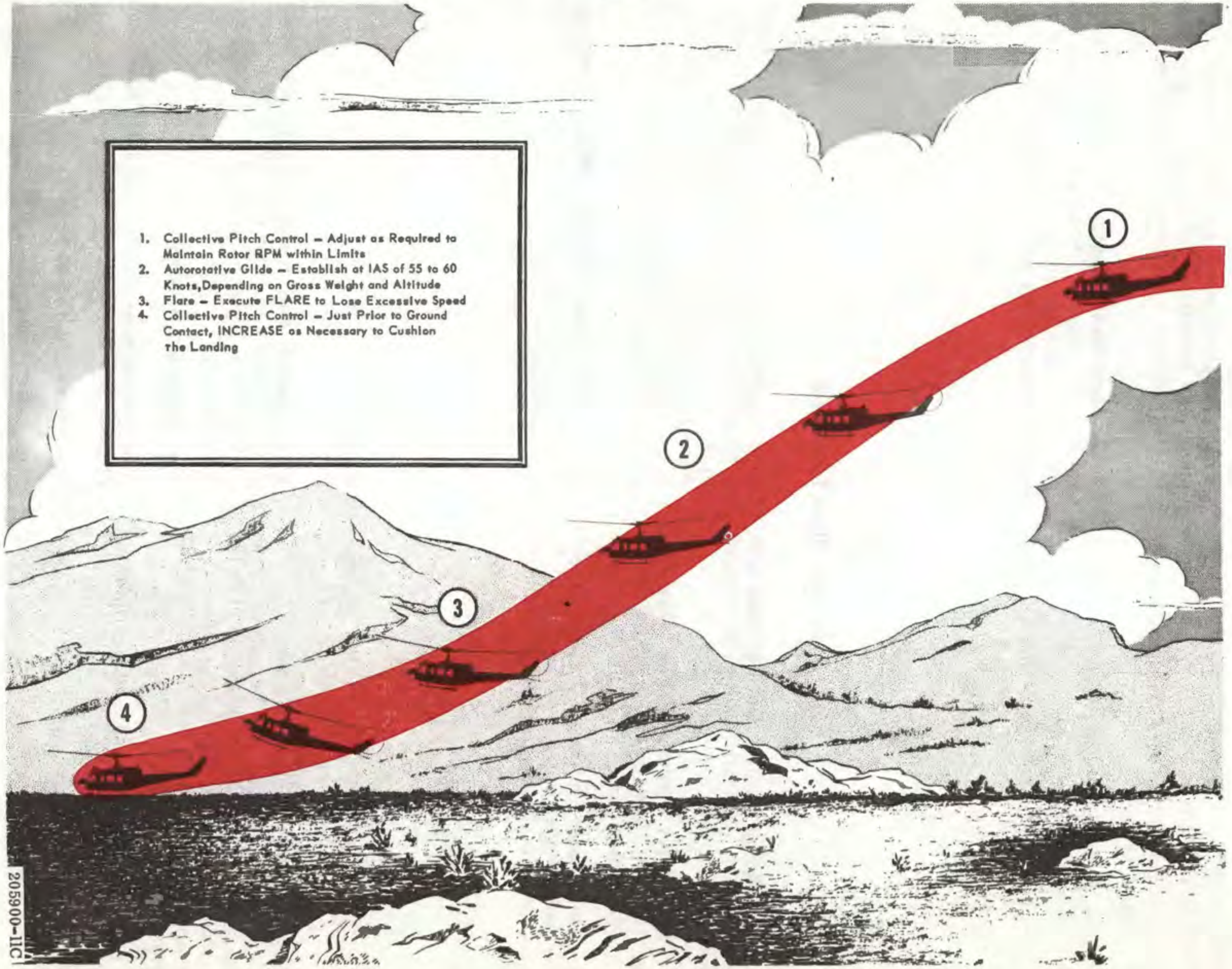
c. Collective Pitch Control — FULL DOWN and engage DOWN lock.

d. Secure aft main rotor blade with tie-down by drawing blade down lightly against static stop and tying web strap to the tail boom. Tie lower tail rotor blade to the vertical fin with web strap.

e. Exhaust Cover and Engine Inlet Cover — As required.

Note

In addition to the established requirements for reporting any system defects or unusual and excessive operations, the pilot will also make entries in DA Form 2408-13 to indicate when any limits in the Operator's Manual have been exceeded.



1. Collective Pitch Control – Adjust as Required to Maintain Rotor RPM within Limits
2. Autorotative Glide – Establish at IAS of 55 to 60 Knots,Depending on Gross Weight and Altitude
3. Flare – Execute FLARE to Lose Excessive Speed
4. Collective Pitch Control – Just Prior to Ground Contact, INCREASE as Necessary to Cushion The Landing

Figure 4-1. Approach and landing — power off

j. Gas Producer Tachometer — OBSERVE for engine START indication.

k. Fuel Start Switch — OFF at 400°C exhaust gas temperature

l. Starter-Ignition Switch — RELEASE at 35 to 42% rpm nI speed

m. Fuel Pressure Within Green Area — CHECK

n. Starter-Generator Switch — STBY GEN position

4-11. Engine Temperature Surge. If Engine temperature surge occurs during flight, the bleed air system shall be turned off. When operating at high power with DE-ICE switch ON, pilot shall closely observe exhaust gas temperature as overtemperature is possible.

4-12. Maximum Glide. A forward glide speed of (70 knots CAS for 44 foot rotor) and (94 knots TAS for 48 foot rotor) will result in obtaining maximum gliding distance (see figure 4-2).

Section III — Tail Rotor

4-13. Tail Rotor Failure During Take-Off. Close throttle immediately and accomplish an autorotational landing.

4-14. Tail Rotor Failure While Hovering Below 10 Feet. Close throttle immediately and accomplish an autorotational landing.

4-15. Tail Rotor Failure During Flight. Loss of anti-torque control will be evident by a loss of directional control. Maintain sufficient forward airspeed of at least 50 knots to insure a streamlined effect and maintain rotor RPM in the green. If altitude and terrain are adverse for immediate landing, the pilot should consider further powered flight to an area affording a safe autorotation running landing.

4-16. Tail Rotor Failure While Landing. Refer to paragraph 4-15, Tail Rotor Failure During Flight.

Section IV — Fire

4-17. Engine Fire During Starting. An engine fire during starting will be caused by an overloading of fuel in the combustion chamber and a delayed ignition of the fuel, resulting in flame emitting from the tailpipe. To extinguish fire, proceed as follows:

a. Throttle — CLOSE and continue to crank engine.

b. Fuel Main Switch — OFF.

(Deleted)

4-18. Engine Fire During Flight. Immediately on discovery of an engine fire during flight prepare for a power-off landing and accomplish the following:

a. Throttle — CLOSE.

b. Autorotative Glide — ESTABLISH and prepare for a power-off landing.

c. Fuel Main Switch — OFF.

d. Battery Switch — OFF.

e. Generator Switch — OFF, except when power is required to operate lights or avionic equipment.

4-24. Engine Fuel Control Malfunction. Malfunction or failure of the engine fuel control unit or nII governor will be evidenced by overspeeding nII rpm, underspeeding nII rpm, compressor stall, or flameout.

4-25. Overspeeding nII Governor (High RPM). In the event an overspeeding nII governor is evidenced perform the following steps:

a. Throttle — RETARD toward closed position sufficiently to control nII rpm.

b. Landing — ACCOMPLISH as soon as practical.

4-26. Underspeeding nII Governor (Loss of RPM). In the event an underspeeding nII governor is evidenced perform the following steps:

Warning

> When operating on EMERGENCY fuel system, the throttle must be manually adjusted to maintain engine rpm. Throttle movement shall be performed at a slow rate to minimize the possibility of compressor stall or flameout.

a. Collective — DOWN to maintain rotor rpm.

b. Throttle — RETARD to FLIGHT IDLE detent.

Note

> When above 10,000 feet, retard throttle to flight idle detent; when below 10,000 feet, retard until a reduction of nII rpm is noted.

c. Engine Fuel Governor Switch — EMERGENCY.

d. Throttle — ADVANCE slowly and firmly to obtain engine operating rpm.

4-27. Compressor Stall. If compressor stall occurs, perform the following steps immediately.

a. Reduce Power.

b. De-Ice Switch — OFF.

4-28. Flameout. If a flameout occurs, perform the following steps:

a. Engine Fuel Governor Switch — EMERGENCY.

b. If altitude Permits — INITIATE ENGINE RESTART DURING FLIGHT.

4-29. 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 ENGINE FUEL PUMP caution light to illuminate. The MASTER CAUTION light can be extinguished by positioning the CAUTION panel RESET/TEST switch to RESET. The ENGINE FUEL PUMP light will remain illuminated until the cause of the malfunction is corrected.

Section VI — Electrical System

4-30. Electrical Power System Failure. Complete failure of the electrical system is improbable because the primary DC power normally supplied by the main generator will be furnished by the standby generator or battery if the main generator fails. Evidence of generator failure will be provided by illumination of the DC GENERATOR fault light and the MASTER CAUTION light. If the generators have not failed, the circuits can be restored as follows: Push in on main GEN & BUS RESET and STBY GEN FIELD circuit breakers on overhead console; position MAIN GEN switch to RESET then to ON. DC GENERATOR fault light should extinguish. Push CAUTION panel switch to RESET to extinguish MASTER CAUTION light.

4-31. AC Inverter Failure. Failure of the main inverter will be evidenced by illumination of the MASTER CAUTION light and the INST INVERTER fault light located on the CAUTION panel. In the event of main inverter failure, check the MAIN INVTR PWR and INVTR CONT circuit breakers by pushing in. If main inverter power is not restored, position INVTR switch to SPARE ON.

Note

> Power output of the main and spare inverters is the same.

Section VII — Hydraulic System

4-32. Hydraulic System Failure. 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 movement. In the event of a hydraulic power failure, proceed as follows:

a. Hydraulic Control Circuit Breaker — IN.

b. Hydraulic Control Switch — ON (OFF if power is not restored).

c. Airspeed — ADJUST as desired to obtain most comfortable control movement level.

d. Landing — ACCOMPLISH as soon as practical.

Section VIII — Landing and Ditching

4-33. Emergency Descent. To perform an emergency descent, establish an autorotative glide at minimum airspeed of 55 knots for less than 7500 pounds gross weight, or to 60 knots for gross weight exceeding 7500 pounds. Refer to paragraph 4-9, Engine Failure During Flight.

Note

> When anticipating a crash landing or ditching (and the time permitting) locking of the shoulder harness provides an added safety precaution over that of the automatic lock. However, depending on pilot's seat adjustment and cockpit configuration, certain controls and switches may become inaccessible with the harness locked. Each pilot should determine for himself to what extent, in each type aircraft he flies, a locked shoulder harness would interfere with aircraft and systems control.

4-34. Emergency Landing. Emergency landings can be performed without undue difficulty, as they are accomplished in near the same manner as power-on landings. During final touchdown, reduce forward speed to desired touchdown speed for existing conditions.

4-35. Landing in Trees. 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.

4-36. At altitude sufficient for normal autorotation:

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

b. Execute a FLARE to attain ZERO ground speed at tree top level and allow the helicopter to descend vertically.

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

4-37. At altitude above tree tops with clearance to execute FULL FLARE, complete engine failure, normal airspeed.

Section X — Bail-Out

4-44. Bail-Out. 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:

a. Passengers — ALERTED.

b. Notification of Base — RADIO position.

c. Doors — RELEASE jettisonable doors, OPEN cargo doors as required.

d. Controls — SET to establish CRUISE forward speed with flight attitude slightly nose down.

e. When Ready — BAIL OUT through nearest exit.

CHAPTER 5
AVIONICS

Section I — General

5-1. Scope. This chapter covers the electronic equipment configuration in Army Models YUH-1D and UH-1D 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.

5-2. Nomenclature and Common Names. 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.

Table 5-1. Nomenclature and common names (Sheet 1 of 2)

NOMENCLATURE	COMMON NAME
*Radio Set AN/ARC-44	FM Liaison set
Receiver-Transmitter RT-294/ARC-44	FM receiver-transmitter
Control Panel SB-327/ARC-44	FM control panel
Signal Distribution Panel SB-329/AR	Signal distribution panel
Antenna AT-454/ARC	FM antenna
Antenna Group AN/ARA-31	Antenna group
*Radio Set AN/ARC-54	Radio set
Receiver-Transmitter RT-348/ARC-54	Receiver-transmitter
Control Panel C-3835/ARC-54	Control panel
Antenna and Coupler AT-765/ARC-54	FM antenna and coupler
Antenna Group AN/ARA-56	Antenna group
Indicator ID-453/ARN-30	Course indicator
*Radio Set AN/ARC-55	UHF command set
Receiver-Transmitter RT-349/ARC-55	UHF receiver-transmitter
Control Panel C-1827/ARC-55	UHF control panel
Antenna AT-1108/ARC	UHF/VHF antenna
*Radio Set AN/ARC-51X	UHF radio set
Receiver-Transmitter RT-702/ARC-51X	Receiver-transmitter
Control Panel C-4677/ARC-51X	Control panel
*Radio Set AN/ARC-51BX	UHF radio set
Receiver-Transmitter RT-742/ARC-51BX	Receiver-transmitter
Control Panel C-6287/ARC-51BX	Control panel
Radio Set AN/ARC-73	VHF command set
Receiver 51X-2B	VHF receiver
Transmitter 17L-7A	VHF transmitter
Control Panel 614U-6	VHF control panel
Transmitter T-366 ( )/ARC	Emergency VHF transmitter
Control Panel C-80B	Emergency VHF control panel

Table 5-1. Nomenclature and common names (Sheet 2 of 2)

NOMENCLATURE	COMMON NAME
Receiving Set AN/ARN-30E	VHF navigation set
Receiver R-1021/ARN-30D	VHF receiver
Signal Data Converter CV-265A/ARN-30A	Converter
DMN4-4 Antenna	Omni antenna
Control Panel C-3634A/ARN-30D	VHF navigation control panel
Indicator ID-453/ARN-30	Course indicator
Radio Receiver AN/ARN-59	Direction finder set
Receiver R-836/A	ADF receiver
Control Panel C-2275/ARN-59	ADF control panel
Indicator ID-998/ASN	Bearing-heading indicator
Antenna AT-780/ARN	Loop antenna
Antenna 205-075-325	Sense antenna
Transponder Set AN/APX-44	Transponder set
Receiver-Transmitter, radar RT-494/APX-44	Receiver-transmitter
Transponder Set Control C-2714/APX-44	Control panel
Antenna AT-884/APX-44	Antenna
Radio Receiver R-1041 ( )/ARN	Marker beacon receiver
Receiving Set - AN/ARN-82	VOR/LOC navigation set
Receiver R-1388/ARN-82	VOR/LOC receiver
DMN4-4 Antenna	Omni antenna
Control Panel C-6873/ARN-82	NAV-COMM control panel
Indicator ID-1347/ARN-82	Course indicator
ADF Receiving Set AN/ARN-83	Direction finder set
Receiver R-1391/ARN-83	ADF receiver
Control Panel C-6899/ARN-83	ADF control panel
Indicator ID-998/ASN	Bearing-heading indicator
AS-1863/ARN-83	Loop Antenna
Antenna 205-075-325	Sense Antenna

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

Section II — Description and Data

5-3. Purpose and Use. The purpose and use of the communication and navigation equipment installed in the UH-1D helicopter is described in the following paragraphs:

5-4. ***FM Liaison Set AN/ARC-44.*** The FM Liaison Radio Set provides the pilot and copilot with two-way communication between their aircraft and ground stations and between other aircraft. Communication with armored, artillery, and infantry units in the field is also provided within the frequency range of 24 to 51.9 megacycles (mc) on 280 preset channels. The distance range is limited to line of sight up to distances of approximately 50 miles.

5-5. 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 mc.

5-6. 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 the pilot, copilot, and medical attendant and is also used for monitoring the communication and navigation receivers singly or in combination.

5-7. Signal Distribution Panel C-1611A/AIC. Signal Distribution Panel C-1611A/AIC is a transistorized unit which provides the same functions that are provided by the SB-329/AR Panel. (Refer to paragraph 5-6.) 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.

5-7A. Beginning with ship No. 64-13662 and subsequent helicopters, four C-1611A/A1C 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 C1611A/A1C 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 5-57 for description of the operating controls on the panel and paragraph 5-79 for operation.

5-8. UHF Command Set AN/ARC-55B. The ARC-55B Command Set provides two-way amplitude-modulated voice radio communication between aircraft in flight, aircraft and ship, and aircraft and ground stations. Transmission and reception is provided on any one of 1750 channels, in the band of 225.0 to 399.9 megacycles. Channel selection is manual and the guard frequency may be monitored.

5-9. UHF Command Set AN/ARC-51()X. 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 megacycles (mc). The ARC-51X provides 1750 channels and tunes in 0.1 mc increments. The ARC-51BX tunes in 0.05 mc 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 between aircraft in flight, aircraft and ground, or aircraft and surface ships when such installations are equipped with similar UHF equipment. Transmission and reception are conducted on the same frequency with the use of a common antenna.

5-10. FM Radio AN/ARC-54. Radio Set AN/ARC-54 is an FM radio that provides the aircraft crew with two-way voice communications between aircraft and ground stations within the frequency range of 30 to 69.9 megacycles. 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.

5-11. VHF Command Set. The VHF Command Set AN/ARC-73 is an alternate set for the UHF radio. The set provides air-to-air and air-to-ground 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 mc in 50 kc increments to any one of the 720 available channels. The transmitter may be tuned within its frequency range of 116.00 to 149.95 mc in 50 kc 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.

5-12. *Emergency VHF Transmitter.* 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.

5-13. *HF AM/SSB Radio Set.* The AN/ARC-102 is a High Frequency (HF) Single Side Band (SSB) transceiver which transmits and receives in the 20 to 30 megacycle frequency range. The set tunes in 1 kc steps to any one of 28,000 manually selected frequencies. The set provides long range communications to airborne, portable mobile or fixed stations. The primary mode of operation is SSB, however the ARC-102 can also transmit and receive a ompatible AM signal.

5-14. *VHF Navigation Receiver.* The VHF navigation receiver provides for reception of 190 VHF channels whose frequencies are all the 0.1 mc steps between 108.00 mc and 126.90 mc. This permits reception and interpretation of VHF omnidirectional 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 VOR or a localizer station.

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

5-14A. *Navigation Receiver — AN/ARN-82.* 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 kc 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 — mc frequencies between 108.00 mc and 112.0 mc. 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 5-14 (refer to paragraph 5-14).

5-15. *Direction Finder Set.* The direction finder set is a radio compass system designed to provide automatically, a visual indication of the directon from which an incoming radio-frequency (RF) signal is received. It provides for aural reception of AM signals in the 190 to 1,750 kc frequency range. It may also be used for homing and position fixing or as a manually operated direction finder.

5-15A. *Direction Finder Set — AN/ARN-83.* 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 KC. 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.

5-16. *Gyro Magnetic Compass.* The gyro magnetic compass is a direction sensing system which provides a visual indication of the magnetic heading of an aircraft with respect to the magnetic meridian and/or horizontal component of the earth's magnetic field. The information which the system supplies may be used for navigation and to control the flight path of the aircraft. The system may also be used as a free gyro in areas where the magnetic reference is unreliable.

5-17. *Marker Beacon Receiver.* 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.

5-18. *Transponder Set.* Transponder Set AN/APX-44 receives, decodes and responds to interrogations of the Mark X Identification Friend or Foe (IFF) System, to the interrogations 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.

5-19. 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.

5-20. 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

5-21. 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.

5-22. *AN/APX-68 Transponder.* (Information not available at this time.)

5-23. Technical Characteristics. The technical characteristics of the electronic equipment installed in the helicopter are listed in the paragraphs 5-24 through 5-33. Table 5-2 is a complete listing of the communication and associated electronic equipment that may be installed in the helicopter.

5-24. *Technical Characteristics of FM Liaison Set AN/ARC-44.*

Frequency range	24.0 to 51.9 mc.
Number of channels and spacing	280 channels, spaces 100 kc.
Modes of operation	FM voice, or homing.
Type of modulation	Frequency.
Distance range	50 miles (average conditions).

5-25. *Technical Characteristics of FM Liaison Set AN/ARC-54.*

Frequency range	30.00 to 69.95 mc.
Number of channels and spacing	800 channels, spaces 50 kc.
Modes of operation	FM voice or homing.
Type of modulation	Frequency.
Distance range	80 miles (average conditions).

5-26. *Technical Characteristics of UHF Command Set AN/ARC-55B.*

Frequency range	225.0 to 399.9 mc.
Number of channels and spacing	1750 channels, spaces 100 kc.
Modes of operation	AM voice.
Type of modulation	Amplitude.

Table 5-2. Communications and associated electronic equipment (Sheet 1 of 2)

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 mc	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 mc	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 within 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 mc	Line of sight or 50 miles average conditions	Pedestal	The AN/ARC-73 is used as an 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 mc		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

Table 5-2. Communications and associated electronic equipment (Sheet 2 of 2)

FACILITY	NOMENCLATURE	USE	RANGE	LOCATION OF CONTROLS	REMARKS
FM homing	Antenna Group AN/ARA-31 used with AN/ARC-44 or AN/ARA-56 used with AN/ARC-54	Homing on FM transmission within frequency range of 24 to 49 mc	Line of sight or 50 miles average conditions	Pedestal	The FM liaison set must be operated while homing
VHF navigation (VOR, VAR, LOCALIZER)	Radio Receiver AN/ARN-30E or AN/ARN-82	VHF navigational aid and VHF audio reception in the frequency range of 108 to 126 mc	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 kc	50 to 100 miles range signals 100 to 150 miles broadcast	Pedestal	
Magnetic heading indications	J-2 Gyro Magnetic Compass	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	

c. The homing antenna consists of four antenna elements and two impedance matching networks installed forward of the nose section of the helicopter. Data provided by the homing facility is displayed visaully on the course indicator, which is mounted on the instrument panel.

5-40. *UHF Command Set AN/ARC-55B.* 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 28-volt 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 5-58 and see figure 5-6.

b. The UHF antenna (see 2, 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.

5-41. *Radio Set AN/ARC-51X.* The ARC-51X Radio Set includes a receiver-transmitter and mount installed in the nose, a remote control

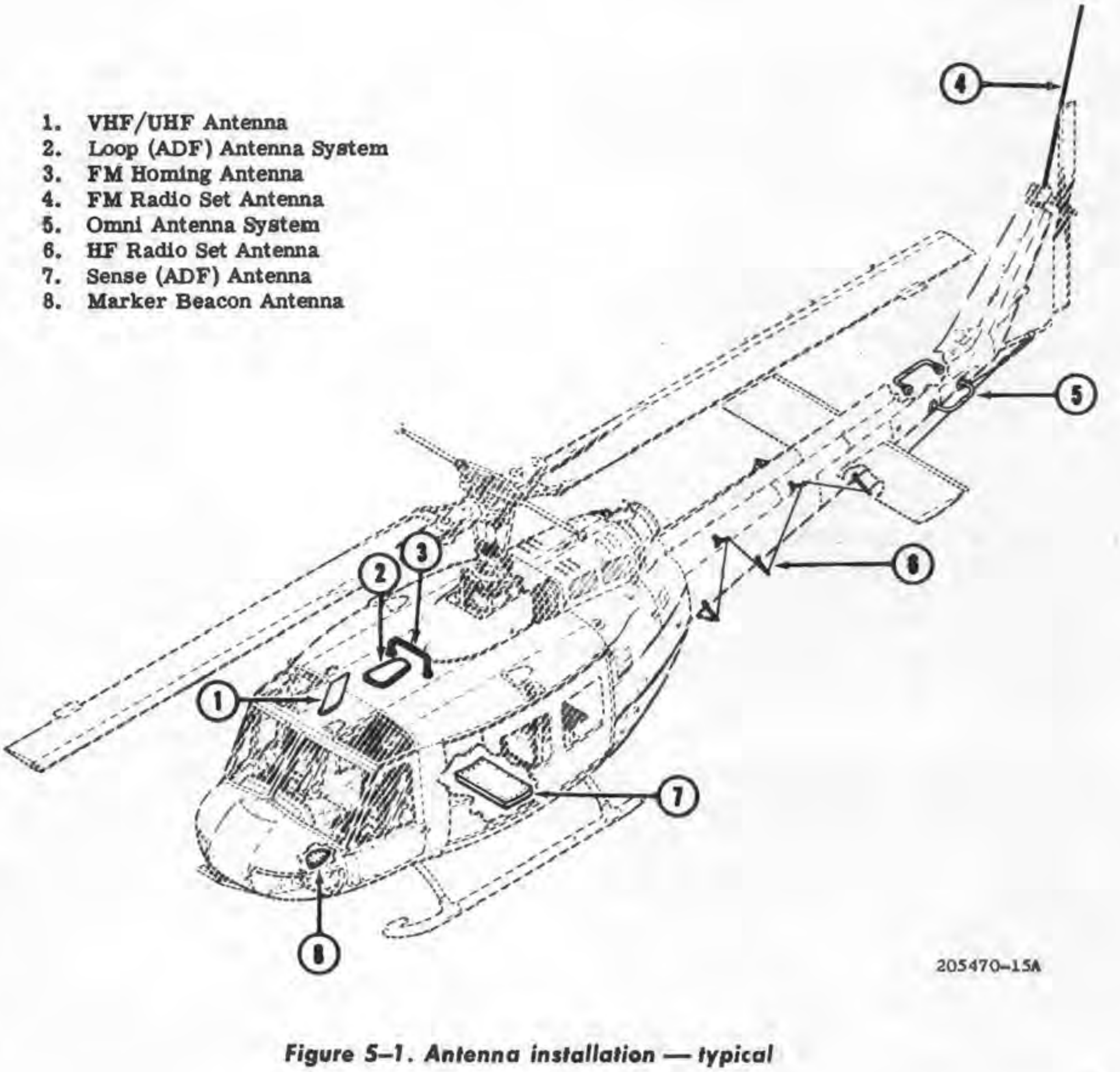


Figure 5-1. Antenna installation — typical

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 power supply. The receiver-transmitter is controlled from the UHF remote control panel installed in the pedestal. For discription of the control panel refer to paragraph 5-60 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 5-40b for description.

5-42. Radio Set AN/ARC-51BX. The ARC-51BX is similar to the ARC-51X (refer to paragraph 5-41) in purpose, operation and appearance. The receiver-transmitters differ in internal electrical circuitry only. The control panels differ as follows:

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 preset 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 5-60 and 5-61 for description of the panels also see figures 5-8 and 5-9.

5-43. Radio Set AN/ARC-73. The VHF Radio Set AN/ARC-73 consists of a receiver, transmitter, dual mount, remote control panel, VHF antenna, and interconnecting 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 5-62 and see figure 5-10. The VHF antenna and UHF antenna are contained in the same housing. Refer to paragraph 5-40b.

5-44. Radio Set AN/ARC-102. 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 5-65; also see figure 5-13. Primary power to operate the receiver-transmitter is supplied from the helicopter 28 volt 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.

5-45. VHF Navigation Receiver. 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) a remote control panel mounted in the pedestal, (refer to paragraph 5-66 and see figure 5-14) and a course indicator mounted on the instrumen panel (refer to paragraph 5-67 and see figu 5-15).

5-45A. Navigation Receiver — AN/ARN-82. **The** AN/ARN-82, navigation system consists of receiver and mount, a remote control panel, 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 DMN4-4 antenna installed on the aft tailboom (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 5-66A, and see figure 5-14A.

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 5-67A, and see figure 5-15A. For description of the bearing-heading indicators refer to paragraph 5-69, and see figure 5-17.

5-46. *Direction Finder Set*. The direction finder set consists of a receiver, a control unit, a power unit, a loop antenna 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. Tuning of the receiver is accomplished through a flexible mechanical linkage that connects the receiver and remote control unit. For description of the control unit refer to paragraph 5-68 and see figure 5-16.

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 3, figure 5-1) is enclosed in a streamlined housing and is installed on top of the cabin roof. The sense antenna (see 7, 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 (see figure 5-17) and the copilot's bearing-heading indicator. For further description of the bearing-heading-indicators refer to paragraph 5-69.

5-46A. *Direction Finder Set — AN/ARN-83.* 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 5-68A and see figure 5-16A.

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 7, 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 bearing-heading indicators and aurally through the intercom system. For further description of the bearing-heading indicators refer to paragraph 5-69, and see figure 5-17.

5-47. *Transponder Set AN/APX-44.* 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 5-71 and see figure 5-18. Power to operate the transponder set is supplied from the helicopter 28 volt power supply system.

b. The antenna used with the transponder set is a lightweight blade type. It is installed beneath the nose section of the helicopter.

5-48. *Marker Beacon Receiver.* 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 power supply.

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 applies power to the receiver and adjusts the audio level. The sensitivity switch controls 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 (see 8, 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 transmitted by ground transmitter.

5-49. *Gyro Magnetic Compass.* The J-2 Gyro Magnetic Compass System consists of a remote compass transmitter, directional gyro control, slaved gyro magnetic compass amplifier, two heading indicators 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 in relation to the position of the gyro, and the earth's magnetic meridian 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 5-69, and see figure 5-17.

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.

5-50. *Emergency VHF Transmitter*. 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 5-63, and see figure 5-11. Power to operate the transmitter is supplied from the helicopter 28-volt dc system.

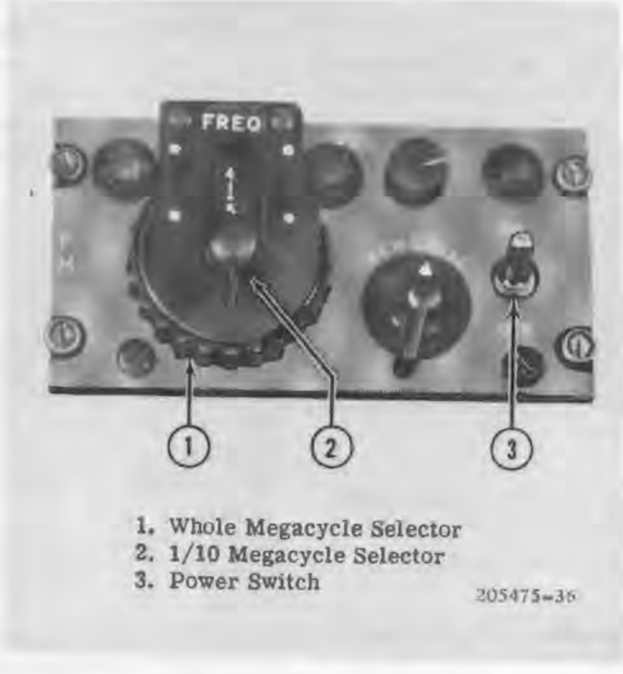
5-51. *Communications Junction Box*. The communications junction box is mounted on the aft end of the pedestal. It consists of two terminal blocks, a connector and an impedance matching network. The junction box is an interconnecting, distributing and impedance matching junction point for communication and navigation circuits.

5-52. *Radio Transmit, ICS Trigger Switch*. 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.

5-53. A foot operated switch (see 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 signal distribution panel.

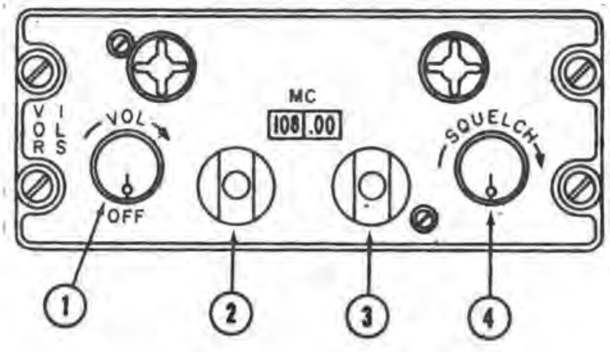
Section III — Operating Controls

5-54. FM Control Panel SB/327-ARC-44. 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:



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

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



1. Volume - Off Control
2. Megacycle Control (First Three Digits)
3. Fractional Megacycle Control (Fourth and Fifth Digits)
4. Squelch Control

47710-51

Figure 5-14. VHF navigation receiver control panel

CONTROL	FUNCTION
VOL-OFF switch	Clockwise rotation applies power to the VHF receiver, further clockwise rotation increases the audio output of the receiver. Extreme counterclockwise position turns off power to VHF receiver.
SQUELCH control	Controls receiver squelch circuit. Clockwise rotation decreases receiver noise.
Whole megacycle channel selector switch	This is the control on the left side. It permits selection of the desired frequency in 1-mc steps between 108 mc and 126 mc. The selected frequency is displayed on the left side of the dial.
Fractional megacycle channel selector switch	This is the control on the right side. It permits selection of the desired frequency in 0.1-mc steps, between 0.0 mc and 0.9 mc. Frequency selection is displayed on the right side of the dial.

5-66A. Navigation Control Panel C-6873/ARN-82. The C-6873/ARN-82 Control Panel (see figure 5-14A) 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:

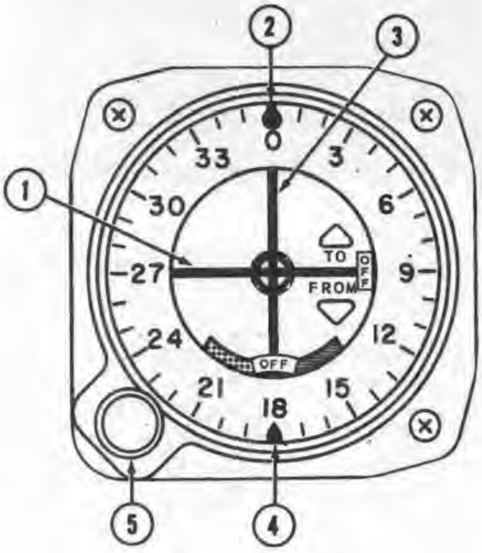
CONTROL	FUNCTION
VOL control	Adjusts audio level of the receiver.
Power switch	OFF position — turns power off. PWR position — turns power ON. TEST position — disables squelch.
Whole megacycle channel selector knob	This is the control knob on the left side. It is used to select the whole megacycle number of the desired frequency.
Fractional megacycle channel selector knob	This is the control knob on the right side, It is used to select the fractional megacycle number of the desired frequency.

Figure 5-14A. Navigation control panel C-6873/ARN-82

5-67. Course Indicator. The course indicator (see figure 5-15) 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. The indicator consists of six indicating elements and one control knob. The function of the indicators and control are as follows:

INDICATOR OR CONTROL	FUNCTION
Course Selector Knob	Selects desired magnetic bearing of helicopter, relative to VOR station being received. Its setting is indicated by position of course pointer on selector dial. Helicopter is at bearing selected when vertical pointer is centered.

INDICATOR OR CONTROL	FUNCTION
Course pointer	Indicates magnetic bearing selected by operation of course selector knob. When vertical pointer is centered, helicopter is flying magnetic bearing indicated by course pointer.
Reciprocal pointer	Indicates the magnetic bearing which is 180° out of phase with the bearing selected with the course pointer.
OFF vertical flag	Indicates that VHF navigation receiver is tuned to VOR or localizer station frequency of usable signal strength by moving out of view. The OFF vertical flag also indicates the sufficiency of AN/ARC-54 signal being received in the homing mode.
OFF horizontal flag	Indicates sufficiency of signal being received via AN/ARC-54 in homing mode.
TO - FROM meter	Indicates TO when helicopter is flying towards VOR station being received; indicates FROM when helicopter is flying away from VOR station being received.
Vertical pointer	Indicates whether or not helicopter is flying on selected course. Vertical pointer is centered on VOR operation when helicopter is flying magnetic bearing indicated by position of course pointer. Vertical pointer is centered in localizer operation when the helicopter is flying on the runway centerline. The vertical pointer also indicates whether or not the helicopter is on course when using the homing facility of the AN/ARC-54.
Horizontal pointer	Indicates when helicopter is over station when using the homing facility of the AN/ARC-54.



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

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Figure 5-15. Course indicator

5-67A. Course Indicator—ID-1347/ARN-82. The course indicator (see figure 5-15A) used with the AN/ARN-82 system is installed in the instrument panel. The purpose of the indicator is to present a visual indication of deviation of the aircraft from a selected course. The data presented on the indicator may be localizer signals from a ground station for making a localizer approach or VOR signals for maintaining a selected course. The data presented on the course indicator is from the AN/ARC-54, FM Receiver when the mode selector switch is in the HOME position. The function of the control knob and indicators in the course indicator are as follows:

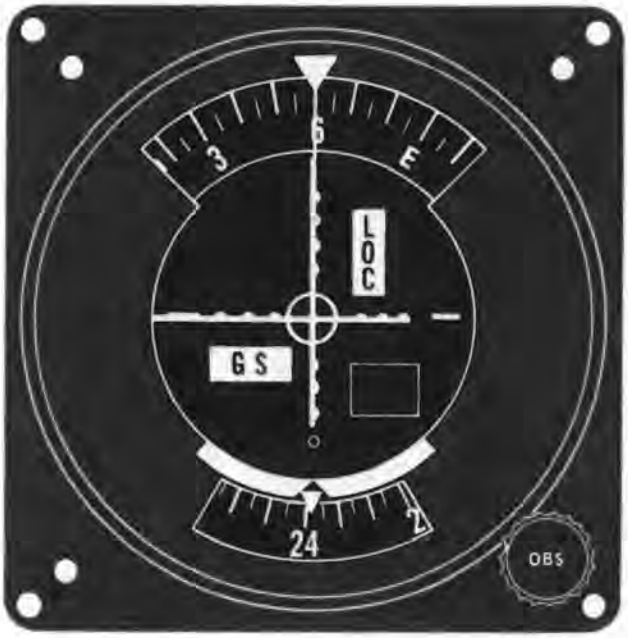

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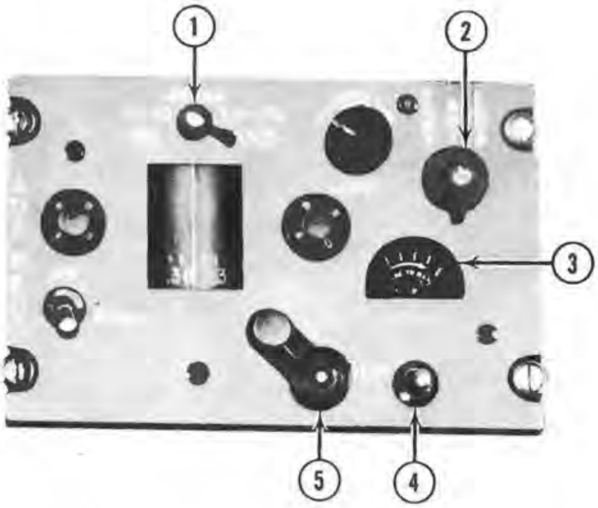
Figure 5-15A. Course indicator — ID-1347/ARN-82

INDICATOR OR CONTROL	FUNCTION
OBS control knob	The OBS (omnibearing selector) is a manually variable selector on which the desired course is selected. Helicopter is flying on the selected course when the vertical needle or CDI (Course Deviation Indicator) is centered.
Course deviation indicator (CDI)	The VOR/localizer CDI indicates the direction of deviation and amount of deviation from the selected VOR course or localizer path. When the AN/ARC-54 is operating on the HOME mode the CDI is automatically switched to inputs from the AN/ARC-54.
TO-FROM indicator	Indicates TO when the helicopter is flying within the 180 degree semicircle centered about the direction selected on the course selector. Indicates FROM when the helicopter is within the 180 degree semicircle centered about the reciprocal of the selected course direction.

Warning flags The VOR/localizer warning flag appears when the VOR or localizer signal, or FM signal in HOME mode is unreliably weak or when a malfunction develops in the navigation receiver or FM receiver in HOME mode. The horizontal needle warning flag should function only when the FM, AN/ARC-54 is being used in HOME mode. When the AN/ARN-82 is being used the red flag for the horizontal needle will not disappear from view.

5-68. Direction Finder Control Panel. The direction finder control panel (see figure 5-16) is marked ADF REC. The control panel is located in the pedestal and is used to control the AN/ARN-59 receiver. The controls and indicators located on the panel and their functions are as follows:



1. Band Switch
2. Function Switch
3. Tuning Meter
4. Loop Switch
5. Tuning Crank

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Figure 5–16. ADF control panel

CONTROL	FUNCTION
MC BAND switch	Selects the desired frequency band.
VOL-OFF control	Turns direction finder set on or off. Adjusts receiver audio level when function switch is in COMP position. Adjusts receiver RF sensitivity when function switch is in ANT or LOOP position.
Function switch	COMP position — Receiver operates on combined loop and sense antennas as a radio compass.
	ANT position — receiver operates with sense antenna. Loop position — receiver operates with loop antenna.
LOOP switch	Positions the loop antenna when the function switch is in either COMP or LOOP position.
Tuning crank	Tunes the receiver to the frequency of the received signal.
Tuning meter	Facilitates accurate tuning of the receiver.
BFO switch	Turns BFO ON or OFF.

5-68A. Direction Finder Control Panel — C6899/ARN-83. The C-6899 control panel (see figure 5-16A) is marked ADF, and is located in the pedestal. The control panel is used to control the AN/ARN-83 receiver, and to select and control the loop antenna and sense antenna. The controls and indicators located on the panel and their functions are as follows:

CONTROL	FUNCTION
Band selector switch	Selects the desired frequency band.
TUNE control	Selects the desired frequency.
Tuning meter	Facilitates accurate tuning of the receiver.
GAIN control	Adjusts audio level when mode selector is in ANT or LOOP position.
Mode selector switch	Turns set OFF and selects ADF, ANT and LOOP modes of operation.
LOOP L-R switch	Controls audio level when mode selector is in ANT or LOOP position.
BFO switch	Turns BFO, on or off.

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Figure 5-16A. Direction finder control panel — C6899/ARN-83

5-69. Bearing-Heading Indicator. Two bearing-heading indicators are installed in the instrument panel (see figure 5-17 for illustration of the pilot's bearing-heading indicator). The copilot's indicator (not shown) is a repeater type instrument similar to pilot's indicator except that it does not have a set heading knob or a heading synchronization knob. The moving type dials on both indicators display the gyro magnetic compass heading. The No. 1 (single bar) pointers display the radio magnetic bearing from the direction finder set. The No. 2 (double bar) pointers display the bearing of the station being received on the VHF navigation receiver. The controls located on the bearing-heading indicators and their functions are as follows:

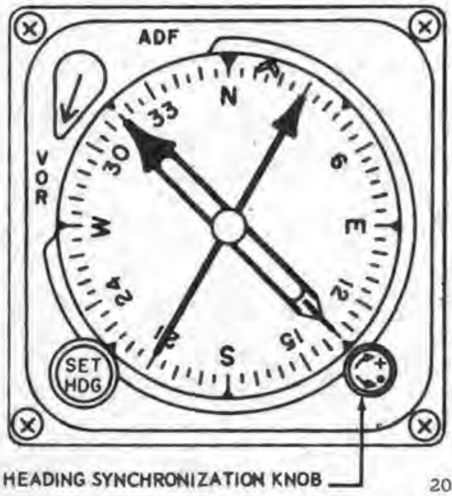

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Figure 5-17. Bearing-heading indicator

CONTROL	FUNCTION
Heading synchronization knob	This is the knob in the lower right corner of the indicator, it is used to synchronize the dials when two indicators are used.
SET HDG knob	This knob is marked SET HDG and is in the lower left corner of the indicator. Turning the knob drives a selector pointer around the heading dial. The circuit is not connected, but the SET HDG pointer can be used as a heading reminder.
VOR-ADF knob	This switch is to be used when two VOR and one ADF units are installed. This installation has one VOR and one ADF unit and the VOR - ADF switch shall be set to ADF at all times. Setting switch to VOR will result in no display on pointer No. 1.

5-70. Marker Beacon Controls. The marker beacon receiver controls (see 41 and 43, figure 2-5) are located on the lower right section of the instrument panel. The control and indicators and their functions are as follows:

5-80. AN/ARC-54 Operation. The operating procedures for voice transmission and reception, the homing operation and stopping procedure for the AN/ARC-54 FM Liaison Set are presented in the following steps:

a. Check that helicopter master power is on.

b. Check that ARC-54 and C-1611A circuit breakers are in.

c. Set the mode selector switch to PTT.

d. Adjust frequency control knobs to select the desired operating frequency.

Note

> A channel changing tone should be heard in the headset while the radio set is tuning. When the tone stops the radio set is tuned.

e. Set the VOL control on the FM panel to mid-position.

f. Set the SQUELCH control to CARR or as required.

g. To monitor the FM receiver set No. 1 of RECEIVERS switches on the INT panel to Up position.

h. Adjust VOL on INT panel to a comfortable level.

i. To transmit set the transmit-interphone selector switch on the INT panel to No. 1 position.

j. After a three minute warmup, depress the cyclic stick trigger switch to the second detent, or depress the foot switch, and speak into the microphone. Note that sidetone is heard in the headset.

5-81. *Homing Operation.* The procedure for operating the AN/ARC-54 Radio Set in the homing mode is presented in the following steps:

a. Perform steps a. and b. paragraph 5-80.

b. Set the mode selector switch to HOME.

c. Adjust the frequency controls to the frequency of the homing station. The sufficiency of the signal will be indicated by the disappearance of the flags in the course indicator.

d. Set the SQUELCH control to CARR or as required.

e. Fly the course that keeps the vertical pointer of the course indicator in the center of the indicator scale. To insure that the aircraft is not heading away from the station, change the heading slightly and note that the course indicator vertical pointer deflects in the direction of the turn.

f. Over-the-station position is indicated by the course indicator horizontal pointer.

5-82. *Stopping Procedure — AN/ARC-54.* When the equipment is not needed set the mode control on the control panel to OFF.

5-83. AN/ARC-55B Operation. The operating procedure for operation of the ARC-55B UHF Command Set is outlined in the following steps:

a. Check that helicopter master power is on.

b. Check that the ARC-55B circuit breaker is in.

c. Position selector switch on UHF control panel to T/R or T/R+G REC as required.

d. Rotate frequency controls to select the desired frequency.

e. To monitor UHF receiver position RECEIVERS switch No. 2 to up position.

f. Set VOL-SENS controls as desired.

Note

> No transmission will be made on emergency (distress) frequency channels except for actual emergency purposes in order to prevent transmission of messages that could be construed as actual emergency call messages.

g. To transmit set transmit-interphone switch on signal distribution panel to position 2.

h. Depress trigger switch on cyclic stick, or depress foot switch and speak into the microphone.

5-84. *Operation on Guard Frequency.* A completely separate guard channel receiver is provided in the equipment to continuously monitor the guard frequency while operating on the main channel. To operate on the guard frequency proceed as follows:

a. To energize the guard receiver position the function switch to T/R+G REC position and operate the equipment as described in paragraph 5-83.

b. To transmit on the guard frequency perform steps a. and b. in paragraph 5-83.

c. Position function switch to T/R position.

d. Rotate the channel selector to select the assigned guard frequency.

e. Depress cyclic stick trigger switch to second detent, or depress foot switch and speak into microphone.

5-85. *Stopping Procedure — AN/ARC-55B.* When the equipment is not needed set the selector switch to OFF position.

5-86. AN/ARC-51X Operation. The operating procedure for the ARC-51X UHF Command Set is outlined in the following steps:

a. Check that helicopter master power is on.

b. Check that ARC-51X and C-1611A circuit breakers are in.

c. Set the function select switch to T/R or T/R+G to select the desired type of operation.

d. Allow the radio set to warm up for five minutes.

e. Rotate megacycle controls to select the desired frequency.

f. Position No. 2 RECEIVERS switch on the signal distribution panel to up position.

g. Adjust SENS and VOL controls for a comfortable level.

h. To transmit set the transmit-interphone selector switch to position 2.

i. Depress the foot switch or cyclic stick trigger switch and speak into the microphone.

5-87. *AN/ARC-51X Guard Frequency Operation.* The operation of the ARC-51X on the guard frequency is the same as the procedure outlined in paragraph 5-86, except, the function select switch must be in the T/R+G position, and the megacycle controls must be tuned to the assigned guard frequency.

5-88. *Stopping Procedure.* To turn the ARC-51X off, rotate the function select switch to OFF position.

5-89. AN/ARC-51BX Operation. The operating procedure for the ARC-BX UHF command set is outlined in the following steps:

a. Check that helicopter master power is on.

b. Check that the ARC-51BX and C-1611A circuit breakers are in.

c. Set the function select switch to T/R or T/R+G as required.

d. Set the mode selector switch to PRESET CHAN and allow set to warm up for five minutes.

e. To monitor the UHF receiver, position RECEIVERS switch No. 2 to UP position.

f. Rotate PRESET CHAN control to select desired preset frequency. Note 800-cps audio tone in headset during channel changing cycle.

g. Set SQ DISABLE switch to ON.

h. Adjust VOL control to a comfortable level.

i. To transmit set the transmit-interphone selector switch to position 2.

j. Depress foot switch or cyclic stick trigger switch and speak into the microphone.

5-90. *AN/ARC-51BX Guard Frequency Operation.* To transmit and receive on the guard frequency set up the equipment as outlined in paragraph 5-89, steps a, b, and c. Set the mode selector switch to GD XMIT to tune automatically t the guard frequency. Complete steps g, h, and j in paragraph 5-89.

5-91. *Stopping Procedure.* To turn the ARC-51BX off, rotate the function select switch t OFF position.

5-92. VHF Command Set Operation. The operating procedure for the VHF Command Set is outlined in the following steps:

a. Check that helicopter master power is on.

b. Check that ARC-73 and C-1611A circuit breakers are in.

c. Set the POWER switch on the VHF control panel to ON position and allow set to warm-up.

d. Rotate megacycle and kilocycle selector knobs to select the desired operating frequency.

e. To monitor the VHF receiver, position RECEIVERS switch No. 3 to up position.

f. Adjust SQuelch and VOLume control knobs for a comfortable audio level.

g. To transmit set the transmit-interphone selector switch to position 3.

h. Depress foot switch or cyclic stick trigger switch, to second detent, and speak into the microphone.

i. To turn off the VHF command set, operate the POWER switch on the VHF control panel to OFF position.

5-93. Emergency Transmitter Operation. The operating procedure for the T-366/ARC Emergency Transmitter is outlined in the following steps:

a. Check that helicopter master power is on.

b. Check that VHF XMTR T-366 circuit breaker is in.

c. Rotate the transmit-interphone selector switch on the signal distribution panel to position 3.

d. Position the toggle switch or switches (pilot and copilot) on EMER COMM switch panel to down (STBY VHF) position.

Note

The EMER COMM panel is only used when the AN/ARC-44 fails.

e. Position the toggle switch on the emergency transmitter control panel to on position.

f. Rotate the frequency selector switch on the emergency transmitter control panel to the desired frequency.

g. Depress the foot switch or cyclic stick trigger switch and speak into the microphone.

h. To turn the emergency transmitter off, position the toggle switch on the control panel to OFF position.

5-94. HF Radio Set Operation. The operating procedure for the AN/ARC-102 HF Radio Set is presented in the following steps:

Warning

When ground testing ARC-102 equipment, be sure that personnel are clear of antenna. Serious burns can result if body contact is made with the antenna during ground testing.

a. Check that master helicopter power is on.

b. Check that ARC-102 circuit breakers are in.

c. Position the function selector switch to the desired mode of operation.

d. Rotate the frequency control knobs to select the desired frequency.

Note

If the function selector is moved from the OFF position to an operating mode and the desired operating frequency is already set up on the control panel, rotate the 10-kilocycle knob one digit off frequency and then back to the operating frequency. This will allow the system to retune to the frequency.

e. To monitor the HF receiver position RECEIVERS switch marked HF to up position.

f. Adjust RF SENS control and volume controls on HF control panel and signal distribution panel to a comfortable level.

g. To transmit set the transmit-interphone selector switch on signal distribution panel to HF position (refer to transmitter selector decal).

h. Depress foot-switch or cyclic stick trigger switch and speak into the microphone.

i. To turn the HF radio set off rotate the function selector switch to OFF position.

5-95. ***HF Radio Emergency Procedures.*** The HF radio has two built in protective devices that could cause the set to stop operating. The condition and corrective steps are as follows:

a. A protective circuit is designed to turn the receiver-transmitter off, when a short exists in the output circuit. To restore the receiver-transmitter to operation, move the function selector to OFF position and then back to the desired operating mode.

b. When the associated antenna coupler is required to complete several consecutive tuning cycles it may become overheated. In this event a thermal relay in the coupler unit is designed to turn off the receiver-transmitter. If the receiver-transmitter stops operating after a series of tuning cycles, position the function selector switch to OFF position, allow the thermal relay to cool for two minutes, and return the function selector to the desired operating mode.

c. If the above procedures do not return the HF radio set to normal operation, place the function selector in the OFF position and report the failure to the maintenance personnel.

5-96. VHF Navigation Receiver Operation.

The different modes of operation for the AN/ARN-30E VHF navigation receiver are presented in the following paragraphs.

5-97. ***Visual Omni Range Instructions.*** To operate the VHF receiver as a Visual Omni Range (VOR) receiver perform the following steps:

a. Rotate VOL-OFF control clockwise until a click is heard, indicating that the set is energized. Allow five minutes for set to warm up.

b. Rotate SQUELCH control knob full counterclockwise.

c. Turn selector knobs to select the desired frequency on the MC dials.

d. Ensure that the warning flag for the vertical pointer is out of sight.

Warning

> The warning flag for the vertical pointer is an indication of signal strength and reliability. Under no circumstances should navigation be attempted if the flag is visible or if the TO-FROM indicator remains blank.

e. Check to see that the TO-FROM indicator is operating properly.

f. Adjust SQUELCH control knob as desired.

5-98. ***VOR Operating Procedures.*** With the VHF navigation receiver tuned to a VOR station, information is provided to accomplish the following:

5-99. ***Determine Relative Bearing.*** To determine the relative bearing of the aircraft to the station being received accomplish the following:

a. Perform the starting procedure outlined in paragraph 5-97, identify the station.

b. Rotate the course selector knob on the course indicator until the vertical pointer is centered.

c. Read the heading to which the course pointer is pointing and note whether it is TO or FROM. This is the bearing of the aircraft relative to the station being received.

5-100. ***Intercept and Fly a Course To or From VOR Station.*** To intercept and fly a course to or from a VOR station accomplish the following:

a. Perform the starting procedure as outlined in paragraph 5-97.

b. Rotate the course selector knob on the course indicator until the course pointer points to the desired course to or from the station.

c. Check TO-FROM indicator for desired indications.

d. Turn the aircraft until its magnetic heading is flying toward the vertical pointer. Hold this heading until the vertical pointer starts to center. Adjust aircraft heading to keep vertical pointer centered.

Note

> If the aircraft heading and the desired course are about 180° apart, it indicates that the aircraft is heading in a direction opposite to the desired course. An attempt to fly toward the vertical pointer under this condition causes the vertical pointer to move still further left or right. To correct this situation, make a 180° turn and fly toward the vertical pointer.

5-101. ***Maintaining Course.*** If the course pointer is adjusted on course so that the TO-FROM indicator is reading TO going toward the station being received and FROM going away from the station being received, the steering rule to get back on course is as follows:

a. When the vertical pointer moves left then steer left.

b. When the vertical pointer moves right then steer right. These two steps are referred to as steering into the needle and is the same rule which should be followed on normal runway approaches on the localizers.

5-102. ***Passage over VOR stations.*** When the VHF navigation receiver is tuned to a VOR station passage over the station will be indicated by the following:

a. Increase in station identification.

b. Vertical pointer fluctuates from side to side.

c. Off flag may appear and disappear in rapid succession.

5-103. ***Runway Localizer Instructions.*** The procedure for making a runway localizer approach using the VHF navigation receiver is presented in the following steps:

a. Check that helicopter master power switch is on and ARN-30 circuit breaker is in.

b. Rotate VOL-OFF switch clockwise until a click is heard indicating receiver is energized, and allow receiver to warm up.

c. Rotate SQUELCH control knob full counterclockwise.

d. Turn megacycle channel selector knobs to select the desired frequency on the MC dials. The localizer function of the VHF navigation system is selected automatically whenever a localizer frequency appears in the MC dial, providing a full scale deflection for a lesser deviation from course line. Localizer frequencies are those ending in odd tenths of a megacycle from 108.1 to 111.9 megacycles inclusive.

e. Position NAV switch on the signal distribution panel up to on position.

f. Listen for the station call sign. Adjust audio and SQUELCH control. Note the identifying signal to make sure the proper station is tuned in. Be sure the course warning flag is out of sight on the course indicator.

g. Check position of the vertical pointer on the course indicator and begin flying toward the station.

h. Fly left if the vertical pointer on the course indicator is left of center; and a 150 cycle-per-second (cps) tone is heard in the interphone system (when used); fly right if the vertical pointer is right of center and a 90 cps tone is heard in the interphone (when used.)

Note

> When making a back course localizer approach, repeat the procedure used for the front approach except as follows: Fly left if the vertical pointer on the course indicator is right of center and a 90 cps tone is heard in the interphone (when used); fly right if the vertical pointer is left of center and a 150 cps tone is heard in the interphone (when used).

5-104. ***Operation as Communications Receiver.*** The procedure for operating the VHF navigation receiver as a communications receiver is outlined in the following steps:

a. Check that helicopter master power is on and ARN-30 circuit breaker is in.

b. Adjust the SQUELCH control to the full counterclockwise position.

c. Turn VOL-OFF switch clockwise until a click is heard, indicating set is energized. Allow five minutes for the receiver to warm up.

d. Rotate the channel selector controls to select the desired VHF communications frequency on the MC dials.

e. Position the NAV switch on the signal distribution panel up to on position.

f. Adjust VOL-OFF and SQUELCH controls for comfortable audio level.

g. To turn the VHF receiver off rotate the VOL-OFF control full counterclockwise to OFF position.

5-104A. Navigation Receiver — AN/ARN-82 — Operation. The different modes of operation for the AN/ARN-82 Receiver are outlined in the following paragraphs.

5-104B. VOR Instruction — ARN-82. To operate the ARN-82 Receiver as a Visual Omni Range (VOR) receiver perform the following steps:

a. Check that helicopter master power is on and ARN-82 and C-1611A — Circuit breakers are in.

b. Position power switch to PWR.

c. Rotate frequency selector knobs to select the desired frequency.

d. Position NAV switch on C-1611A/AIC panel up to on position.

e. Adjust VOL control for a comfortable level.

f. Ensure that course warning flag is out of sight.

Warning

> The course warning flag is an indication of signal strength and reliability. Under no circumstances should navigation be attempted if the flag is visible or if the TO-FROM indicator remains blank.

g. Check that the TO-FROM indicator is operating properly.

5-104C. VOR Operating Procedures — ARN-82. With the navigation receiver tuned to a VOR station information is provided to accomplish the following:

5-104D. Determine Relative Bearing. To determine the relative bearing of the aircraft to the station being received accomplish the following:

a. If the set is not operating perform steps a. through g. in paragraph 5-104B, and identify the station.

b. Rotate the OBS knob on the course indicator until the CDI is centered.

c. Read the heading to which the CDI is pointing and note whether it is TO or FROM. This is the bearing of the aircraft relative to the station being received.

5-104E. Intercept and Fly a Course To or From a VOR Station. To intercept and fly a course to or from a VOR station with the AN/ARN-82 installed accomplish the following:

a. If the set is not operating perform steps a. through g. in paragraph 5-104B.

b. Rotate the OBS knob on the course indicator until the desired course is selected.

c. Check the TO-FROM indicator for desired indications.

d. Turn the aircraft until its magnetic heading is toward the CDI. Hold this heading until the CDI starts to center. Adjust aircraft heading to keep CDI centered.

Note

> If the aircraft heading and desired course are about 180 degrees apart, it indicates the aircraft is heading in a direction opposite to the desired course. An attempt to fly toward the CDI under this condition causes the CDI to move still further left or right. To correct this situation, make a 180 degree turn and fly toward the CDI.

5-104F. Maintaining Course. If the course selector is adjusted so that the desired course is under the course index and the TO-FROM indicator is reading TO going toward the station being received and FROM going away from the station being received, the steering rule to get back on course is as follows.

a. When the CDI moves left, then steer left.

b. When the CDI moves right, then steer right. These two steps are referred to as flying into the needle and is the same rule which should be followed on normal runway approaches on the localizers.

5-104G. ***Passage Over VOR Stations.*** When the AN/ARN-82 Receiver is tuned to a VOR station, passage over the station will be indicated by the following.

a. Increase in station identification.

b. CDI fluctuates from side to side.

c. Off flag may appear and disappear in rapid succession.

5-104H. ***Runway Localizer Instructions—AN/ARN-82.*** To make a runway localizer approach using the AN/ARN-82 system, perform steps a. through f. paragraph 5-104B, and perform the following additional steps:

a. Listen for the station call sign, note the identifying signal to make sure the proper station is tuned in.

b. Check the position of the CDI on the course indicator and begin flying toward the station.

c. Fly left if the CDI on the course indicator is left of center and a 150 cycle-per-second (CPS) tone is heard in the headset (when used); fly right if the CDI is right of center and a 90 cps tone is heard in the headset (when used).

Note

> When making a back course localizer approach, repeat the procedure used for the front approach except as follows: Fly left if the CDI on the course indicator is right of center and a 90 cps tone is heard in the headset (when used); fly right if the CDI is left of center and 150 cps tone is heard in the headset when used.

5-104J. ***Operation of AN/ARN-82 as a Communications Receiver.*** To operate the AN/ARN-82 as a communications receiver perform steps a. through f. in paragraph 5-104B. To turn the set off position the selector switch to OFF.

5-105. Direction Finder Set Operation. The operating procedure for the AN/ARN-59 Direction Finder Set is outlined in the following steps:

a. Check that helicopter master power is on.

b. Check that ARN-59 and INT circuit breakers are in.

c. Turn the VOL control on the ADF REC control panel full clockwise and allow equipment to warm up.

d. Position the NAV switch on the signal distribution panel up to ON position.

e. Set the function switch on the ADF REC panel to ANT position.

Caution

> Tuning the direction finder set with the function switch in COMP position will result in premature wear or possible damage to the gear teeth of the loop antenna assembly.

f. Set the MC BAND switch to the desired frequency band and turn tuning crank until the desired frequency is indicated in the indicator window. Tune for maximum tuning meter reading if a signal is present.

g. Check station identification to be certain the desired station is being received.

h. Set the function selector switch to COMP.

Note

> If the signal strength is too weak for easy identification in the COMP position, switch to ANT position temporarily for identification purposes. Signal-to-noise ratio may be generally improved.

i. Ascertain that the bearing reading on the indicator is a reliable one as follows: Move the LOOP switch to the right and observe that the indicator pointer rotates clockwise. When the pointer has traveled 10 to 20 degrees, release LOOP switch and note action of indicator pointer. If operation is normal and a reliable signal is received, pointer will immediately return to original reading.

5-106. *Manual Operation of Direction Finder Set.* To operate the direction finder set manually, perform steps a. through d., in paragraph 5-105 and perform the following additional steps:

a. Set the function switch to LOOP.

b. Set the BAND switch to the desired operating band.

c. Turn the tuning crank to select the desired frequency.

d. Turn BFO switch ON.

e. Press the LOOP switch to the right or left and rotate loop until the tone drops to a minimum.

Note

> When using the loop antenna alone (LOOP position) for taking bearings, the pointer may be indicating the proper bearing or its reciprocal. Unless the aircraft position is known definitely, this ambiguity must be resolved to determine the bearing from the aircraft to the station.

5-107. *Operation of Direction Finder As A Low Frequency Range Receiver.* The operating procedure for operating the Direction Finder Set as an LF Range Receiver is outlined in the following steps:

a. Perform steps a. through f. paragraph 5-105.

b. Adjust VOL control for desired headset level.

Note

> When operating the direction finder as a range receiver, back off VOL control knob to obtain a comfortable audio level, because broadening may result at high audio levels.

c. To turn off the direction finder set rotate VOL control knob full counterclockwise to OFF position.

5-107A. *Direction Finder Set Operation — AN/ARN-83.* The operating procedure for the AN/ARN-83 Direction Finder Set is outlined in the following steps:

a. Check that helicopter master power is on.

b. Check that ADF, and INTERCOM circuit breakers are in.

c. Position band selector switch, on the ADF panel to the desired position.

d. Position the NAV switch, on the signal distribution panel up to the ON position.

e. Set the mode selector switch, on the ADF panel to ANT.

f. Rotate TUNE knob, on the ADF panel to select the desired frequency.

g. Adjust GAIN control for a comfortable level and identify the station.

h. Position mode selector switch to ADF.

5-107B. *Manual Operation of Direction Finder Set —AN/ARN-83.* To operate the ARN-83 Direction Finder Set manually, perform steps a. through d. in paragraph 5-107A, and perform the following additional steps:

a. Set the mode selector switch to LOOP and perform steps f. and g. in paragraph 5-107A.

b. Turn on BFO switch.

c. Position the LOOP L-R switch to the right or left until the tone drops to a minimum.

5-107C. Operation of Direction Finder AN/ARN-83, As An LF Range Receiver. The operating procedure for operating the ARN-83 as an LF range receiver or for receiving standard broadcasts is outlined in steps a. through g. in paragraph 5-107A. To turn the AN/ARN-83 off position the mode selector switch to OFF.

5-108. Marker Beacon Receiver Operation. The marker beacon on-off volume control switch and high-low sensing switch are located on the lower right corner of the instrument panel. The operating procedure is outlined in the following steps:

a. Check that helicopter master power is on.

b. Check that MARKER BEACON and INT circuit breakers are in.

c. Rotate VOLUME ON/OFF control clockwise to ON.

d. Position the NAV switch on signal distribution panel (MB switch if SB/329-AR panel is used) up to on position.

e. Adjust VOLUME control for desired headset audio level.

f. Position HIGH/LOW SENSING switch as required.

g. When marker beacon receiver is not needed position VOLUME ON/OFF control to OFF position.

5-109. Transponder Set Operation. The preliminary starting procedure and different modes of operation for the AN/APX-44 Transponder Set are given in the following paragraphs:

a. Preliminary Starting Procedure. Set the controls on the control panel as follows:

(1) Master control — OFF
(2) AUDIO switch — OFF
(3) I/P switch — OFF
(4) MODE 2 switch — OFF
(5) MODE 3 switch — OFF
(6) MODE 1 control — To read 00
(7) MODE 3 control — To read 00
(8) Function control — NORMAL

b. Starting Procedure

(1) Check that master helicopter power is on.

(2) Check that APX-44 circuit breaker is in.

(3) Place the master control in STBY position. The pilot light should light.

(4) If the pilot light does not light, press the test button. If the light does not light when the test button is pressed, either light is burned out or operating power is not reaching the transponder set.

(5) Adjust the pilot light to the desired brilliance by opening or closing the lens shutter.

(6) Allow three to five minutes for the transponder set to warm up.

5-110. Normal Operation. The normal operating procedure is outlined in the following steps:

a. For Mode 1 operation set the controls as follows:

(1) Function control — NORMAL.
(2) Master control — LOW or NORM as required.
(3) Mode 2 switch — OFF.
(4) Mode 3 switch — OFF.
(5) 1/P switch — Refer to paragraph 5-113.
(6) AUDIO switch — Refer to paragraph 5-114.

b. Combined modes 1 and 2. Set the controls as follows:

(1) Function control — NORMAL.
(2) Master control — LOW or NORM as required.
(3) MODE 2 switch — ON.
(4) MODE 3 switch — OFF.
(5) 1/P switch — Refer to paragraph 5-113.
(6) AUDIO switch — Refer to paragraph 5-114.

c. Combined modes 1 and 3. Set the controls as follows:

(1) Function control — NORMAL

(2) Master control — LOW or NORM as required.

(3) MODE 3 switch — ON

(4) MODE 2 switch — OFF

(5) 1/P switch — Refer to paragraph 5-113.

(6) AUDIO switch — Refer to paragraph 5-114.

d. Combined modes 1, 2 and 3. Set the controls as follows:

(1) Function control — NORMAL

(2) MODE 2 switch — ON

(3) MODE 3 switch — ON

(4) Master control — LOW or NORM as required.

(5) 1/P switch — Refer to paragraph 5-113.

(6) AUDIO switch — Refer to paragraph 5-114.

5-111. ***Modified Operation.*** The procedure for operating with the function selector at MOD position is outlined in the following steps:

a. Mode 1. Set the controls as follows:

(1) Function control — MOD

(2) MODE 1 code control — Assigned two digit code number.

(3) Master control — LOW or NORM as required.

(4) MODE 2 switch — OFF

(5) MODE 3 switch — OFF

(6) 1/P switch — Refer to paragraph 5-113.

(7) AUDIO switch — Refer to paragraph 5-114.

b. Combined Modes 1 and 2. Set the controls as follows:

(1) Function control — MOD

(2) MODE 1 code control — Assigned two digit code number.

(3) MODE 2 switch — ON

(4) Master control — LOW or NORM as required.

(5) MODE 3 switch — OFF

(6) 1/P switch — Refer to paragraph 5-113.

(7) AUDIO switch — Refer to paragraph 5-114.

c. Combined Modes 1 and 3. Set the controls as follows:

(1) Function control — MOD

(2) MODE 2 switch — OFF

(3) MODE 3 switch — ON

(4) MODE 1 code control — Assigned two digit code number.

(5) MODE 3 code control — Assigned two digit code number.

(6) Master control — LOW or NORM as required.

(7) 1/P switch — Refer to paragraph 5-113.

(8) Audio Switch — Refer to paragraph 5-114.

d. Combined modes 1, 2 and 3. Set the controls as follows:

(1) Function control — MOD

(2) Mode 1 code control — Assigned two digit code number.

(3) MODE 2 switch — ON

(4) MODE 3 switch — ON

(5) MODE 3 code control — Assigned two digit code number.

(6) Master control — LOW or NORM as required.

(7) 1/P switch — Refer to paragraph 5-113.

(8) AUDIO switch — Refer to paragraph 5-114.

5-112. ***Civil Operation.*** The procedure for operating with the function selector at civil position is outlined in the following steps:

a. Combined Civil and Military Mode 1. Set the controls as follows:

(1) Function control — CIVIL

(2) MODE 3 code control — Assigned two-digit code number.

(3) MODE 3 switch — ON

(4) MODE 2 switch — OFF

(5) MODE 1 code control — Assigned two-digit code number.

(6) Master control — LOW or NORM as required.

(7) 1/P switch — Refer to paragraph 5-113.

(8) AUDIO switch — Refer to paragraph 5-114.

b. Combined Civil and Military Mode 1 an 2. Set the controls as follows:

(1) Function control — CIVIL

(2) MODE 3 code control—Assigned tw digit code number.

CHAPTER 6

AUXILIARY EQUIPMENT

Section I — Scope

6-1. Scope of Auxiliary Equipment Instructions. This chapter includes the description, normal operation, and emergency operation of all equipment not directly contributing to flight, but which enables the helicopter to perform certain specialized functions.

6-2. Much of the equipment discussed in this chapter is highly specialized or interchangeable for use in other aircraft. Coverage for specialized or interchangeable equipment of this type will be brief, since complete coverage is appropriately available in publications devoted entirely to that equipment.

Section II — Heating and Ventilation

6-3. Ventilating System. The ventilating system consists of four independently controlled scoop type ventilators. (See 9 and 28, figure 2-1) located as follows: two single orifice scoops on the top side of the cockpit section and two double orifice scoops on the top side of the cargo-passenger section of the cabin. The amount of outside air entering the cabin through the ventilators is regulated by knurled rings located on the ventilators above the pilot's, copilot's and passenger's stations.

6-4. Operation. Rotate knurled control ring to desired position to provide outside air for flight.

6-5. Bleed Air Heating and Defrosting System. The heating and defrosting system (see figure 6-1) consists of tube assemblies, selector valve, noise suppressors, ducts, outlets control panel, and attaching hardware. Heat is supplied from the engine compressor bleed air system. (See figure 6-1.) Electric power for heating and defrosting system operation is supplied by the 28-volt DC electrical system. Circuit protection is provided by CABIN HEATER PWR and CONT circuit breakers. (See figure 2-12.)

6-5A. Bleed Air Heating and Defrosting System (Serial Numbers 65-9565 through 66-16860). The heating and defrosting system (see figure 6-1A) consists of tube assemblies, selector valve, noise suppressors, ducts, outlets, control panel, and attaching hardware. Heat is supplied from the engine compressor bleed air system. Electric power for system control operation is supplied by the 28-volt DC essential bus. Circuit protection is provided by CABIN HEATER CONT circuit breaker. (See figure 2-12.)

Note

> This system differs from system installed on helicopters prior to serial number 65-9565 (see figures 6-1 and 6-1A) as follows: Bleed air ducts under seat outlets, one noise suppressor, two valve assemblies and one thermostat have been deleted. The bleed air mixing valve and one noise suppressor are relocated to the heater compartment for easy removal when winterization kit is installed.

6-6. Provisions are Incorporated for Winterization of Helicopters. A 100,000 BTU combustion heater is part of the winterization equipment.

6-7. Heating and Defrosting Controls. The heating and defrosting controls consist of the cabin heater panel and the pedestal-mounted heater control levers. (See figure 6-1.)

6-8. Cabin Heater Panel. A dual purpose CABIN HEATING panel is located on the overhead console (see figure 6-1). The aft portion of this panel, marked HEATER, is inactive unless the winterization combustion heater equipment is installed. The forward section of the panel, marked BLEED AIR is active for use of the

BLEED AIR HEAT SYSTEM:

1. Engine Bleed Air Hose
2. Bleed Air Control Valve
3. Air Mixing Valve
4. Noise Suppressors
5. Bleed Air Heat Distribution Valve
6. Under-Seat Registers
7. Windshield Nozzles
8. Heat Selector Valve
9. Lower Window Nozzle
10. Heat Selector Control

AUXILIARY HEATING SYSTEM:

11. Lower Right Outlet Control
12. Lower Left Outlet Control
13. Iris Valves
14. Auxiliary Heat Duct
15. Thermostat Dial
16. Door Post Outlets
17. Distribution Valve
18. Thermostat
19. Heater Fuel Train Assembly
20. Fuel Filter
21. Fuel Pump
22. Fuel Solenoid Valve
23. Aft Heat Outlets
24. Spot Heating Connection
25. Aft Outlets Valve
26. Auxiliary Combustion Heater

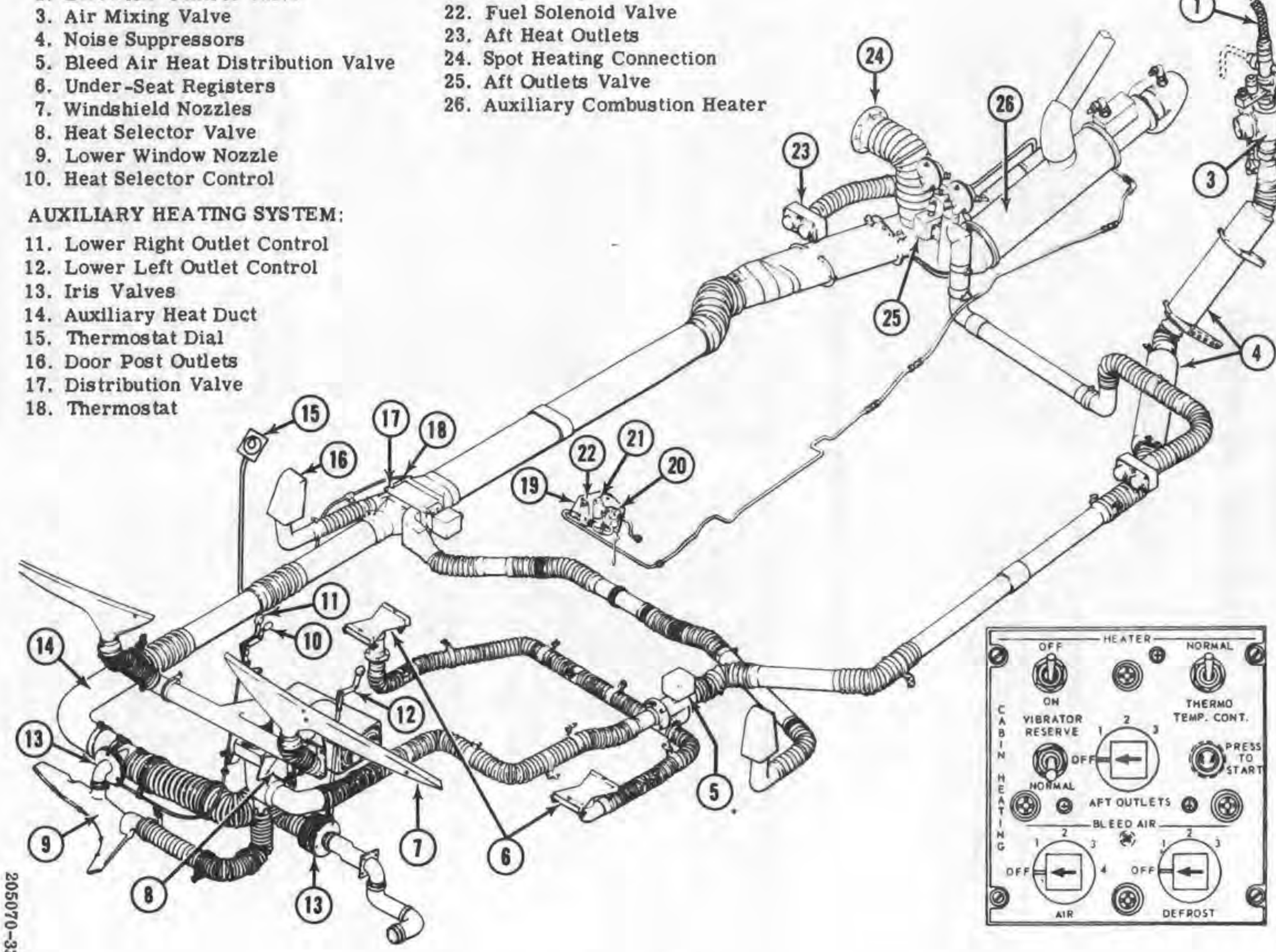


Figure 6-1. Heating and defrosting system

bleed air for heating and defrosting. Electric power to the panel is supplied by the 28-volt DC electrical system.

Caution

> To prevent fire hazard to the helicopter due to possibility of cabin heater exhaust blast causing fire on landing surfaces, move the cabin heater switch to the OFF position at least one minute prior to landing on clean surface and at least two minutes prior to landing on surface with combustible materials present.

6-9. *Pedestal-Mounted Heater Control.* Manual controls are secured to the forward outer edges of the pedestal installation (see 10, 11 and 12, figure 6-1). The outboard levers are installed as part of the winterization equipment and are used in conjunction with the combustion heater. The inner right-hand lever is used to actuate the bleed air circuit.

6-9A. *Cabin Heater Controls (Serial numbers 65-9565 through 66-16860).* The overhead console contains a panel labeled "CABIN HEATING" (See figure 6-1A). This panel contains two rotating switches, one labeled BLEED AIR and the other labeled AFT OUTLET. Rotating the BLEED AIR switch clockwise increases the amount of heated air. Rotating the switch, labeled AFT OUTLET, clockwise distributes an increasing amount of heated air to the aft cabin through the door post outlets, while decreasing the amount of air to cockpit through the center pedestal outlets. In the OFF position of this switch the door post outlets are closed and all of the air is directed to the center pedestal outlet. Positions 1, 2 and 3 open the door post outlets an increasing amount so that less air is distributed through the center pedestal outlet. In No. 3 position air is still supplied through the center pedestal outlets, unless the flapper is closed in the ball outlet.

6-9B. A lever on the forward right hand edge of the center pedestal is used for directing air to the defrost nozzles on the cockpit and cabin outlets (see figure 6-1A). In the full forward position all of the air is directed to the defrost nozzles. Intermediate positions may be selected for partial defrost and partial cockpit and cabin heat. The full aft position permits no air flow to the defrost nozzles, and directs all heat to the cockpit and cabin area.

6-10. *Heating and Defrosting System Operation.* The operating procedure for the bleed air heating and defrosting system is presented in the following paragraphs.

6-11. *Precautions to be Observed.* The pilot shall comply with cautionary steps listed below. Failure to comply may cause engine compressor stall resulting in possible severe damage to engine, transmission, main rotor, or tail rotor.

a. T53-L-9 engine:

(1) Do not use bleed air heater on takeoff or during Engine Restart During Flight. (Refer to Chapter 4.)

(2) Do not use bleed air heater with AIR selector switch in position 3 or 4 when above 85 percent nI speed.

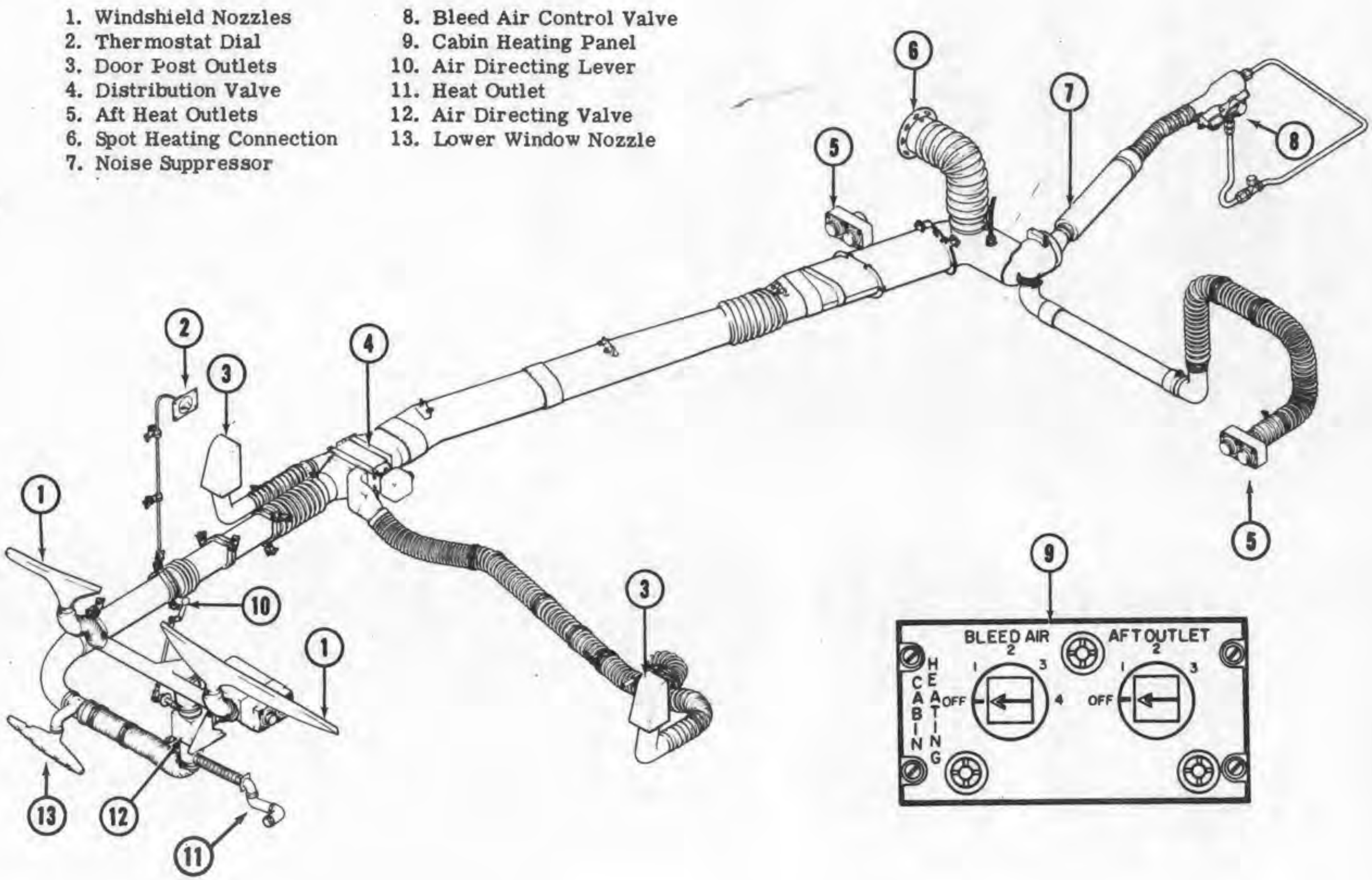
b. T53-L-9A and -11 engines:

(1) Do not use bleed air heater above 90 percent nI speed.

(2) Do not use bleed air heater with AIR selector switch in positions 2, 3, or 4 when above 85 percent nI speed or when ambient temperature exceeds 50 degrees F.

(3) Do not use bleed air during Engine Restart During Flight.

6-12. *Normal Operation.* a. Position the inner right-hand lever on forward edge of pedestal



1. Windshield Nozzles
2. Thermostat Dial
3. Door Post Outlets
4. Distribution Valve
5. Aft Heat Outlets
6. Spot Heating Connection
7. Noise Suppressor
8. Bleed Air Control Valve
9. Cabin Heating Panel
10. Air Directing Lever
11. Heat Outlet
12. Air Directing Valve
13. Lower Window Nozzle

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Figure 6-1A. Heating and defrosting system aft to CLOSED DEFROST to actuate the system.

b. Rotate AIR switch on overhead console CABIN HEATING control panel clockwise to increase defrost air to under-seat outlet and defrost outlet.

c. Rotate DEFROST switch on control panel clockwise to:

(1) DEFROST OFF position — 100 percent to under-seat registers.

(2) No. 1 position — 33 percent to defrost nozzles and 67 percent to under-seat registers.

(3) No. 2 position — 67 percent to defrost nozzles and 33 percent to under-seat registers.

(4) No. 3 position — 100 percent to defrost nozzles.

d. To turn off the system, rotate AIR switch to OFF and position inner right-hand lever adjacent to pedestal fully forward.

6-12A. ***Normal Operation — Cabin Heater and Defrosting System Numbers (65-9565 through 66-16860).*** See cabin heater controls, figure 6-1A.

a. BLEED AIR rotating switch — Rotate clockwise from OFF position to actuate the system. Set to 1, 2, 3, or 4 position as required for amount of heat desired.

b. AFT OUTLET rotating switch — position to distribute the desired amount of heated air to aft cabin through door post outlets.

Note

> When the AFT OUTLET switch is in the OFF position the door post outlets are closed and all of the air is directed to the center pedestal outlet.

c. Lever on pedestal — Position as required.

(1) Full forward position — all heated air is directed to the defrost nozzles.

(2) Full aft position — all heated air is directed to the cockpit and cabin area.

(3) Intermediate positions — may be selected for partial defrost and partial cockpit and cabin heat.

d. To turn off the system — Rotate BLEED AIR switch counterclockwise to OFF position.

6-13. ***Emergency Operation.*** There is no emergency operation of the bleed air heating and defrosting system. If engine temperature surge occurs during flight, the bleed air system shall be turned off.

6-14. Combustion Heating and Defrosting System. The 100,000 BTU combustion type heating and defrosting system (see figure 6-1) equips the helicopter with a sufficient heat supply to maintain a plus 40 degrees Fahrenheit cabin temperature with an outside temperature to minus 60 degree Fahrenheit. With the combustion heater installed, a combination of bleed air heat and combustion heat is available for heating, or bleed air for defrosting and combustion heat for heating, or combustion heat for defrosting only. Bleed air is OFF for the last condition. The combustion heater consists of a fuel system, cycling switch, temperature control, and distribution system. The heater fuel system consists of a fuel pressure regulator, fuel filter, fuel pump, and a fuel shutoff valve.

Note

> The helicopter's fuel pump must be operating before fuel is available for heater combustion.

6-15. The safety devices are: purge switch, overheat switch, and air pressure switch. The purge switch keeps the blowers operating after shutdown to prevent overheating of the system due to residual heat. The overheat switch automatically turns the heater off if a malfunction occurs, and the starting cycle has to be repeated to start the heater. The combustion air blower and the ventilation blower are the axivane type, operated by 28-volt DC. Both of these blowers operate when the heater switch is ON and continue operation until the switch is OFF. The cycling switch, located on the heater plenum, operates in conjunction with the temperature control system and is set at 25 degrees Fahrenheit. It turns the fuel on and off, cycling the heater at approximately this temperature. The temperature control systems are the automatic or the duct sensing control. The automatic system is a three-temperature pickup system; outside temperature, cabin temperature, and duct temperature controlled from the overhead console. The duct sensing control system controls only the duct temperature from a control located on the right-hand door post.

6-16. Combustion Cabin Heater Controls. The aft section of the dual purpose cabin heating panel (see figure 6-1) located on the overhead console, controls the combustion heater when installed. Electric power to the panel is supplied by the 28-volt DC essential bus of the electrical system.

6-17. Pedestal Mounted Heater Controls — Combustion. Manual controls are secured to the forward outer edges of the pedestal installation (see figures 2-3 and 6-1). The outboard levers control valves to admit hot air to the pilot's and copilot's foot area ducts. The inner right-hand lever is used to control the bleed air-combustion air separator valve.

6-18. Normal Operation — Combustion. a. External power — Connected or battery switch to BAT-ON.

b. Fuel MAIN switch — ON.

c. HEATER ON/OFF switch — ON.

d. VIBRATOR switch — NORMAL.

e. PRESS TO START switch — DEPRESS and hold in for three to four seconds, then release.

f. Heater air control knobs — Regulate as desired.

g. HEATER ON/OFF switch — OFF to stop heater operation.

6-19. Emergency Operation – Combustion. There is no emergency operation of the combustion heating and defrosting system.

Section III — Anti-Icing, De-Icing, and Defrosting System

6-20. Engine Anti-Icing System. The engine anti-icing system prevents icing of the air inlet areas when the engine is operating at low ambient temperatures. Hot air under pressure, from the annular manifold within the air diffuser housing, flows forward through the airflow shutoff anti-icing valve into the hollow annulus on top of the air inlet housing. This hot air is then directed through five of the six hollow inlet housing support struts to de-ice the air inlet area. Hot scavenge oil, draining through the lower strut into the accessory drive gear box, de-ices the bottom of the air inlet area. Hot air also flows into the inlet guide vane area and is directed through an annulus around the region of the temperature sensing element of the main fuel control to prevent ice formation in the area of the ambient temperature sensing bulb. Small openings in the bottom of the inlet guide vanes allow hot air to bleed back into the compressor area. The shutoff anti-icing valve is spring-loaded in the open or ON position. The pilot can close the valve by positioning DE-ICE switch on ENGINE panel to OFF. (See figure 2-3.) This energizes a solenoid, causing the valve to shift to the closed or OFF position. If an electrical power failure occurs, the solenoid is de-energized, allowing the spring-loaded valve to open and anti-icing becomes continuous. With anti-icing ON, full power will be limited due to increased exhaust gas temperature (egt.). Pilot shall closely monitor egt when anti-icing is ON.

6-21. Indicator Lights — Engine Anti-Icing System. Two indicator lights are located on the pedestal-mounted CAUTION panel (figure 2-15). These lights provide visual information as to the system status. The ENGINE ICING indicator light illuminates to denote engine icing conditions and the operation of the detector proportional to the engine ice accumulation. The ENGINE ICE DET disarmed light will be illuminated when the circuit breaker is out (de-actuated), or the probe is clogged, or when there is an electrical malfunction in the system.

6-22. Pitot Heater. The pitot heater is installed in the pitot head and functions to prevent ice forming in the pitot tube. Electric power for pitot heater operation is supplied by the 28-volt DC electrical system. Circuit protection is provided by PITOT TUBE HTR circuit breaker on the DC circuit breaker panel (see figure 2-12).

6-23. Pitot Heater Switch. The PITOT HTR switch is on the DOME LT panel on the overhead console (see figure 2-11). This is a two-position switch marked OFF in aft position and ON in the fwd position.

b. If the round is ejected, return cocking handle assembly to FORWARD position, relay on target, and attempt to fire. If machine gun does not fire, it must be cleared and the weapon and ammunition inspected to determine the cause of stoppage.

c. If the round **is not** ejected, move the safety to SAFE (S) position. Remove ammunition and links, inspect the receiver and chamber. If a round is present in the chamber, close cover, move safety to FIRE (F) position, and attempt to fire. If the round does not fire and the barrel is considered hot enough to cause cook-off (200 rounds fired within two minutes), wait five minutes with the bolt in the FORWARD position. Remove round and reload.

Note

> Disregard the five minute wait if the weapon is not hot enough to cause a cook-off.

6-57. *Runaway Gun(s).* If gun continues to fire after trigger assembly has been released, immediately open feed cover permitting bolt to go underneath the rounds of ammunition and stop in the FORWARD position.

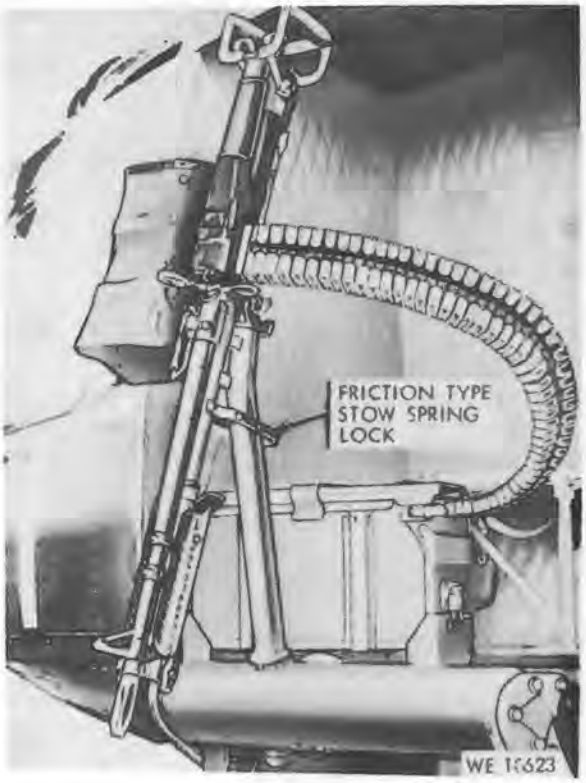

Figure 6-15. 7.62-millimeter machine gun installed and stowed in friction type stow spring lock

Table 6-2. After Firing Operation

Sequence Number	Procedure	References
1	Push safety button to SAFE (S) position and attempt to fire weapon	Fig. 6-4
2	Retract bolt, engage sear, and push handle forward. Raise cover assembly and remove ammunition or last link	Figs. 6-4 and 6-5
3	Remove ammunition box assembly and chute assembly	Figs. 6-10 and 6-11
4	Remove ejection control bag	Fig. 6-9
5	Inspect machine gun chamber to be sure it is clear.	

Section VIII. Photographic Equipment

(Not Applicable)

Section IX. Aerial Delivery Equipment

(Not Applicable)

Section X. Miscellaneous Equipment

6-58. Windshield Wiper. Two windshield wipers are provided, one for the pilot on the right-hand section of the windshield and one for the copilot on the left-hand section of the windshield. The wipers are driven by electric motors with electric power supplied by the 28-volt DC electrical system. Circuit protection is provided by WINDSHIELD WIPER PILOT and WINDSHIELD WIPER COPILOT circuit breakers on the DC circuit breaker panel. (See figure 2-12.) The windshield wiper switches on the overhead console mounted MISC panel (see figure 2-11), have five positions: HIGH, MED, LOW, OFF and PARK. The panel also has a selector switch which permits the operation of windshield wipers for pilot, copilot or both as desired. Do not operate the wiper on a dry windshield.

6-59. Casualty Carrying Equipment. See figure 6-16 for a typical litter installation.

6-60. Litter Provision. Provisions for the installation of folding litter racks adapt the helicopter to carry six litter patients. Three standard army medical service litters are located on each side of the transmission support structure and are attached to the transmission support structure and stanchions. Alternate litter loading is to position three litters laterally. Litter patients are loaded through the cargo doors. Passenger safety belts are used to secure litter patients to the litters. The litters are designed to be quickly installed, folded for internal storage, or removed when their use is not anticipated.

6-61. ***Medical Attendant's Seat.*** When six litters are installed, the center forward-facing troop seat (attached to transmission support structure) is used for the medical attendant. The seat may be folded and stowed or removed, as required, for accomplishment of various missions. The seat is attached to the floor and the transmission support structure and is equipped with a detachable safety belt. When lateral litter loading is used, a single seat attached to the floor behind the pilot and copilot and facing aft, is used for the medical attendant. This seat is equipped with a safety belt.

Note

> The medical attendant's seat is not installed on helicopter serial number 65-9605 and subsequent helicopters.

6-62. Cargo Loading Equipment. The helicopter cargo areas do not require any special loading aids or equipment to accomplish loading or unloading.

6-63. External Cargo Suspension Unit. See figure 6-17, External Cargo Suspension System.

Caution

> Helicopters equipped with a non-rotating cargo suspension unit, which maintains the hook in a fixed position, (facing forward) should be used only with a cargo sling having a swivel attachment ring. A device which may be used for this application is: Sling Endless, Nylon Webbing, Type I, 10 inch, Part No. PD 101-10.

6-64. External cargo can be carried by means of a short single-cable suspension unit (see figure 6-17), secured to the primary structure and located at the approximate center of gravity. This method of attachment and location has proved to be the most satisfactory for carrying external cargo. Pitching and rolling due to cargo swinging is minimized, and good stability and control characteristics are maintained under load. A MANUAL CARGO RELEASE PUSH pedal is located between the pilot's tail rotor control pedals, and an electrical release

pushbutton switch is on the cyclic control stick. Before the electrical release switch on the cyclic control stick can be actuated, the CARGO RELEASE switch on the overhead panel must be positioned to ARM. When not in use, the cargo suspension unit need not be removed, nor does it require stowing. Three cable and spring attachments keep the unit centralized, and the hook protrudes only slightly below the lower surface of the helicopter. A rear view mirror enables the pilot to visually check operation of the external cargo suspension hook.

6-64A. ***Internal Rescue Hoist.*** Provisions have been made for the installation of an internal rescue hoist. See figure 6-15A. This installation may be made in any one of four positions in the helicopter's cabin as shown in figure 6-15B. The hoist installation consists of a vertical column extending from the floor structure to the cabin roof, a boom, and an electrically operated winch. Two electrical controls for the operation of the rescue hoist are provided, one for the pilot, and one for the hoist operator. The pilot's control switch is located on the cyclic control stick (figure 2-4) and provides up and down operation of the hoist as well as positioning the boom. A four position hoist switch located on the hoist control pendant (figure 6-15C) is provided for the hoist operator. The pilot's control can override the hoist operator's control. An electrically operated ballistic charge type cable cutter is provided with two guarded type cable cutter switches. The pilot's cable cutter switch is mounted on the pedestal (figure 6-15D) and the hoist operator's cable cutter switch is mounted on the top of the hoist control box (figure 6-15E). The hoist drum has a usable capacity of 256 feet of cable. Two limiting switches provide automatic stoppage to control reel-in and reel-out limits of usable cable. An intercom headset, wired to the hoist and controlled by a switch on the pendant, gives the hoist operator interphone communications with the flight crew.

Note

> The hoist cable is color coded as follows: The first 25 feet is yellow, the next 181 feet is unpainted. The next 35 feet is yellow and the last 15 feet is red.

6-64B. ***Rescue Hoist Operations.*** The rescue hoist is used to accomplish the lifting of personnel or cargo when a landing cannot normally be made. The types of lifts usually required in the use of the rescue hoist are:

a. Pickups from wooded or obstructed areas.

b. Pickups from water.

c. Pickups from boats or ships where landings could not be accomplished.

Note

> The hoist operator has variable speed control for raising or lowering the cable. The further the down/up toggle is pushed from its spring loaded neutral position, the faster the hoist will run. The hoist should normally be operated in the full speed condition as slow speed operation will cause the motor and gear box to heat excessively. See Hoist Cable Speed Versus Load Chart, 6-1.

Caution

> A minimum of 5 pounds tension must be applied to the cable for a reel-out (cable down) at all times. The hook and hand wheel provide this weight. DO NOT PERMIT cable to become slack.

6-64C. ***Operating Data.*** The following general information is provided for use when operating rescue hoist.

a. Maximum Load	600 pounds for raising or lowering
b. Usable Cable Length	256 feet
c. Limits	
Boom In and Boom Out	Preset limit switches in the actuator
Up Limit	Trigger at end of boom (contacted by rubber bumper on the hook handwheel)
Down Limit	Switch (actuated when three wraps of cable remain on storage drum)
d. Override	The pilot's control will override the operator's control

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Figure 6-15A. Hoist installation (Sheet 1 of 2)

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Figure 6-15A. Hoist installation (Sheet 2 of 2)

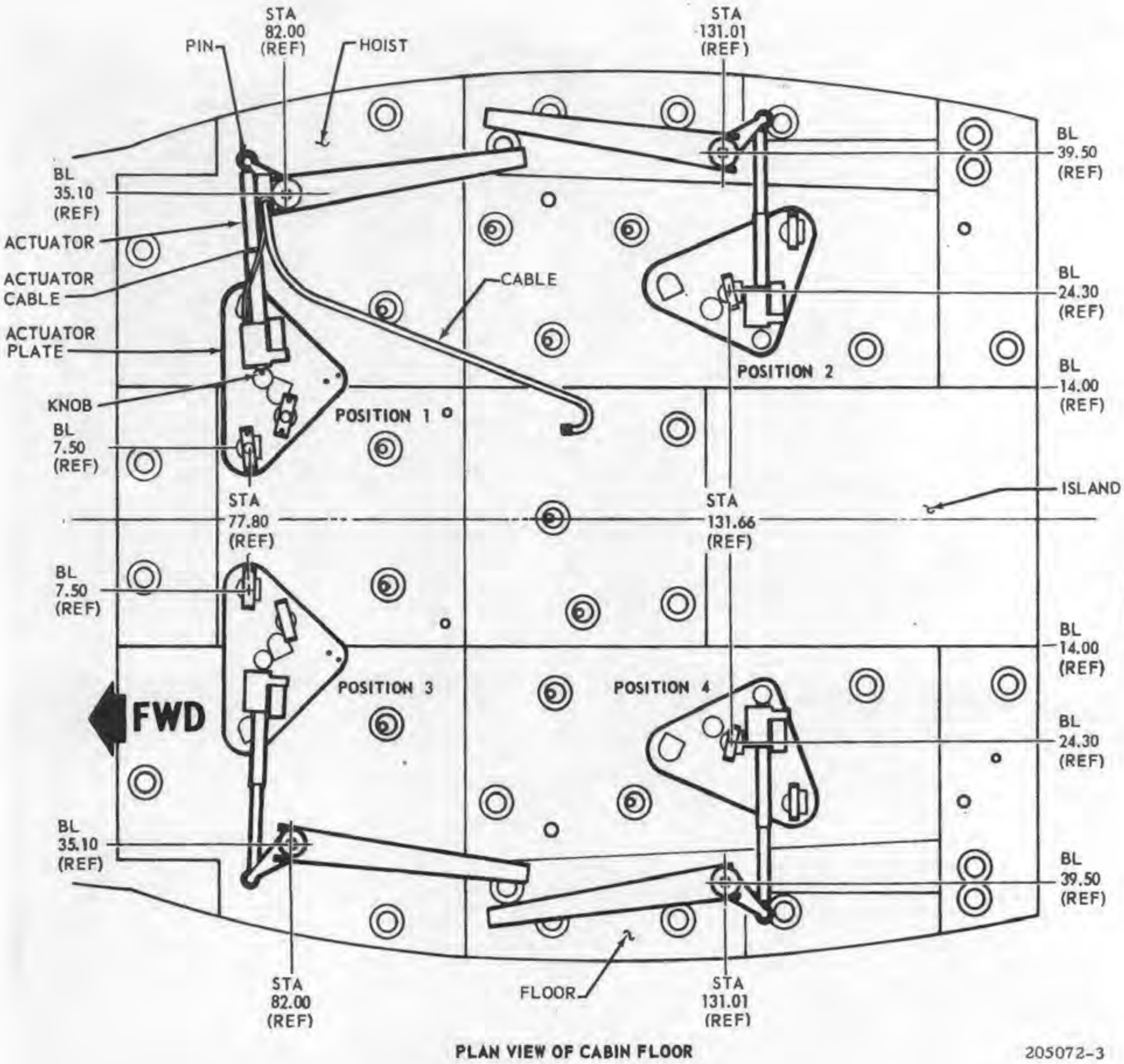


Figure 6-15B. Four positions hoist may occupy in cabin

Figure 6-15C. Pendant control — rescue hoist

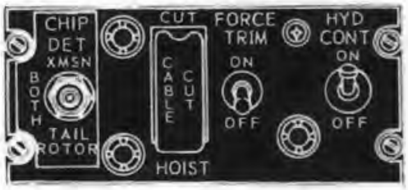


Figure 6-15D. Hoist cable cutter switch — pilot

Figure 6-15E. Hoist cable cutter switch — hoist operator

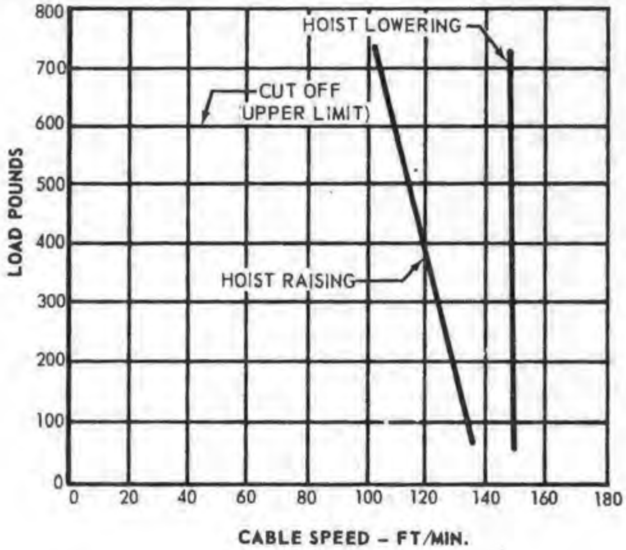


Chart 6-1. Hoist cable speed versus load plus or minus 15 percent

6-64D. *Weight and Balance Information*. Weight and balance information resulting from installation of the internal rescue hoist is as follows:

a. Forward position (hoist arm inside).

(1) Change in basic weight ....Plus 151.3 pounds

(2) Moment arm ....87.3 inches

(3) Change in basic moment ..11.211 inch-pounds

(4) Chart "A" entry ....Not applicable

(5) Chart "C" entry ....Weight change, plus 151.3 pounds
Moment Arm, 87.3 inches
Moment/100, plus 132.1 inch-pounds

b. Aft position (hoist arm inside).

(1) Change in basic weight ....Plus 151.3 pounds

(2) Moment arm ....125.1 inches

(3) Change ....18.927 inch-pounds

(4) Chart "A" entry ....Not applicable

(5) Chart "C" entry ....Weight change, plus 151.3 pounds
Moment Arm, 125.1 inches
Moment/100, plus 189.2 inch-pounds

c. Possible Loading and Hoist Loading Locations. See chart 6-2.

6-64E. *Operating Procedure — Pilot*. The pilot's hoist control switch is located on the cyclic control stick (see figure 2-4).

a. Check rescue hoist cable cutter, rescue hoist control and rescue hoist power circuit breakers are "IN"

b. Establish zero ground speed over pick-up location.

c. Move hoist control, on cyclic stick, to right to swing boom outboard.

Note

> Pilot's controls will override the hoist operator's control inputs, however the pilot has only a fixed full speed capability.

d. Move hoist control switch forward to lower cable hook.

Note

> Hoist cable is painted at each end to provide visual indication of cable footage that is extended. The hoist cable is lowered approximately 150 feet per minute and is retracted approximately 120 feet per minute (see chart 6-1).

e. Move hoist control switch aft to raise hoist load.

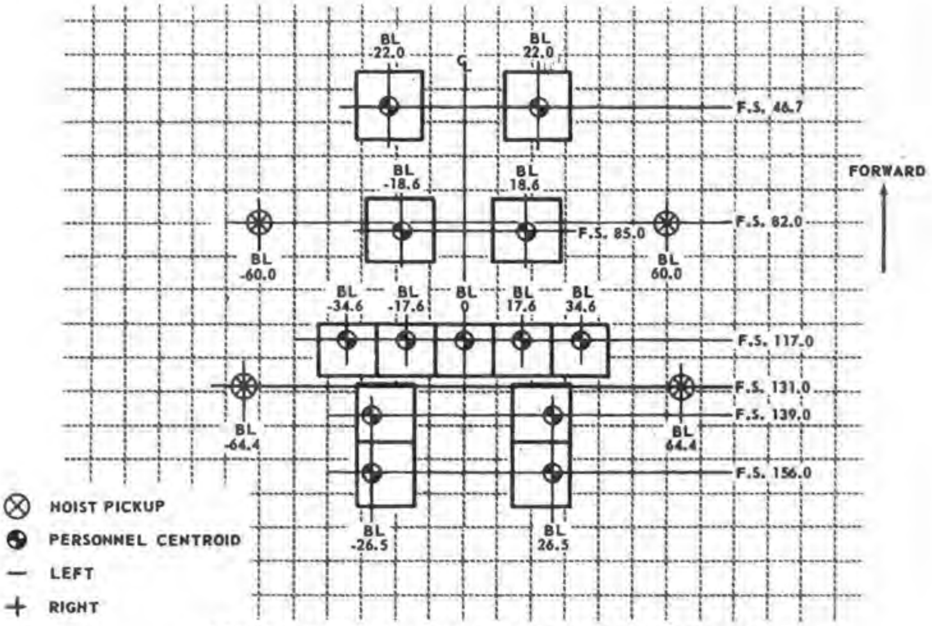
Note

> In case the extended portion of the hoist cable has to be jettisoned a cable cut switch is provided on the instrument pedestal. (See figure 6-15D.) The cable cutter is an electrically initiated ballistic charge type.

f. Move hoist control switch to left to swing hoist boom inboard.

g. Bring hoist load into cabin and hoist to stowed position (fully inboard).

6-64F. *Operating Procedure — Hoist Operator*. The hoist operator's operating procedure is set forth in Chapter 11.



POSSIBLE SEATING & HOIST LOAD LOCATIONS

C. G. Limits	Longitudinal	F. S. 130 to F. S. 144
	Lateral	B. L. -7. 5 to B. L. +7. 5

Sample Balance Calculations:

		HORIZONTAL		LATERAL	
	WEIGHT	ARM	MOMENT	ARM	MOMENT
1) Basic Wt (Incl, Hoist, Fwd, Rt)	5407	141. 8	766878	+ 1. 5	8202
Pilot	200	46. 7	9340	+22. 0	4400
Hoist Attendant	200	117. 0	23400	+34. 6	6920
Troopers (2) - Aft R. H.	440	147. 5	59000	+26. 5	11660
Hoist Load	600	82. 0	49200	+60. 0	36000
Fuel (Min. with Load on Hoist)	1000	144. 0	144000	0	0
	7847	134. 0	1051818	+ 8. 6	67182

Lateral C. G. of +8. 6 exceeds limit stated above. Troopers should be moved to left side of helicopter.

2) Basic Wt (Incl. Hoist, Aft Left)	5407	143. 1	773623	- 0. 5	-2699
Pilot	200	46. 7	9340	+22. 0	4400
Copilot	200	46. 7	9340	-22. 0	-4400
Hoist Attendant	200	82. 0	16400	-18. 6	-3720
Fuel (Min. with Load on Hoist)	550	127. 1	69905	0	0
Hoist Load	600	131. 0	78600	-64. 4	-38640
	7157	133. 7	957208	- 6. 3	-45059

Seating satisfactory. Additional Personnel should be seated on the right side of the helicopter.

Chart 6-2. Possible seating and hoist load locations

6-65. Heated Blanket Receptacles. Six electrical receptacles are provided to furnish 28-volt DC for heated blankets. These receptacles are mounted on the inside cabin roof structure of the cargo passenger area, aligned with the forward edge of the transmission support structure, three at the right side and three at the left side. Electric power to these receptacles is supplied by the 28-volt DC nonessential bus. Circuit protection is provided by HEATED BLANKET circuit breakers on the DC circuit breaker panel (see figure 2-12).

6-66. Data Case. A data case for maps, flight reports, etc., has been provided and conveniently located on the aft end of the instrument pedestal.

6-67. Deleted.

6-68. Mooring Fittings. Mooring fittings are provided at four locations on the helicopter. Two fittings are installed under the fuselage

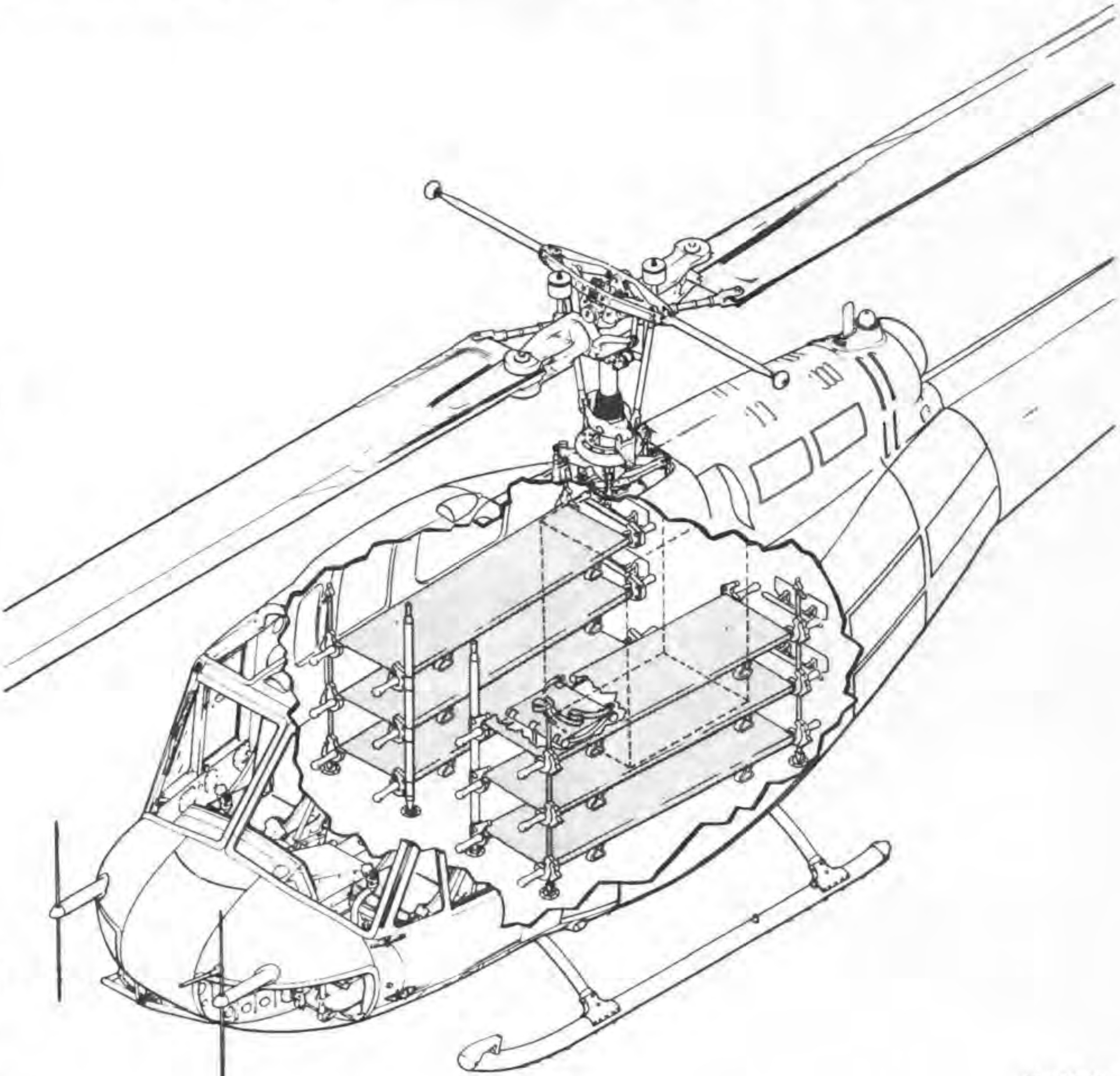


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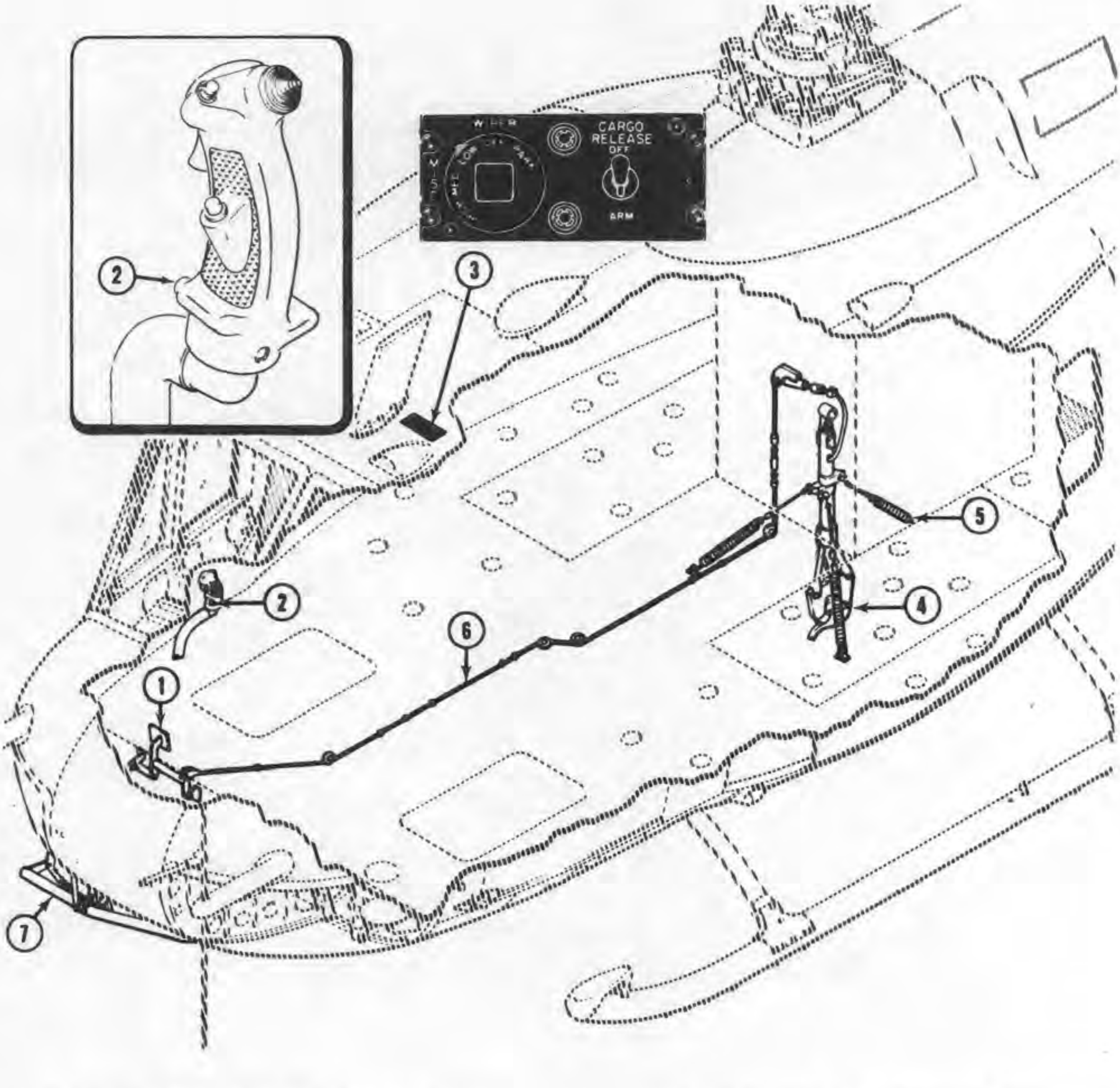
Figure 6-16. Litter installation — typical



1. External Cargo Mechanical Release
2. External Cargo Electrical Release Switch
3. Cargo Release Off/Arm Switch - Miscellaneous Panel
4. External Cargo Suspension Assembly
5. Suspension Unit Centering Assembly Springs (3)
6. Mechanical Release Cable Assembly
7. Cargo Rear View Mirror

205070-3B

Figure 6-17. External cargo suspension system just aft of the pilot's and copilot's stations, one at the right-hand side and one at the left-hand side. The other fittings are installed under the fuselage just aft of the skid landing gear, one on each side.

6-69. Tow Rings. To facilitate towing the helicopter with ground handling wheels lowered, a tow ring has been provided near the forward end of each of the landing gear skids. These rings will accommodate a standard tow bar.

6-70. Ground Handling Wheels. Ground handling wheels have been provided on each of the landing gear skids. These wheels can be extended to accomplish ground handling (pushing and towing the helicopter). Ground handling gear is usually removed before flight, but can be left in place on skids if properly secured in retracted position by means of support rods provided on each side.

6-71. Blackout Curtains. Provisions have been made for installing blackout curtains behind pilot's and copilot's seats and between forward and aft cabin sections. Other blackout curtains may be installed over both cargo door windows and window in removable door post.

6-72. Blood Bottle Hangers. Two blood bottle hangers have been provided on the inside of the cabin roof structure within easy reach of the medical attendant's station, for administration of blood to litter patients in flight.

Note

Blood bottle hangers are not installed on helicopter serial number 65-9605 and subsequent helicopters.

6-73. Main and Tail Rotor Tie-Downs. Main and tail rotor tie-downs are provided to use in mooring the aft blade of the main rotor and the tail rotor to prevent the rotors from seesawing when the helicopter is parked. The tie-downs are stowed in the cargo compartment when not in use.

6-74. Cargo Tie-Down Fittings. Thirty-nine cargo tie-down fittings are located on the cabin floor for securing cargo to guard against and prevent cargo shifting during flight.

6-75. External Cargo Rear View Mirror. A mirror is installed under the right-hand lower nose window to give the pilot clear visibility of the external cargo. This mirror is easily removed and stowed when not in use. (Refer to Paragraph 13-9.)

6-76. Deleted.

6-77. Paratroop Static Line. Provisions are included in the cabin for the attachment of a static line kit for parachutes. This consists of attachment fittings, spreader bar and static line.

6-78. Electrical Provisions for Lycoming Engine Vibration Check Equipment. (Serial Nos. 64-13662 and subsequent.) Provisions are provided to permit the use of engine vibration check equipment as a maintenance aid. The provisions consist of an AC electrical receptacle, associated wiring hardware and a circuit breaker. The receptacle and circuit breaker are located on the AC circuit breaker panel.

6-79. The purpose of these provisions is to facilitate the use of the Lycoming engine vibration check equipment. The 115 volt, 60-400 CPS power source for the aircraft corresponds to the requirements of the check equipment. The electrical outlet eliminates the necessity for elaborate wiring of the equipment into the aircraft electrical distribution system to provide operating power.

Section XI. Auxiliary Fuel Equipment

6-80. Auxiliary Fuel Equipment. Complete provisions have been made for installing an auxiliary fuel equipment kit in the helicopter cargo-passenger compartment for extended distance and ferry missions. This equipment allows the helicopter to be serviced with an additional 300 U. S. gallons (1950 pounds) of fuel.

6-81. The kit consists of two 150-gallon bladder type tanks, fittings, fuel lines, drain lines, valves, a pump in each tank, and the necessary electrical equipment. The tanks are secured to fittings on the aft bulkhead and transmission support structure by nylon webs which are an integral part of each tank. Fuel is pumped from left auxiliary tank to left forward main fuel cell by the electrically driven transfer pump in the left auxiliary tank and controlled by the LEFT transfer pump switch. Fuel is pumped from the right auxiliary tank to the right front main fuel cell by the electrically driven transfer pump in the right auxiliary tank and controlled by the RIGHT transfer pump switch. The pilot is alerted to an auxiliary tank low condition by means of a worded segment on the CAUTION panel (see figure 2-15) which illuminates when actuated by an auxiliary fuel low level switch. A check valve incorporated in the auxiliary fuel flow line attached to the tank prevents fuel flow from the main fuel cells to the auxiliary tank. This valve is so set that fuel cannot free-flow from the auxiliary tanks to the main fuel cells, thus eliminating the danger of overfilling the main fuel cells with TRANS pump switches in OFF position.

6-82. Electrical power to operate the fuel transfer pumps and the low level switches is supplied by the 28-volt DC essential bus. Circuit protection for the transfer pumps and low level electrical switches is provided by FUEL TRANSFER PUMP circuit breaker (see figure 2-12) on the DC circuit breaker panel.

6-83. *Operation — Transfer Pumps.* The procedure herein outlined assumes that the complete auxiliary fuel equipment has been securely installed in the helicopter and the electrical transfer pumps and the low level switch electrical cables are connected.

a. TRANS PUMP switch (on ENGINE control panel) — Position forward to LEFT or RIGHT as desired.

Note

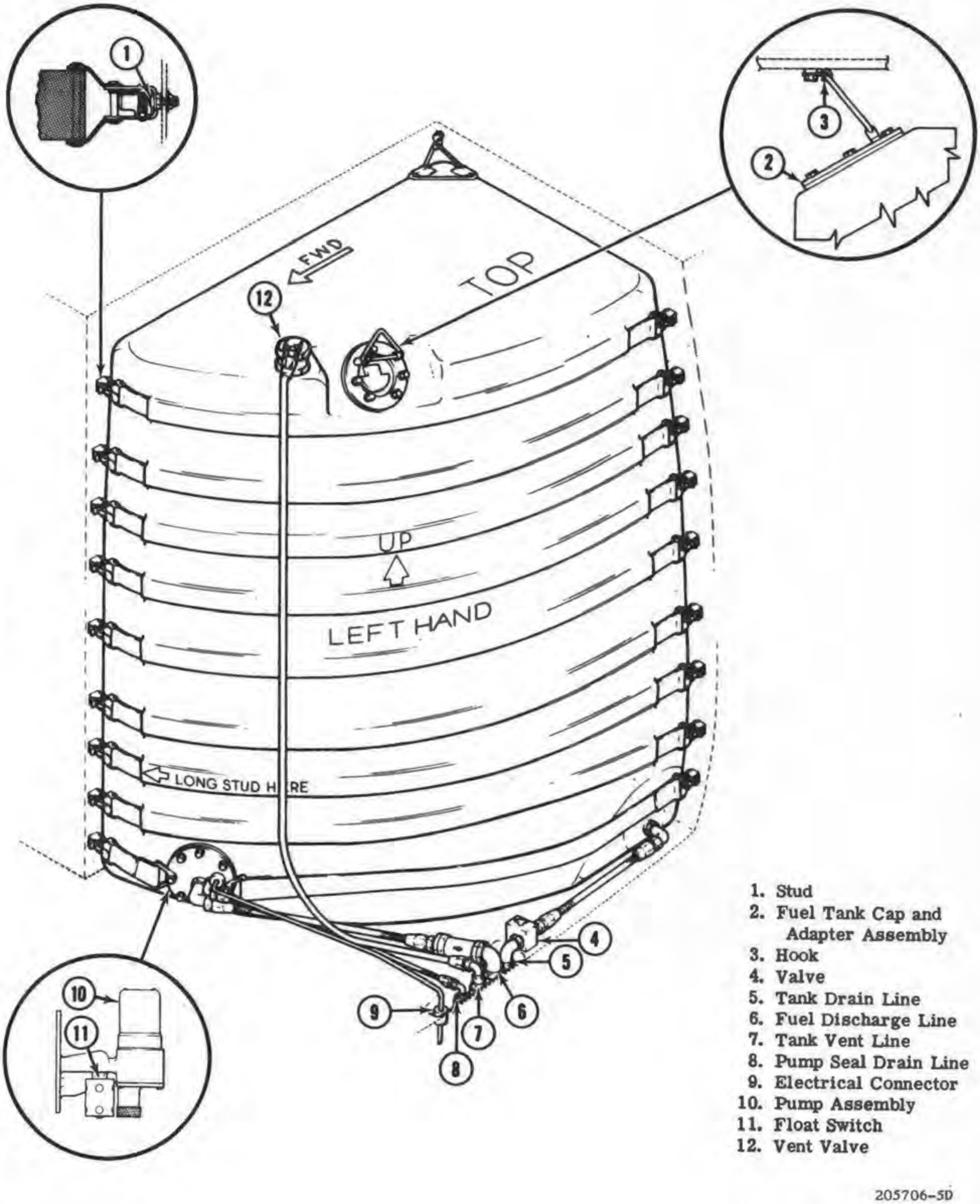
When an auxiliary fuel tank has emptied of all fuel, the fuel low level switch will function to cause the illumination of the MASTER CAUTION indicator on the instrument panel and the AUX FUEL LOW worded segment on the pedestal mounted caution panel (see figure 2-15). The pilot must then position the RESET/TEST switch on the caution panel to RESET to extinguish the master caution indicator. The AUX FUEL LOW worded segment will not light unless a TRANS PUMP switch is ON.

b. TRANS PUMP switch — Position aft to OFF.

Note

An automatic fuel float switch installed in the center aft fuel cell prevents inadvertent overfilling of main fuel cells when a transfer pump is ON. The pump will not operate when fuel makes contact with the high-level switch element, 1390 pounds (approximately 213 U. S. gallons) of fuel. The pump operates when the fuel makes contact with the low level switch element, 1225 pounds (approximately 188 U. S. gallons) of fuel. Power is supplied by the 28-volt DC essential bus.

6-84. External Auxiliary Fuel System. Provisions are made in the helicopter for the operation of external auxiliary fuel kit. The external auxiliary fuel tank kit consists of the necessary fuel lines, electrical wiring and attachment fittings to attach, either two 100 gallon tanks or two 60 gallon tanks to the aft external stores support assemblies. One tank shall be located on each side of the helicopter and are electrically or manually jettisonable in an emergency.



1. Stud
2. Fuel Tank Cap and Adapter Assembly
3. Hook
4. Valve
5. Tank Drain Line
6. Fuel Discharge Line
7. Tank Vent Line
8. Pump Seal Drain Line
9. Electrical Connector
10. Pump Assembly
11. Float Switch
12. Vent Valve

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Figure 6-18. Auxiliary fuel tank — typical

CHAPTER 7

OPERATING LIMITATIONS

Section I — Scope

7-1. Scope of Operating Limitations Data. All important limitations that must be observed during normal operations are covered in this chapter.

7-2. Limitations that are characteristic only of a specialized phase of operation are not repeated here.

Section II — Limitations

7-3. Introduction. The flight and engine limitations set forth in this chapter are the direct result of numerous flight test programs and actual operation experience. Compliance with these limits will allow YOU, THE PILOT, to safely perform the assigned missions and permit YOU to derive maximum utility from the helicopter, when used for intended purposes. The operational range limits (see figure 7-1) will serve as a constant reminder during operations. Additional limits concerning maneuvers, cg, and loading are also covered in this chapter. Close observation of instrument markings is required since they represent limits that are not necessarily repeated in the text.

7-4. Minimum Crew Requirements. The minimum crew requirement for all missions consists of only the pilot, whose station is on the right side. Additional crew members, as required, will be added at the discretion of the Commander in accordance with appropriate Department of Army Regulations.

7-5. Instrument Markings. The operating ranges and limits for both the helicopter and the engine are shown in figure 7-1.

7-6. Engine Limitations. The gas turbine power plant, as installed in this helicopter, is rated at an output torque value equivalent to 1100 hp at 6600 RPM for take-off and 900 hp at 6400 to 6600 RPM for continuous operation. Other engine limitations are as follows:

EXHAUST TEMPERATURE
320°C to 620°C Continuous Operation.
620°C to 640°C 30 Minute Limit.
760°C Maximum for starting and Acceleration.
GAS PRODUCER TACHOMETER
101.5 percent Maximum.
TORQUEMETER
50 PSI Maximum.
ENGINE OIL PRESSURE
25 PSI Minimum.
90 PSI Maximum.
ENGINE OIL TEMPERATURE
93°C Maximum.

7-7. Rotor Limitations. The normal operating range of the main rotor is 294 to 324 rpm and the range is marked on the dual tachometer as a green arc on the face of the instrument. Normally, autorotation rpm will be set at approximately 310 rotor rpm at sea level, 50 to 60 knots airspeed, and an approximate gross weight of 6600 pounds. Autorotation main rotor speed shall not exceed 339 rpm. main rotor speeds in excess of 339 rpm shall be logged. Rotor Operating Limits decal (see figure 7-2) located at the lower left of the instrument panel, specifies limitation conditions at specific altitudes and gross weights. It is possible to encounter blade stall within the operating range under high gross weight, high altitude, or high airspeed, or during acceleration or low rpm. Blade stall and the remedy are more thoroughly discussed in Chapter 8. At heavy gross weights, high density altitudes, or during maneuvering, the rotor rpm will tend to overspeed and shall be monitored and controlled by the pilot, using collective pitch to keep the rotor within limits.

7-8. Airspeed Limitations. The maximum permissible indicated forward airspeed for this helicopter is 120 knots, and this maximum is indicated by a red line on the airspeed indicator. Sideward and rearward airspeeds should be limited to 30 knots, which must be estimated for lack of instruments to provide these indications.

INSTRUMENT MARKINGS

T53-L-11 Engines
JP-4 or JP-5

FUEL PRESSURE
🟩 5 to 35 PSI Continuous Operation

ENGINE OIL PRESSURE
🟥 25 PSI Minimum
🟥 90 PSI Maximum

ENGINE OIL TEMPERATURE
🟥 93°C Maximum

TRANSMISSION OIL PRESSURE
🟥 30 PSI Minimum
🟩 40 to 60 PSI Continuous Operation
🟥 70 PSI Maximum

TRANSMISSION OIL TEMPERATURE
🟥 110°C Maximum

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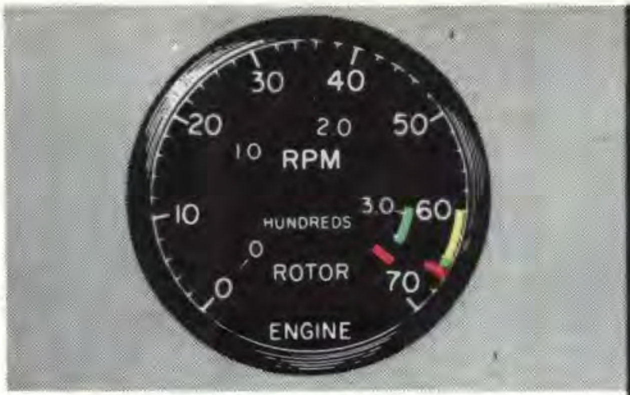
Figure 7–1. Instrument markings (Sheet 1 of 3)



ROTOR TACHOMETER

🟩 294 to 324 RPM Continuous Operation

🟥 339 RPM Maximum for Autorotation

ENGINE TACHOMETER

🟨 6000 to 6400 RPM 0 to 70 Knots

🟩 6400 to 6600 RPM Continuous Operation

🟥 6600 RPM Maximum

AIRSPEED

🟥 120 Knots Maximum

🟨 Above 70 Knots 6400 RPM Minimum

GAS PRODUCER TACHOMETER

🟥 101.5 Percent Maximum

TORQUEMETER

🟥 50 PSI Maximum

EXHAUST TEMPERATURE

🟩 390°C to 620°C Continuous Operation

🟨 620°C to 640°C 30 Minute Limit

🟥 640°C

🟥 760°C Maximum for Starting and Acceleration.

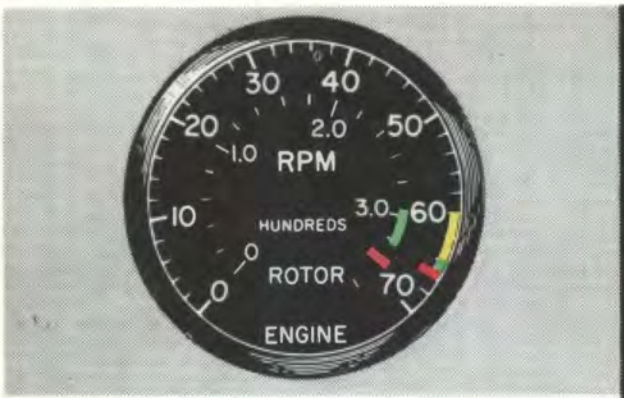
INSTRUMENT MARKINGS

FUEL
GRADE
JP-4

T53-L-11 Engines
JP-4 or JP-5

205070-2E

Figure 7-1. Instrument markings (Sheet 2 of 3)



ROTOR TACHOMETER

🟩 294 to 324 RPM Continuous Operation

🟥 339 RPM Maximum for Autorotation

ENGINE TACHOMETER

🟨 6000 to 6400 RPM 7500 lbs. Maximum (48' Rotor Only)

🟩 6400 to 6600 RPM Continuous Operation

🟥 6600 RPM Maximum

AIRSPEED

🟥 120 Knots Maximum

INSTRUMENT MARKINGS

FUEL
GRADE
JP-4

T53-L-11 Engines
JP-4 or JP-5

204070-14-3D

Figure 7–1. Instrument markings (Sheet 3 of 3)

Caution

> Cargo door airspeed restrictions: YUH-1D, half open, 50 knots; full open, 120 knots.

7-9. Climb Limitations. During climbs at low altitude, a safe autorotative speed shall be maintained so that in the event an engine failure occurs, sufficient airspeed is available to accomplish a safe autorotative landing. See figure 7-3 for details concerning climb limitations.

7-10. Prohibited Maneuvers. The in-flight maneuvers are restricted as follows: a. No aerobatic maneuvers permitted.

b. Protracted rearward flight and downwind hovering are prohibited.

c. The speed for any and all maneuvers shall not exceed the level flight velocities as stated in Airspeed Limitations.

d. Partial-power descents shall be accomplished at landing approach speed not less than shown in Landing Distance—Power Off Charts in Chapter 14.

7-11. Hovering Limitations. Hovering performance limits for the helicopter are shown on the Hovering Charts in Chapter 14.

7-12. Center of Gravity Limitations. Center of gravity (cg) limits for loading purposes are located between fuselage station 129 and 144 or 130 and 144 (see figure 7-4). For additional information concerning cg limitations, refer to Chapters 12 and 13.

Caution

> Do not attempt to carry external loads with a cg aft of station 142 prior to lifting external load.

7-13. Weight Limitations Chart. The Weight Limitations Chart (see figure 7-5) provides the flight crew a rapid means of determining the load carrying capabilities of the helicopter while remaining within safe operating limits. Performance due to the requirements of a particular mission as well as structural limitations, may restrict the maximum weight at which the helicopter can be flown. Center of gravity of the helicopter is not a consideration in the information presented in the Weight Limitations Chart. This data is available by use of Chart C of the helicopter Weight and Balance Data Handbook and Chart E in Chapter 12 of this handbook. (Refer to Chapter 12 and see charts 12-2 and 12-3.)

44 FOOT ROTOR

OPERATING LIMITS								
DENSITY ALTITUDE	CALIBRATED° AIRSPEED — KNOTS							
	6600 LB		7200 LB		8000 LB		8800 LB	
R. P. M.	6400	6600	6400	6600	6400	6600	6400	6600
SL-2000 FT	120	120	109	112	95	101	82	91
3000 FT	116	116	105	108	92	97	78	87
6000 FT	102	106	92	97	77	86	66	78
9000 FT	90	94	79	86	65	76	–	–
12000 FT	77	84	66	75	–	–	–	–
15000 FT	64	72	–	–	–	–	–	–
18000 FT	51	61	–	–	–	–	–	–

FROM 0 TO 70 KNOTS USE 6000 TO 6600 RPM RANGE
FROM 70 TO 120 KNOTS USE 6400 TO 6600 RPM RANGE

REDUCE AIRSPEED WHEN VIBRATION IS EXCESSIVE

205070-30A

48 FOOT ROTOR

OPERATING LIMITS				
DENSITY ALTITUDE	CALIBRATED SPEED –KNOTS			
	6600 LB	7500 LB	8500 LB	9500 LB
SL-2000 FT	120	120	115	110
3000 FT	117	117	112	107
6000 FT	108	108	103	98
9000 FT	98	98	94	—
12000 FT	89	89	84	—
15000 FT	78	78	—	—
18000 FT	65	65	—	—

UP TO 7500 LBS GW USE 6000 TO 6600 RPM RANGE
OVER 7500 LBS GW USE 6400 TO 6600 RPM RANGE

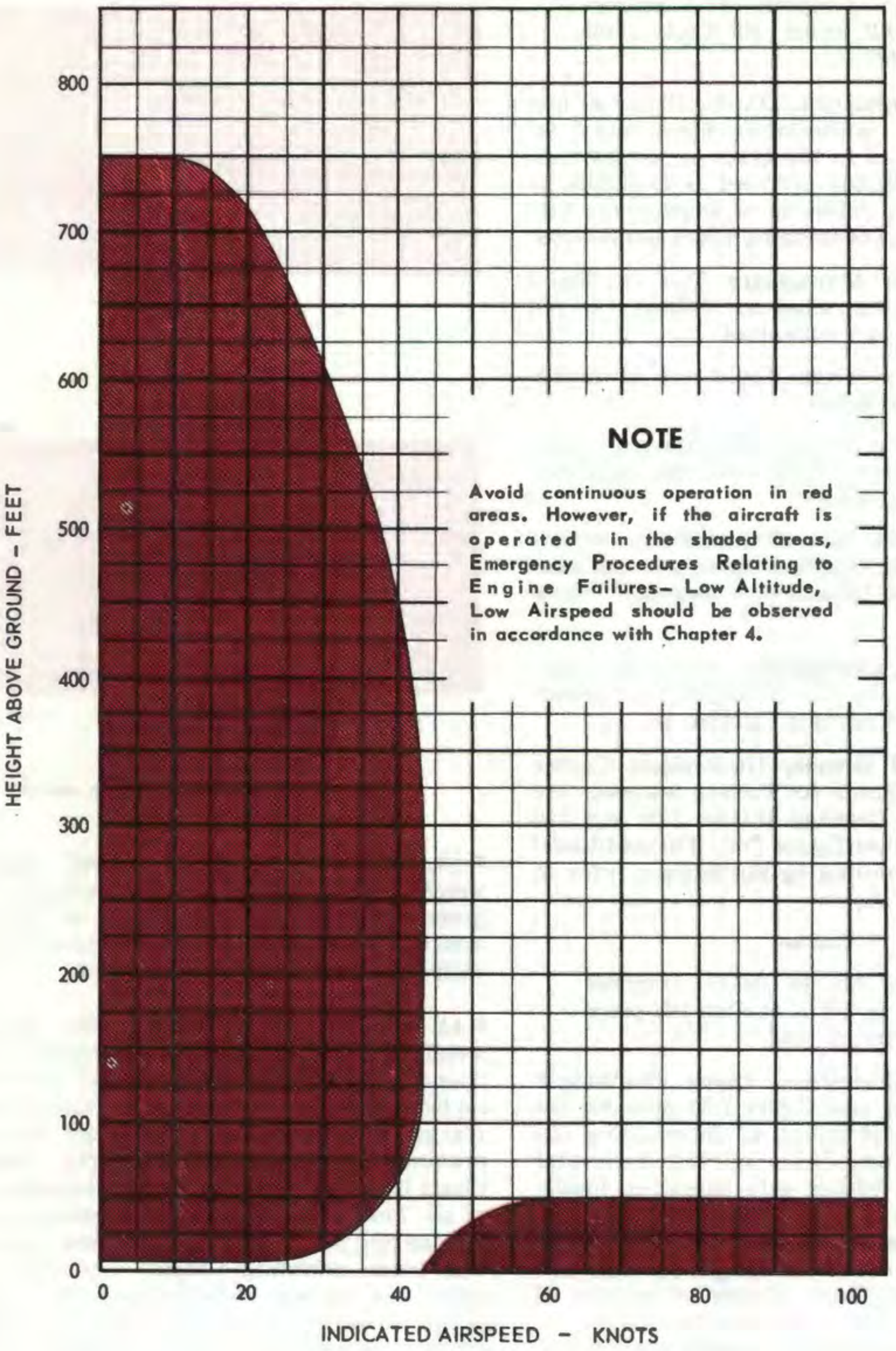
REDUCE AIRSPEED WHEN VIBRATION IS EXCESSIVE

205070-39A

Figure 7–2. Operating limits decal

7-14. Explanation of the Chart. Basic operating weight, gross weight and performance data, green area of chart, yellow area of chart, red area of chart, and use of the chart are explained in the following paragraphs.

7-15. Basic Operating Weight. The operating weight on which the chart is based is 5065 pounds. This weight is the weight of the helicopter ready to fly except for two variables (cargo or passenger load and fuel) and is approximate basic helicopter weight shown in Chart C plus the weight of one pilot and a tank of oil. The intersection of the passenger or cargo load and the fuel load axis at zero represents this basic operating weight. The chart indicates the various combinations that can be added to the basic operating weight to remain within the safe operating range. Since the actual weights of individual helicopters vary, it will be necessary to adjust the chart to these individual weights. To adjust the chart, determine the actual basic weight of the helicopter from chart C and add 200 pounds for



NOTE

Avoid continuous operation in red areas. However, if the aircraft is operated in the shaded areas, Emergency Procedures Relating to Engine Failures– Low Altitude, Low Airspeed should be observed in accordance with Chapter 4.

204099-10B

Figure 7–3. Height velocity diagram

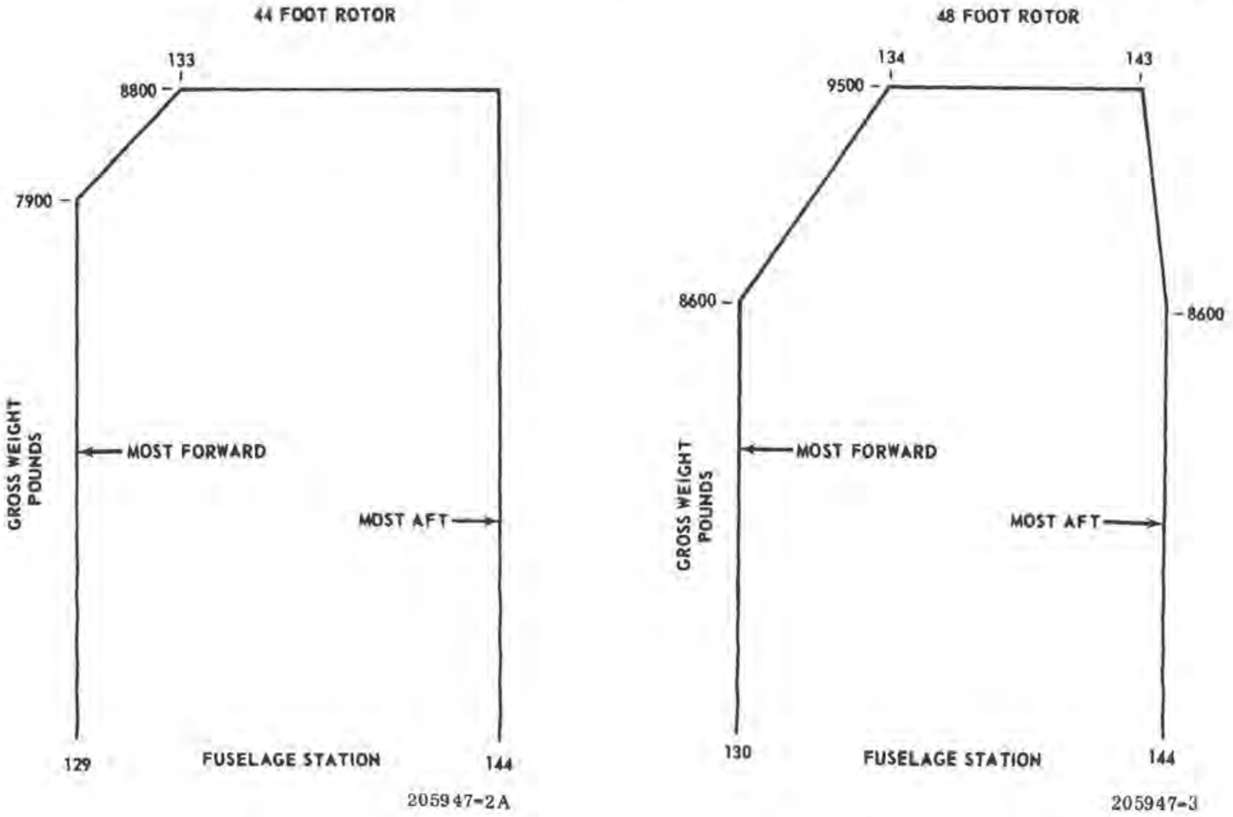


Figure 7-4. Center of gravity limits diagram

the pilot and 24 pounds for the tank of oil. If the actual weight exceeds 5065 pounds, subtract the difference between the actual weight and 5065 pounds from the passenger or cargo load as shown in the chart. If the actual weight is less than 5065 pounds, add the difference to the passenger or cargo load as shown in the chart.

Note

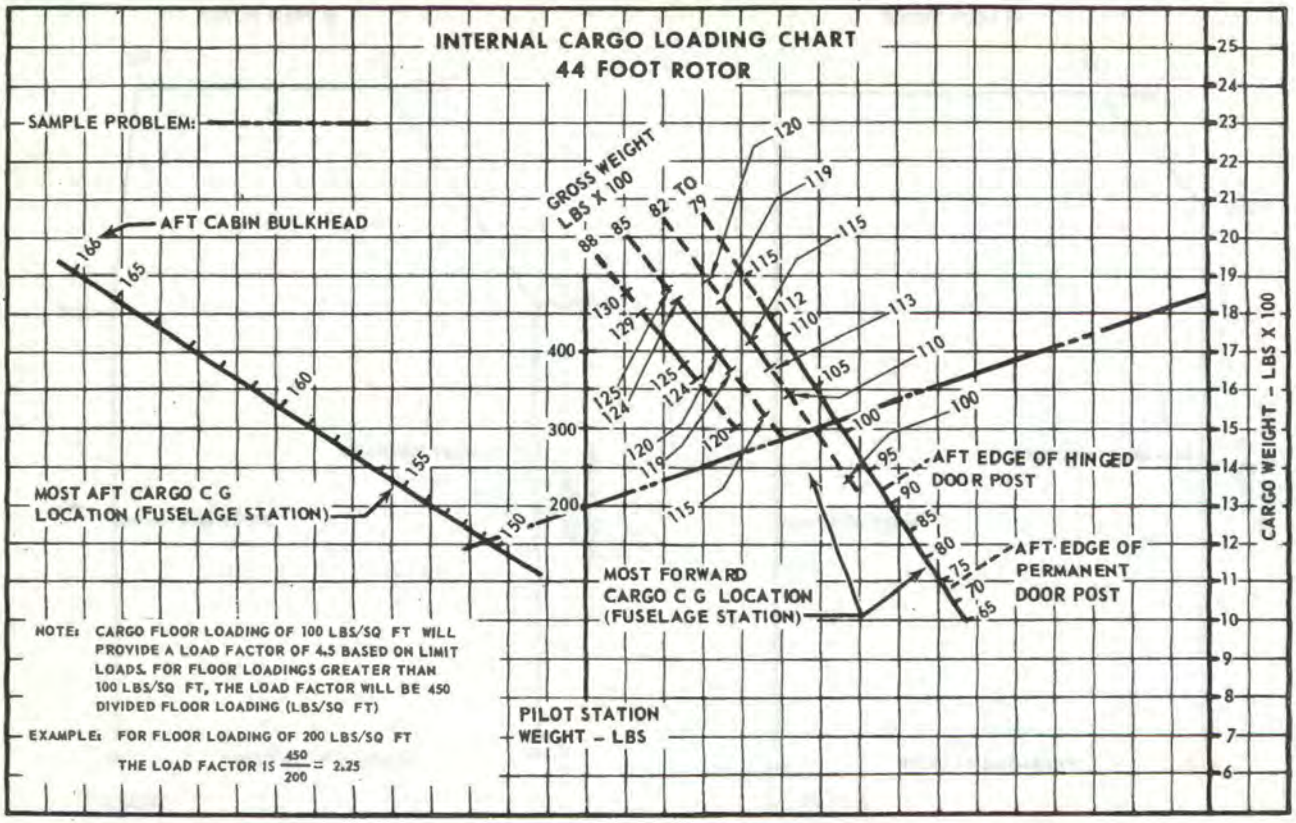
When the helicopter has a 48 foot rotor installed, substitute 5120 pounds operating weight for 5065 pounds. (Refer to paragraph 7-15).***5460 pounds.

-16. Gross Weight and Performance Data. (See gure 7-5). For helicopter with 44 foot rotor installed, two gross weights of the loaded helicopter are shown as diagonal lines in the left (colored) area of the chart: 7600 pounds gross veight and 8600 pounds alternate gross weight. erformance data is presented in the right area of the chart for gross weights of 6600, 7600 and 8600 pounds.

7-17. For helicopter with 48 foot rotor installed, four gross weights of the loaded helicopter are shown as diagonal lines in the left (colored) area of the chart: 6600 pounds design gross weight, 7500 and 8500 pounds gross weight, and 9500 pounds maximum gross weight. Performance data is presented in the right-hand area of the chart for each of these weights.

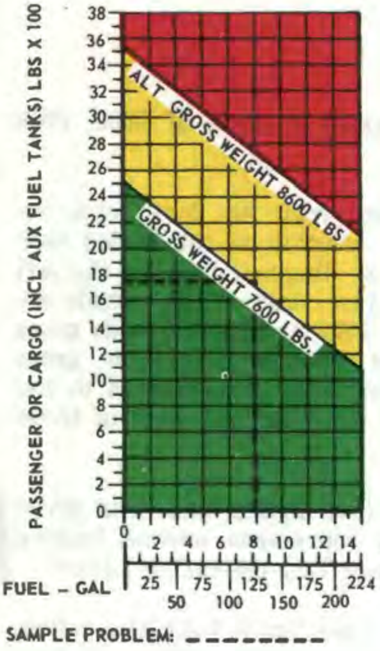
7-18. Green Area. (See figure 7-5). The green area of the chart represents normal loading conditions (see figure 7-2) Operating Limits.

7-19. Yellow Area. (See figure 7-5.) The yellow area of the chart represents loading of progressively increasing risk as the red area is approached. Care shall be exercised when operating within this area as speed, performance, and flight load factors decrease. (See figure 7-2 Operating Limits.)



NOTE: CARGO FLOOR LOADING OF 100 LBS/SQ FT WILL PROVIDE A LOAD FACTOR OF 4.5 BASED ON LIMIT LOADS. FOR FLOOR LOADINGS GREATER THAN 100 LBS/SQ FT, THE LOAD FACTOR WILL BE 450 DIVIDED FLOOR LOADING (LBS/SQ FT)

EXAMPLE: FOR FLOOR LOADING OF 200 LBS/SQ FT THE LOAD FACTOR IS $\frac{450}{200} = 2.25$



STANDARD DAY PERFORMANCE

		GROSS WEIGHT – LBS		
		8600	7600	6600
BEST RATE OF CLIMB AT SEA LEVEL WITH NORMAL RATED POWER (50 KNOTS)	(FPM)	1240	1790	2340
SEA LEVEL VERTICAL RATE OF CLIMB WITH TAKE–OFF POWER	(FPM)	450	1340	2130
SERVICE CEILING WITH NORMAL RATED POWER	(FT)	7600	11,700	16,400
HOVERING CEILING, IGE WITH TAKE–OFF POWER	(FT)	8300	12,500	17,000

🟥 NOT RECOMMENDED LOADING

🟨 CAUTIONARY LOADING

🟩 NORMAL LOADING

**WEIGHT LIMITATIONS CHART
44 FOOT ROTOR**

205070–32A

Figure 7–5. Weight limitations and internal cargo loading charts (Sheet 1 of 3)

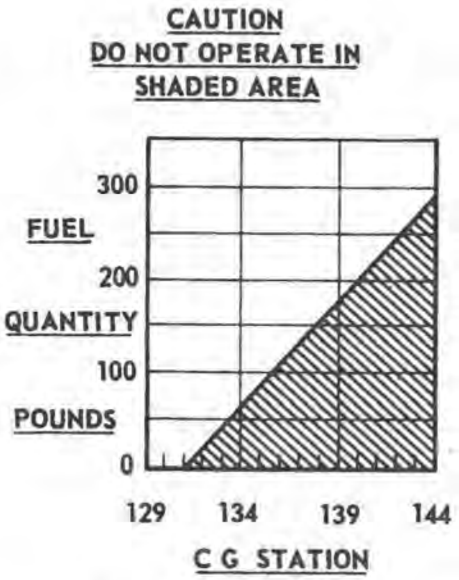


Figure 7–6. Low level fuel warning — YUH-1D

7-20. *Red Area.* (See figure 7-5.) The red area of the chart represents loadings that shall not be used except under conditions of extreme emergency when safety of flight is of secondary importance. (See figure 7-2 Operating Limits.)

Note

> Operating weight should never exceed that required for the mission, since unnecessary risk and equipment wear will result. The data shown in the chart is for information and guidance; however take-off weight, especially at high ground altitude, must be considered in relation to available runway, surrounding terrain, atmospheric temperature, mission requirements, and urgency of the mission.

7-21. *Use of the Chart.* (See figure 7-5.)

Note

> *Denotes 44 foot rotor configuration.
>
> **Denotes 48 foot rotor configuration. (Prior to Serial No. 65-9565).
>
> ***Denotes 48 foot rotor configuration (Serial No. 65-9565 and subsequent).

7-22. *Problem.* In accomplishing a particular mission it is necessary to carry 800 pounds of fuel. Determine the maximum cargo load that can be carried.

7-23. *Solution.* The chart basic operating weight will be used as actual helicopter weight in this problem. Steps e. and f. will show how to adjust the chart for actual basic weight variations.

a. Establish the basic operating weight of the helicopter by completing a Form F using the latest basic weight from Chart C. Actual weight assumed to be chart weight (*5065, **5120, ***5460 pounds) for this problem.

b. Project the fuel weight of 800 pounds vertically until the *7600, **7500, ***7500 pounds gross weight line is intersected. From the intersection of the two lines, project horizontally left to the cargo load scales and read *1750, **1600, ***1260 pounds. This weight is the maximum cargo load that can be carried with 800 pounds of fuel to remain at *7600, **7500, ***7500 pounds gross weight.

c. For the requirements of a particular mission if it is necessary to exceed the *7600, **7500, ***7500 pounds gross weight and if the reduced speed, load factor, and performance (at a higher gross weight) are satisfactory, then project the fuel weight of 800 pounds vertically until the *8600, **8500, ***8500 pounds gross weight line is intersected. From this intersection, project horizontally left to the cargo load scale and read *2750, **2600, ***2260 pounds.

d. When this information is obtained it is then necessary to refer to the Internal Cargo Loading Chart to obtain cargo placement information so that the center of gravity of the helicopter will be within the operating range.

e. If the actual weight of the helicopter is *5100, **5150, ***5490 pounds instead of *5065, **5120, ***5460 pounds, the chart must be adjusted by reducing the cargo weight. Therefore, in step b., the cargo weight will be *1750, **1600, ***1260 pounds minus *35, **30, ***30 pounds, amount the helicopter is overweight, or *1715, **1570, ***1230 pounds. In step c. the cargo weight will be *2750, **2600, ***2260 pounds, minus *35, **30, ***30 pounds, or *2715, **2570, ***2230 pounds.

f. If the actual weight of the helicopter is *5050, **5100, ***5440 pounds instead of *5065,

**5120, ***5460 pounds, the chart must be adjusted by increasing the cargo weight by *15, **20, ***20 pounds. Therefore, in step b., the cargo weight will be *1750, **1600, ***1260 pounds, plus *15, **20, ***20 pounds, or *1765, **1620, ***1280 pounds. In step c., the cargo weight will be *2750, **2600, ***2260 pounds, plus *15, **20, ***20 pounds, or *2765, **2620, ***2280 pounds.

7-24. Cargo Loading — Internal. Internal cargo is carried within the cabin, and large bulk items can be accommodated.

7-25. ***Cargo Area.*** The cargo area is located aft of the crew stations and contains approximately 220 cubic feet of obstruction-free cargo load space. Ease of loading is provided by full-width sliding doors, which enclose two sides of the cargo area and provide straight-through loading capabilities. Cargo can be easily loaded without the use of specialized equipment. High density cargo distributed over the deck area to maintain 100 pounds per square foot, will provide a safety load factor of *4.5, **4.0, ***4.0 based on limit loads. The safety load factor will vary as the floor loading varies. (Load factor = *450, **400, ***400 pounds per square foot floor loading.) Flush-mounted tiedown fittings are provided on the beam and aft cabin bulkhead. A rapid simplified visual method for placement of cargo, after cargo cg has been determined, has been provided by information in the Internal Cargo Loading Chart (see figure 7-5). This information, when used, will maintain the helicopter within its cg operational limits throughout its entire mission.

7-26. ***Internal Cargo Loading Chart.*** The Internal Cargo Loading Chart provides a straight line method of determining cargo location without computations. The variables shown in the chart are crew weight, cargo weight, gross weight, and most forward and most aft locations (fuselage stations) allowable. A sample problem is shown in each of the two charts by dashed line (— -- —), and working of the typical problems follows:

PROBLEM:

Determine the acceptable location for *1850, **1800, ***1800 pounds of cargo, if the pilot weight is *200, **350, ***350 pounds and the gross weight is less than *7900, **8600, ***8600 pounds.

ANSWER:

Draw a straight line from the *1850, **1800, ***1800 pound cargo weight point to the *200, **350, ***350 pound pilot station weight point. Extend line through most aft cargo cg location line and most forward cg location line for a gross weight of less than *7900, **8600, ***8600 pounds. Cargo cg shall be located between fuselage stations *(101 and 151), **(108 and 156), ***(108 and 156), shown on diagonal lines.

Note

> If the drawn diagonal does not intersect the most aft cargo cg location diagonal, there is no aft location limitation. If gross weight exceeds *7900, **8600, ***8600 pounds, use applicable gross weight diagonal line in determining most forward and most aft cargo cg location limits.

7-27. External Cargo Configuration. Caution should be exercised, when carrying external cargo, as handling characteristics may be affected due to the size, weight, and shape of the cargo load. Maximum allowable weight of external cargo is 4000 pounds.

7-28. Low Level Fuel Limitations — YUH-1D. When the 20 MINUTE FUEL light on the CAUTION panel illuminates, there is approximately enough fuel remaining for 20 minute flight time at cruise power. Return to landing field or locate suitable area to land helicopter.

Caution

> Do not operate helicopter in shaded area of figure 7-6.

7-29. When fuel quantity drops below 300 pounds, maintain cg station forward of fuselage station 144. (See figure 7-6.)

7-30. Towing the Helicopter. Towing the helicopter, with ground handling wheels installed, on rough surfaces at gross weights in excess of 9500 pounds may cause permanent set in the aft cross tube.

Caution

> Do not tow helicopter on rough surfaces with a gross weight in excess of 9500 pounds.

CHAPTER 8

FLIGHT CHARACTERISTICS

Section I — Scope

8-1. Scope of Flight Characteristics Data. The function of this chapter is to describe the unique characteristics of the helicopter. Emphasis has been placed on the advantageous flight characteristics as well as any dangerous tendencies.

8-2. The information herein is based on operations at maximum gross weight.

Section II — General Flight Characteristics

8-3. Operating Characteristics. The flight characteristics of this helicopter in general are similar to other single-rotor helicopters. The noticeable difference is in the additional stability that is evident during take-off, hovering, and all flight speeds. This stable condition is the result of the gyroscopic action of the stabilizer bar. The control system, with hydraulic servo assist, provides the pilot with a near-zero force required for control movement; however, control feeling is induced into the cyclic stick and directional control pedals by means of a force trim system. To increase helicopter forward speed, simultaneously apply forward control stick and increase main rotor pitch; power is automatically adjusted to maintain constant rpm. Constant altitude is maintained throughout the entire range of forward flight speeds by fore and aft use of the cyclic control stick in coordination with power and main rotor pitch application. Directional heading is controlled by the application of lateral cyclic control and the appropriate directional control pedal.

8-4. Blade Stall. Blade stall is caused by a high angle of attack on the retreating blade and starts at the inboard section and progresses outboard with increased airspeed. However, this condition will not be encountered when the helicopter is operated within the limits imposed in the preceding chapters of this manual. Blade stall is the result of numerous contributing factors such as gross weight, engine rpm, airspeed, acceleration, and altitude. The condition is most likely to occur at higher airspeeds and low operating rpm; it also follows that the condition will occur sooner with higher values of altitude and gross weight. One of the more important features of the two-bladed semi-rigid rotor system is its warning to the pilot of impending blade stall. Prior to progressing fully into the stall region, the pilot will feel a marked increase in both airframe vibration and vibration in the controls. Consequently, corrective action can be taken before the stall condition becomes severe.

8-5. Blade Stall — Corrective Action. When blade stall is evident, the condition may be eliminated by accomplishing one or a combination of the following corrective actions:

a. Decrease the severity of the maneuver.

b. Increase operating rpm.

c. Reduce power and airspeed.

d. Descend to lower altitude.

8-6. Maneuvering Flight. Action and response of the controls during maneuvering flight are normal at all times when the helicopter is operated within the limitations set forth in this manual.

8-7. Hovering Capability. Hovering capability is affected by in-ground effect (IGE), out-of-ground effect (OGE), outside air temperature (OAT), density and pressure altitude, wind speed, engine torque (power available), and gross weight of the helicopter. Hovering IGE performance is better than OGE because during IGE the rotor sets up a current flow between the helicopter and the ground, providing a cushion of air to partially support the helicopter weight. Temperature variations affect engine and rotor performance. For each four-degree centigrade rise in temperature, there is approximately a four percent loss in engine power. Hovering with heavier gross weights or at higher altitudes is possible with lower temperatures and wind velocities. Lower temperatures increase engine efficiency and wind represents airspeed; therefore, either condition or both will increase hovering performance due to the ability of the main rotor to provide more lift.

8-8. Operating Rules of Thumb. The following general rules are factors contributing to the hovering capability of the helicopter.

a. A rise of three degrees centrigrade above standard causes a loss of 1.5 psig or torque.

b. Assuming a standard temperature lapse rate, approximately 0.75 psig of torque is lost with each 1000-foot increase in altitude.

c. An increase of 1.0 psig in torque is equivalent to 200 pounds lift capability.

d. For a given power setting, there is approximately 1000 pounds difference in gross weight between IGE and OGE hovering.

e. Hovering OGE requires approximately five more psig of torque than hovering IGE.

f. Generally, IGE performance figures should not be used for sling loads. (Refer to Chapter 14.)

Section III — Control Characteristics

8-9. Flight with External Loads. The airspeed with external cargo is limited by controllability.

Caution

Exercise care, when carrying external cargo, as the handling characteristics may be affected due to the size, weight and shape of the cargo load.

8-10. Level Flight Characteristics. The level flight characteristics of this helicopter are normal throughout the range of operating limits. Control response is immediate and gives positive results.

8-11. Flight Controls Coordination. The most efficient performance of this helicopter is obtained by the coordinated movement of the controls; coordinated control movement is as important for helicopter operation as it is for fixed-wing aircraft.

CHAPTER 9

SYSTEMS OPERATION

Section I — Scope

9-1. Scope of Systems Operation. This chapter provides additional material, to that already presented in other chapters, on the operation of the free wheeling unit, the stabilizer system, engine anti-icing system and droop compensator.

9-2. These items have been presented here to avoid interrupting continuity of thought and overcrowding other chapters. Use of this information will result in more efficient operation and increase flight safety.

Section II — Systems

9-3. Freewheeling Unit. The freewheeling unit provides a positive disconnect from the engine in case of power failure and allows the main rotor and the tail rotor to rotate in order to accomplish safe autorotational landings.

9-4. Stabilizer System. The stability of the helicopter is the result of the action of the stabilizer bar. This unit is mounted horizontally, above and at 90 degrees to the main rotor blades. The stabilizer bar and control linkage are so designed as to take advantage of the inertia effect of the bar and thus provide stability which materially lessens pilot fatigue. For example: If the helicopter, while hovering in a level attitude, is tilted to the left, the bar, due to its inertia effect, will tend to remain in a horizontal or level plane. This inertia effect will cause the rotor blades by means of the mixing lever arrangement, to feather in such a manner as to return the helicopter to a near level attitude. If the bar were so completely unrestrained as to actually remain in its original plane of rotation, it would make the helicopter stable to the point of greatly reducing control from the pilot. However, due to restraint or damping in the see-saw attachment to the mast, the bar possesses a mast-following characteristic. This following time is regulated by two hydraulic dampers, which are connected to the bar outboard of the mast, one on each side. By means of these dampers, the following time may be regulated in such a manner as to give the helicopter the desired amount of stability and still leave the pilot with complete and responsive control of the helicopter. In its basic configuration this helicopter may be hovered in still air for short periods of time with hands off the controls.

9-5. Engine Anti-icing System. The engine is equipped with an anti-icing system consisting of a detection system, anti-icing valve, DE-ICE switch, and caution indicator lights. The anti-icing system supplies hot air under pressure to the inlet housing areas to prevent icing when the engine is operating under icing conditions. The detector unit, through a probe mounted in the engine air inlet, senses inlet total pressure on the forward side and a value less than static pressure on the aft side. These two pressures are applied to opposite sides of a diaphragm in the detector head. Operational engine airflow induces a pressure differential across the diaphragm. The diaphragm mechanically displaces a set of electrical contacts. When ice blocks the forward probe openings, a bleed hole in the diaphragm equalizes the pressure on both sides, causing the diaphragm to move. Repositioning of the electrical contacts transmits an electrical signal to the detector unit interpreter, where switching and relay action energizes an electrical heater in the probe and causes intermittent illumination of the ENGINE ICING caution light. The heater melts the ice, allowing a pressure differential to develop across the diaphragm. Movement of the diaphragm returns the electrical contacts to

the no-ice position, de-energizing the electrical heater and ENGINE ICING caution light. The detector unit is again capable of sensing an icing condition.

9-6. Pressurized hot air from the annular manifold within the centrifugal compressor housing flows forward through the shutoff anti-icing valve into the hollow annulus on top of the air inlet housing. Hot air is directed through five or six hollow inlet housing support struts to de-ice the air inlet area. Hot scavenge oil, draining through the lower strut in the accessory drive gear box, de-ices the bottom of the air inlet area. Hot air flows into the inlet guide vane area. Small openings in the bottom of the inlet guide vane allow air to bleed back into the compressor area. The shutoff anti-icing valve is spring-loaded in the open or ON position. The pilot can close the valve by positioning the DE-ICE switch on the ENGINE panel to OFF. This energizes a solenoid, causing the valve to shift to the closed or OFF position. If an electrical power failure occurs, the solenoid is de-energized, allowing the spring-loaded valve to open, and anti-icing becomes continuous. With anti-icing ON, full power will be limited due to a rise in exhaust gas temperature (egt). Pilot shall closely monitor egt when anti-icing is ON.

Caution

> When the ENGINE ICE DET light is illuminated, the anti-icing detector and interpreter units are inoperative. The shut-off anti-icing valve allows continuous flow of hot air. Pilot shall closely monitor egt.

9-7. Power for the detection system is supplied by the 28-volt DC essential bus. Circuit protection is provided by the CAUTION LIGHTS and ANTI-ICE ENG circuit breakers. When an engine icing condition occurs, the MASTER CAUTION and ENGINE ICING lights will illuminate. Operation of the ENGINE ICING caution light will be intermittent. The ENGINE ICE DET light only illuminates to indicate a malfunction of the detection system components.

9-8. Droop Compensator. Droop is defined as the speed change in engine rpm (nII) as power is increased from a no-load condition. It is an inherent characteristic designed into the governor system. In the absence of any droop in the governor system instability would develop as engine output power was increased, resulting in nI speed overshooting or hunting the value necessary to satisfy the new power condition. Design droop of the engine governor system is as much as 300 to 400 rpm (flat pitch to full power). If nII power were allowed to droop, other than momentarily, the reduction in rotor speed could become critical; therefore, a droop compensator is installed on the governor control to raise nII speed, as power is increased, to the rpm value selected by the pilot. The compensator is a direct mechanical linkage between the collective control stick and the speed selector lever on the nII governor. Properly rigged, the droop compensator will hold nII to ± 50 rpm of selected value from flat pitch to climb-out power.

Caution

> A shear pin is incorporated in the droop compensator linkage to permit collective control in the event of a bind occuring in the droop compensator linkage. When the pin is sheared, the droop compensator is inoperative and care must be taken to maneuver within power adjustment capabilities of the governor. Sheared pin shall be replaced before new flight.

Note

> An improperly rigged droop compensator can result in the engine not developing rated power.

are reached, no change should be made to collective pitch setting unless the airspeed changes from 70 (±5) knots IAS or the rate of climb changes from 500 (±100) fpm. Turns should be made, utilizing the attitude indicator to obtain the recommended 15-degree angle of bank which approximates a standard rate of turn of three degrees per second. Using approximately 20 pounds of torque with the cyclic pitch set so that the miniature airplane on the attitude indicator is level with the horizon bar should give the recommended climb airspeed and vertical speed. Any pitch attitude corrections should not exceed one bar width. The angle of bank should never exceed 20 degrees.

Note

> When rolling into and out of turns, the turn and slip indicator initially indicates a turn in the opposite direction. The attitude indicator has negligible precession error and should be utilized for establishing and maintaining angles of bank.

10-14. Instrument Cruising Flight. As previously mentioned, the constant diligence required to conduct instrument flight produces pilot fatigue. This is especially true on long missions. To lessen the fatigue factor, the pilot should handle the cyclic stick with a loose grip and not make collective pitch changes unless the airspeed varies ±10 knots IAS or the altitude varies ±200 feet from cruise speed or altitude. Upon establishing the recommended cruise speed, the attitude indicator should be set for a nose-level indication. Thereafter, any pitch or bank corrections should be made utilizing the attitude indicator. Pitch corrections should not exceed one bar width. The recommended angle of bank for cruising turns is 15 degrees and should not exceed 20 degrees.

Note

> The attitude indicator should never be reset in flight except to align the miniature airplane with the horizon bar. In all cases the helicopter shall be in straight and level flight at recommended cruise speed when this adjustment is made.

10-15. The most economical long range cruise peeds are not recommended for instrument cruising because of their close proximity to the speeds at which induced vibrations occur. As the vibration level permits, use operating limits as specified on the OPERATING LIMITS decal. (Refer to Chapter 7.)

Note

> Instrument cruising flight at speeds less than 60 knots IAS is not recommended. The helicopter handling qualities at speeds less than 60 knots are not compatible with instrument flying.

10-16. ***Radio and Navigation Equipment.*** The UHF radio reception is poor when large obstructions (building, mountains, etc.) lie between the helicopter and the station. When poor reception is encountered on the ground, attempt to establish a clear "line of sight" to the communications station by hovering or changing location. When conducting low level flight in mountainous terrain, if poor reception is encountered, climb, if possible, until readable communications are established.

10-17. ***Direction Finder Set (AN/ARC-59).*** The direction finder is satisfactory for airway navigation. However, when the station line of sight is within 30 degrees of the nose or tail of the helicopter, slight false background signals may be obtained when flying "on course". These false background signals are barely perceptible and are of no concern as their degree of intensity will not cause a false drift correction to be made. To decrease these false signals even further, it is recommended that the direction finder set be tuned for a minimum comfortable reception level.

10-18. ***Operation of Radio Equipment in the Artic.*** The proper functioning of radio equipment in the Arctic is of primary importance because of the large areas of unmapped territory and the poor check points, even in mapped areas. Although, in general, radio equipment gives little additional trouble at low temperature, pilots and maintenance personnel should be aware of a few conditions and phenomena which at some time may affect their safe passage over rugged, uninhabited terrain. Radio fade-outs occur periodically in the Arctic and are caused by solar explosions and sun spot activity. The accepted theory is that the sun emits electrified particles which produce heavy ionization on reaching the earth's atmosphere. The ionized blanket disrupts radio ceilings everywhere but particularly in the polar regions. Fade-outs may last for several weeks. As these are referable to sunspot activity, they may be forecast. Short term fade-outs caused by solar explosions similar to the detonation of atom bombs may occur in the Arctic during both daylight and darkness. The atmospheric disturbance is revealed about eight minutes after a solar explosion. The fade-out conditions last from 15 minutes to several hours and cannot be forecast. By blanketing radio reception fade-outs are of obvious concern to survivors. Radios are unserviceable and communication leading to rescue may be delayed. Do not interpret these fadeouts as faulty equipment. At temperatures below 0°C (32°F), the efficiency of the equipment is affected by decreasing temperatures.

10-19. Normal Descents. Enroute descents to traffic altitude can be initiated and maintained without difficulty using the following procedures.

a. Before commencing the descent, check and reset, if necessary, the attitude indicator for a nose-level indication with the helicopter in straight and level flight at the recommended cruise speed.

b. To establish the descent, reduce the torque to set up a 600 to 1000 fpm rate of descent and maintain recommended cruise speed, angle of bank, and pitch attitude. During the descent, the miniature airplane will remain on the horizon bar.

Note

> In general, below 7000 feet density altitude, a reduction of one pound of torque will increase the rate of descent approximately 100 fpm.

10-20. Maximum (Autorotative) Descents. Autorotations are not difficult on instruments. However, due to the high rate of descent, they are recommended for emergencies (loss of engine, etc.) only. The following procedures are recommended for establishing and conducting autorotations on instruments.

Warning

(Deleted)

a. Reduce collective pitch as required to maintain rotor rpm within limits.

b. Assume a one bar width nose-high attitude and maintain directional control with the pedals. The airspeed will gradually decrease to 60 knots IAS. Approximately a one bar width nose-high attitude will give this speed, which should be maintained until visual contact is made and a reasonable 2000 to 2400 fpm rate of descent is achieved. As soon as the autorotation is established and the helicopter is under positive control, complete the Engine Failure During Flight, Chapter 4, check list. During the descent, limit the angle of bank in turns to 15 degrees.

10-21. Holding. Holding presents no handling or control problems if the recommended instrument cruise speed (80 knots IAS) is used. The VFR maximum endurance airspeeds are not recommended for loitering on instruments. The poor instrument handling qualities at these speeds greatly increase the work load at a time when the pilot is busy monitoring radio communications, flying a given set condition, etc. The decrease in fuel consumption realized from using maximum endurance airspeeds, instead of 80 knots, would be negligible for all practical purposes.

10-22. For all pitch and bank corrections, utilize the attitude indicator. Do not exceed a one bar width pitch correction for minor altitude changes and limit the angle of bank in turns to 15 degrees. It is best not to make a collective pitch change unless the airspeed varies more than ± 10 knots IAS.

10-23. The double drift method should be used for wind drift corrections so that a constant bank angle can be maintained in the turns. Large angle corrections, commonly as much as 30 degrees, should be anticipated when cross winds are encountered in the holding pattern.

10-24. Instrument Approaches. Instrument approaches are easily flown in this helicopter. Before commencing the approach, have the attitude indicator properly set (i.e., miniature airplane on horizon bar at a straight and level cruise speed of 80 knots IAS). During all phases of the approach, the miniature airplane is the attitude indicator and will be approximately on the horizontal bar if the recommended airspeed of 80 knots is maintained.

10-25. For all pitch and bank corrections, utilize the attitude indicator. Do not exceed a one bar width pitch correction for minor altitude changes and limit the angle of bank in a turn to 15 degrees.

10-26. During the descent phase of an approach, make rate-of-descent corrections with the cyclic pitch by reference to the attitude indicator. Allow the airspeed to vary ±10 knots during these corrections before making a collective pitch adjustment.

10-27. Radio Range and ADF Approaches. Radio range and ADF approaches are easily conducted by reference to the procedures outlined in figure 10-1. If not in visual contact at the approach minimums, execute a missed approach.

10-28. Ground Control Approach. The helicopter presents a traffic control problem because of its relatively slow speed compared to other air traffic. Therefore, the GCA operator should be notified that the airspeed will be 80 knots for the entire approach. To reduce the time required to execute a GCA, request a short pattern. This pattern is recommended to have a downwind leg two or three miles from the runway and a four mile final. If the procedures outlined in figure 10-2 are followed, no problem will be encountered.

Note

> A normal GCA will require 20 to 25 minutes; whereas a short pattern requires only 10 to 15 minutes.

Note

> For a 2.8-degree glide and zero wind condition, the required rate of descent at 80 knots IAS is 395 fpm. In general, to maintain 80 knots IAS and proper rate of descent a 1/2 pound increase in torque is required for each 10 knots of headwind and 1/2 pound decrease for each 10 knots of tail wind.

Note

> If traffic will permit and GCA will approve, execute missed approach by making a 180-degree climbing turn. Proceed under radar control out the GCA final approach reciprocal heading at glidepath interception altitude, and execute a 90-degree procedure turn after passing through the glidepath. Then, reinitiate GCA final approach procedures. This will greatly reduce the time required to execute a go around.

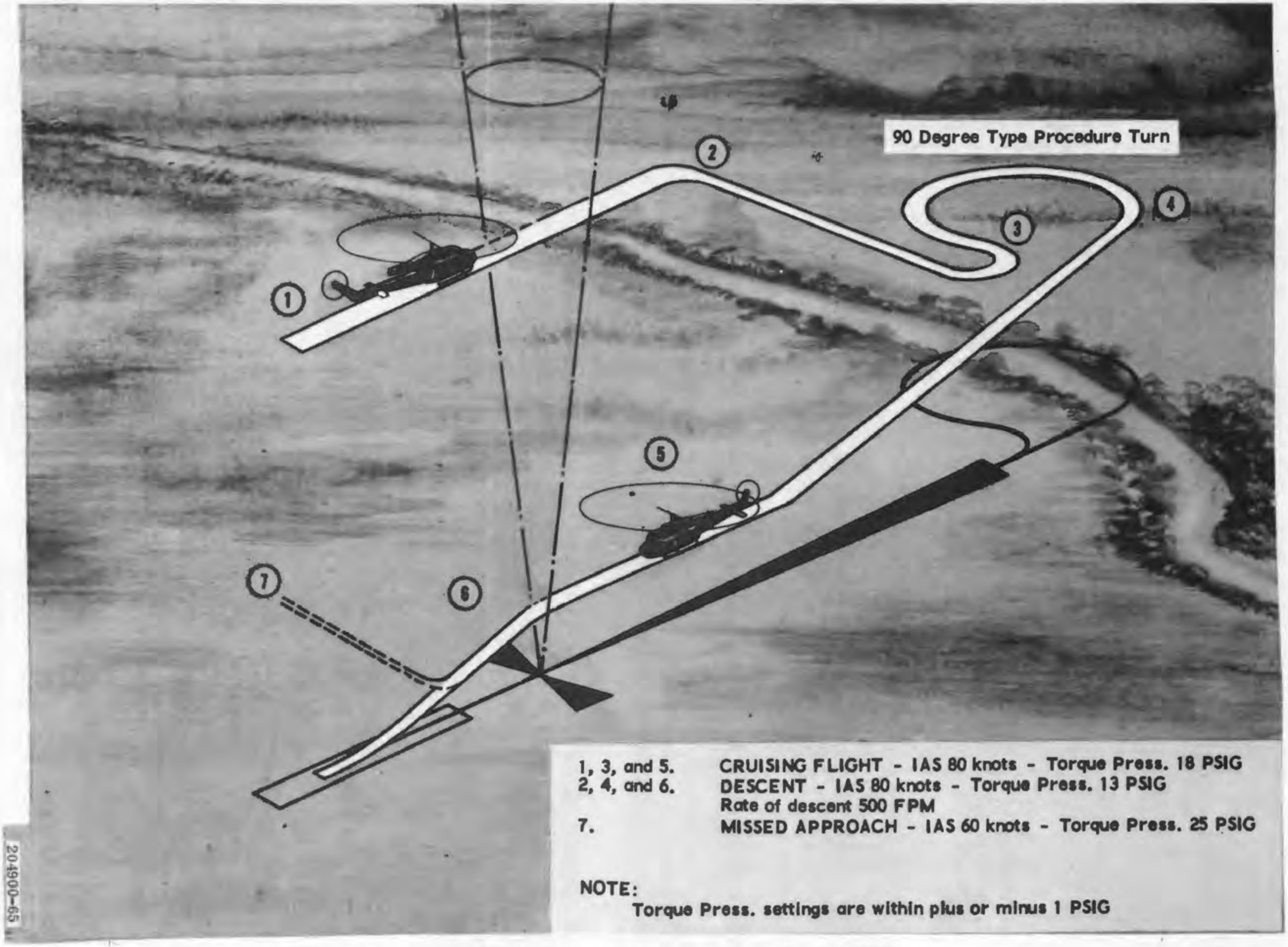
10-29. Missed Approach. To conduct a missed approach, the recommended rate of climb is 500 ft. per minute at 70 KIAS. After the airspeed decreases to 70 knots attitude, initiate the normal instrument climb procedure.

10-30. Boost Out Operation. It is recommended that the pilot establish VFR conditions as soon as possible, if the hydraulic control boost becomes inoperative while under instrument conditions. However, safe instrument approaches can be conducted with the control boost inoperative by using the normal recommended technique and procedures.

10-31. Night Flying. Night Flying presents the same problems as instrument flying, plus additional problems introduced by illumination of the instruments and by cockpit and exterior reflections.

Caution

> During night approaches, the lower nose canopy visibility is extremely restricted due to landing light reflection; however, the visibility improves as the lighted touchdown area comes beneath the helicopter. Night landings can be made with the navigation lights on "steady" if the landing and searchlights are inoperative. However, exercise extreme caution, since the navigation lights do not furnish sufficient illumination for depth perception until just before touchdown.



1, 3, and 5.	CRUISING FLIGHT - IAS 80 knots - Torque Press. 18 PSIG
2, 4, and 6.	DESCENT - IAS 80 knots - Torque Press. 13 PSIG Rate of descent 500 FPM
7.	MISSED APPROACH - IAS 60 knots - Torque Press. 25 PSIG

NOTE:
Torque Press. settings are within plus or minus 1 PSIG

Figure 10-1. Radio range approach — typical

b. Collective Pitch — DOWN.

c. Throttle — CLOSED.

10-39. Exterior Check 0°C to -54°C (32°F to -65°F.) In this temperature range the following items shall be checked when performing the Interior Check.

a. Fuselage — front.

(1) Main Rotor Blade — CHECK covers removed, clear of ice and snow.

(2) Antennas — SECURED.

(3) Cabin Area — Lower Area, and all glass, free of ice and snow.

(4) Searchlight — STOWED (underside of cabin).

(5) Cabin Top Ventilators — UNOBSTRUCTED.

b. Forward fuselage — cabin right side and top.

(1) Entrance Doors—Condition, operation, glass free of ice and snow.

(2) Cabin Top — CHECK for ice or frozen snow. Remove all loose snow that may be pulled into engine during starting.

(3) Antenna — SECURED.

(4) Air Intake — CLEAN and free of ice and snow.

(5) Landing Light — STOWED (underside of cabin).

(6) Landing Gear — CONDITION, handl-g wheels removed.

c. Fuselage — aft of cabin right side.

(1) Engine and Transmission Cowling — ECURED for flight.

(2) Fuel Filler — Security of cap.

(3) Oil Filler — Security of cap.

(4) Access Doors — Secured for flight.

(5) Fuel and Oil Leaks — CHECK external surfaces and ground beneath engine compartment.

(6) Heater Exhaust and Intake — Free of ice and snow.

d. Aft fuselage — right side.

(1) Synchronized Elevator — Surface free of ice and snow. See that operation will not be restricted due to the formation of ice between fuselage and elevator.

(2) 42° Tail Rotor Gear Box — CHECK oil level.

(3) Main Rotor Blades — Check upper surface to be free of ice and frozen snow. Untie the blades and walk through 360 degrees in the direction of rotation and check to see that there is no restriction of operation due to ice formation. Check flapping action, observing the operation of the stabilizer bar.

Note

> At temperatures of -35°C (-31°F) and lower, the grease in the spherical couplings of the main transmission drive shaft may congeal to a point that the couplings cannot operate properly. If found frozen, apply heat to thaw the couplings before attempting to start the engine. Indication of proper operation is obtained by turning the main rotor opposite to direction of rotation while observer watches the drive shaft to see that there is no tendency for the transmission drive shaft to "wobble" while the drive shaft is turning.

e. Fuselage — full aft.

(1) Aft Fuselage Extension Cover — SECURE for flight.

(2) 90° Tail Rotor Gear Box — CHECK oil level.

(3) Tail Rotor — Blades free of ice. Check movement of flapping axis, control linkages free of ice.

f. Aft fuselage — left side.

(1) Tail Rotor Drive Shaft Covers — Secured for flight, upper tail boom free of ice and snow.

(2) Synchronized Elevator — Free of ice and snow. See that operation will not be restricted due to formation of ice between fuselage and elevator.

(3) Aft Fuselage — Free of ice and snow, general condition.

g. Fuselage — aft of cabin left side.

(1) Rotor Head Oil Reservoirs — CHECK oil level.

Note

> It may reasonably be assumed that there is sufficient oil if the reservoirs were at an acceptable level at the last warm check and there is no evidence of of oil leakage. Filling the reservoirs at low temperatures will result in overflow during operation, giving the impression of leakage.

(2) Engine and Transmission Cowling — SECURED for flight.

(3) Access Doors — SECURED for flight.

(4) Vent and Drain Lines — CLEAN and free of ice and snow.

h. Forward fuselage — cabin left side.

(1) Entrance Doors — CONDITION, OPERATION, glass free of frost and snow.

10-40. On Entering the Helicopter — Interior Check All Flights 0°C to -54°C (32°F to -65°F). In this temperature range the following items shall be checked when performing the Interior Check.

a. First Aid Kits — INSTALLED.

b. Fire Extinguisher — SECURITY and PRESSURE.

c. Rotor Blade Tie-Downs — STOWED.

d. Hydraulic Fluid Level → CHECK.

e. Transmission Oil Sight Gage — CHECK oil level.

Note

> Contraction of the oil in the transmission at extremely low temperature causes indication of low oil level. A check made just after the previous shutdown and carried forward to the interior check is satisfactory if no leaks are in evidence. Filling the system when cold-soaked will cause an over-full condition immediatetly upon warm-up, with the possibility of forced leaks at seals.

f. Seat and Tail Rotor Control Pedals — Adjusted.

g. Cabin Interior — CLEANNESS and SECURITY of equipment.

h. All electrical switches check OFF, with the exception of the equipment left running to warm up during exterior check.

i. All circuit Breakers — CHECK IN (except Ignition System — Igniter Solenoid and Starter Relay Circuit Breakers — OUT).

Note

> External power should be used for starting when temperatures are below 0°C (32°F) to prevent draining the battery. When external power is connected, electrical systems will be supplied power and function normally.

j. Battery Switch—ON (OFF when external power is connected).

k. Generator Switch — ON (OFF when external power is connected).

l. External Power Supply — OPTIONAL (Connected for starting at temperatures below 0°C (32°F).

m. Safety Belt and Shoulder Harness — SECURED and shoulder harness unlocked.

n. Headgear Radio Leads — CONNECTED.

o. Inverter Switch — CHECK spare, then switch to main if external power is connected.

p. AC Phase Selector (VM) — ROTATE to each position and observe AC voltmeter for reading of 115 (±2.5) volts at each position, and return selector to AC position for flight.

q. Pitot Heater — CHECK operation with ground personnel.

r. Radio Equipment — ON.

s. Hydraulic Control Switch — ON.

t. Caution Panel Switch — TEST all caution lights and master caution light on instrument panel illuminated, then RESET.

u. Compass Slaving Switch — IN (slaved) or OUT (free gyro) as desired.

v. Fuel Quantity Gage Test — PRESS and HOLD switch. Observe indicator needle for travel counterclockwise. Upon releasing switch, the needle will return (clockwise rotation) to the actual fuel quantity reading.

w. Fire Warning Indicator Light — PRESS to test.

x. Gyro Magnetic Compass — SET.

y. Attitude Indicator Gyro — SET after flag has disappeared.

z. Altimeter — SET.

aa. Clock — SET.

bb. Controls — Check for smooth movement and full travel.

Note

When an engine start is to be made without external power, steps o. through z. and the night flight checks shall be performed after engine start is accomplished and the electrical loadmeter shows an indication of sufficient generator output to prevent battery drain.

10-41. Interior Check — Night Flights 0°C to -54°C (32°F to -65°F). When performing the Interior Check for night flights, in this temperature range, the following items shall be checked with external power connected.

a. Cockpit Lights — CHECK.

b. Dome Lights — CHECK.

c. Navigation Lights — CHECK.

d. Instrument Lights — CHECK.

e. Anti-Collision Light — CHECK.

f. Landing and Searchlights — CHECK.

g. Flashlight — CHECK.

Note

Use of the anti-collision light on the ground shall be kept to an absolute minimum because excessive heat created in the unit while on the ground is detrimental to bulb life, thus increasing maintenance problems.

10-42. Engine Pre-Start Check 0°C to -54°C (32°F to -65°F). At this temperature range the following items shall be checked, with external power connected, when performing the Engine Pre-start Check.

Caution

Use external power whenever possible for engine starts to prevent possibility of hot start with low battery.

Note

> T53-L-11 engine only. At low ambient temperatures, JP-5 fuel may cause slower engine starts. If engine fails to start with JP-5 fuel, the starting fuel line must be disconnected from the scheduled fuel port and connected to the unscheduled port. The starting procedure for this configuration is the same as with the scheduled port.

a. Fuel Main Switch — ON.

b. Engine Fuel Governor Switch — AUTO.

c. Throttle — FULL OFF.

d. Ignition System — Igniter Solenoid and Starter Relay Circuit Breakers — IN.

e. Collective Pitch Control — MINIMUM and release downlock.

f. RPM Increase-Decrease Switch — HOLD in DECR position several seconds for minimum governor setting.

g. Cyclic Control — CENTERED.

h. Fire Guard Posted — Check that rotors will have sufficient obstruction clearances.

10-43. Engine Starting 0°C to -54°C (32°F to -65°F). In this temperature range perform the engine starting procedure as follows with external power connected.

a. Fuel Start Switch — ON.

b. Throttle — FLIGHT IDLE.

Caution

> Limit the starter-energized time to 40 seconds. If engine does not start, a three minute cooling period is recommended, after which a second starting cycle may be attempted. Only three 40-second starting attempts are permissible in any one hour period.

c. Starter Ignition Switch — PULL and HOLD until an indicated 40 percent gas producer speed is reached. If engine does not continue to accelerate, abort start. Motor engine to clear combustor. Attempt another start.

d. Spare Inverter — CHECK then switch to main.

e. Engine Oil Pressure—25 PSIG MINIMUM.

Caution

> If no oil pressure is indicated by the time the gas producer has reached 40 percent, shut down engine and investigate.

f. With the engine operating and the throttle set in the flight idle detent, CHECK the following:

(1) Gas Producer, 56 to 58 percent nI rpm.

(2) Exhaust Gas Temperature — STEADY state BELOW 570°C (1058°F).

Note

> At OAT between -21°C and -54°C (-4°F and -65°F), the exhaust gas temperature may be as low as 290°C (554°F) at flight idle.

(3) Engine Oil Pressure, 20 to 60 PSIG.

(4) Transmission Oil Pressure, 40 PSIG MINIMUM.

(5) External Power Supply — DISCONNECT.

Note

> At this point, electrical power failure will occur unless battery or either spare or main generator is on.

(6) Spare Generator — CHECK for operation, voltmeter indication 28(±2.5) volts.

(7) Battery Switch — ON.

(8) Main Generator — ON, guard down, voltmeter indication 28 (±2.5) volts when operating on main generator.

(9) Fuel pressure 12 to 16 psig—CHECK.

Warning

(Deleted)

Warning

> Control systems checks should be performed with extreme caution when helicopter is parked on snow and ice.

There is reduction in ground friction holding the helicopter stationary; controls are sensitive and response is immediate.

(10) Cyclic Control Stick — CHECK for operation, freedom of movement, and return to neutral.

(11) Tail Rotor Control Pedals — CHECK for operation, freedom of movement.

(12) Collective Pitch Control — Slowly move control level up, CHECKING for operation, freedom of movement.

Note

Functional check of force trim can be performed during control system check.

10-44. Engine Run-up. Perform Engine Run-up procedure as follows:

a. Throttle — ADVANCE slowly to maximum setting and observe engine oil pressure for increase.

Caution

(Deleted)

b. Battery and Generator Switch — Check ON.

c. Exhaust Gas Temperature — STEADY state BELOW 570°C (1058°F).

d. Engine Oil Pressure, 40 to 90 psig — CHECK.

e. Engine Oil Temperature, 93°C (200°F) MAXIMUM.

f. Transmission Oil Temperature, 110°C (230°F) MAXIMUM.

g. Transmission Oil Pressure, 50 PSIG (±5).

h. GOVernor RPM INCRease - DECRease Switch — Actuate through full range (6000 to 6700 plus or minus 50 RPM) and leave at 6600 RPM.

i. Torquemeter—CHECK for INDICATION.

10-45. Cold Weather Capability. The cold weather capability has been improved with the installation of a nickel-cadmium battery which, because of its partial immunity to low temperature, can be used to start engine at temperatures down to -30°C (-22°F). The operator is cautioned that a battery start should only be attempted if the battery is fully charged and that the safety margin for starting is increased if the battery has been warmed. Following each cold weather flight, the pilot should (before shutting down the engine) check the battery for charge, using the following procedures:

a. Main Rotor Speed — MINIMUM 250 RPM, main generator ON.

b. Main Generator Loadmeter Reading — NOTE.

c. Battery Switch — OFF and note change in reading.

10-46. A ten percent change in loadmeter reading would indicate a charge rate of 30 amps and the battery not sufficiently charged for subsequent engine starting. A change of two tenths in loadmeter reading indicates a charge rate of six amps and the battery considered reasonably charged. After a flight of one-half hour or more, during which the main generator and battery were ON and a main generator voltage of 28.5 to 29.0 volts, a battery charging rate of less than six amps should be expected.

10-47. Emergency Engine Starting Without External Power. If an emergency engine start must be made, proceed as outlined in the following note and steps presented in pargraphs 10-48, and 10-49.

Note

If a battery start must be attempted when the helicopter and battery have been cold-soaked at temperatures between -26°C and -37°C (-15°F and -35°F), preheat the engine and battery if equipment is available and time permits. Preheating will result in a faster starter cranking speed, which tends to reduce the hot start hazard by assisting the engine in reaching a self-sustraining speed (40 percent nI) in the least possible time.

10-48. ***Engine Pre-Start Check.*** Check the following before starting the engine.

a. All Switches — OFF.

b. All Circuit Breakers — IN.

c. Fuel Main Switches — ON.

d. Fuel Start Switch — ON.

e. Engine Governor Switch — AUTO.

f. Hydraulic Control Switch — ON.

g. Throttle — FULL OFF.

h. Collective Pitch Control — FULL DOWN.

i. Fire Guard Posted — CHECK area for sufficient rotor clearance.

10-49. ***Engine Starting Check.*** When making an emergency engine start without external power perform the following steps.

a. Battery Switch — ON.

b. Spare Inverter — ON. Check fuel pressure 12 to 16 psig. Engine and transmission pressure indicating zero.

c. Spare Inverter Switch — OFF

Warning

> During an unassisted battery start, the throttle must be positioned between the flight idle stop and the off position, because the electrical power necessary to release the flight idle stop may not be available due to the high battery drain during engine starting operation. To insure adequate fuel, place throttle close to the flight idle stop.

d. Throttle — ADVANCE to just short of the flight idle stop.

Caution

> If engine does not continue to accelerate after ignition is indicated by exhaust gas temperature (egt) or if it gives indication of climbing too fast, abort start. Motor engine to clear combustor. Attempt another start.

e. Starter - Ignition Switch — PULL and HOLD until 40 percent gas producer speed is reached.

f. Throttle — ADVANCE to flight idle.

g. With the engine operating and the throttle set in the flight idle detent, check the following:

(1) Gas Producer, 56 to 58 percent nI rpm.

(2) Inverter ON — CHECK spare, then switch to main.

(3) Exhaust gas temperature — STEADY state BELOW 570°C (1058°F).

Note

> At OAT between -20°C and -54°C (-4°F and -65°F), the egt may be as low as 290°C (554°F) at flight idle.

(4) Engine Oil Pressure, 30 to 90 psig.

(5) Transmission Oil Pressure, 40 PSIG MINIMUM with rotor above 230 rpm.

(6) Select SPARE generator — CHECK voltage at 28.5 to 29.0 volts with rotor above 230 rpm.

(7) Select MAIN generator — CHECK voltage at 28.5 to 29.0 volts with rotor above 230 rpm.

(8) Battery Switch ON — CHECK.

(9) Fuel Pressure 12 to 16 PSIG — CHECK.

(10) Engine Fuel System — Function Check — Proceed with normal cold weather check from this point.

10-50. Take-Off. Snow take-off from an air base may be considered normal except for the following precautions that should be observed.

a. Select an area that is free of loose or powdery snow so that visibility will not be restricted by blowing snow.

b. Before attempting take-off, make sure the landing gear skids are free and are not frozen to the surface.

Warning

> Under cold weather conditions, make sure all instruments have warmed up sufficiently to insure normal operation. Check for sluggish instrument indications before take-off.

10-51. Landing. Snow landings at an air base may be considered normal except for the following precautions that should be observed.

a. Select an area free of loose or powdery snow so that visibility will not be restricted by blowing snow.

b. Accomplish a normal landing with a minimum hover before touchdown. Limited visibility will result from swirling snow, when hovering is attempted before making a touchdown.

10-52. Strange Area Snow Landing and Landing Site Evaluation. Landings may often be necessary in areas other than operational air bases. In addition to the basic factors in landing site evaluation, factors pertinent to snow landings are outlined in this paragraph.

a. The pilot should have knowledge of the type of terrain under the snow (bush, marshland, tundra, etc.)

b. The snow depth is usually less in clear areas where there is little drifting snow effect. Clear areas normally form gentle swells with the crests of these swells usually crusted. The heaviest crust will generally be found upwind of the crests.

c. Deep snow is usually found in the valleys and to the "lee". These areas are suitable for landings and take-offs if caution is exercised.

10-53. *Landing*. When making a snow landing observe the following.

a. Anticipate loose powdery snow and crusts on all landings on snow.

b. Landings should always be made when visual ground references can be maintained. The reference point should be kept forward and to the right so that it will be visible to the pilot at all times.

Note

> When making an approach and landing on snow, it should be one continuous operation without extended hover, in order to reduce the white-out condition that results from extended hovering over snow. This white-out will usually occur on loose snow and can cause the pilot to lose all reference with the ground or any object he is approaching. If the object being used as reference should become completely obscured, accomplish a go around.

10-54. Stopping the Engine. At temperatures below -7°C (20°F), or if main rotor grip seal leakage is evident on engine shutdown, use the following procedure:

a. Prior to engine shutdown, maintain 6000 to 6200 rpm, for one minute in minimum pitch.

b. Make normal engine shutdown with collective pitch control in full down position.

Note

> Do not use collective pitch control to decelerate rotor speed.

c. At extreme low temperatures the time in minimum pitch may have to be extended to allow seals to seat properly.

10-55. Before Leaving the Helicopter. Before leaving the helicopter accomplish the following.

a. All Electrical Switches — OFF.

b. Radio Switches — OFF.

c. Collective Pitch Control — FULL DOWN and LOCKED.

d. Cyclic Control Stick and Tail Rotor Control Pedals — NEUTRAL.

e. Pilot's and copilot's windows — OPEN approximately one and one-half inches to permit free circulation of air.

f. Protective Covers — INSTALLED. As required.

g. Secure Aircraft.

10-56. Hight Altitude Operation. Before operation at high altitude accomplish the following.

a. Determine the pressure altitude for the area into which the flight is intended and compute maximum gross weight at which a hover may be possible from appropriate charts.

b. Determine the existing and forecast wind conditions whenever possible.

c. Insofar as practicable, plan the flight to avoid known and probable areas of turbulence.

10-57. Engine Starting. (Refer to Chapter 3.)

10-58. Take-Off. The take-off should be made to obtain airspeed and altitude simultaneously. The take-off should begin with a slow acceleration to obtain translational lift, followed by a gradual increase in power and airspeed until a normal climb is attained.

a. All turns should be shallow. Avoid turns close to the ground.

b. Control movements should be gentle.

c. Sufficient altitude should be maintained to allow for any emergency, keeping in mind the high rate of autorotational descent associated with high altitudes.

d. Forward airspeed should be limited to prevent blade stall which is preceded by blade "buffeting".

e. Avoid areas of known turbulence such as the base of clouds, the lee side of mountains, and steep canyons.

10-59. Descent. Accomplish high altitude descents as outlined in the following steps.

a. All descents should be gradual. Under no circumstances shall a high rate of descent be allowed to develop.

b. Caution should be used during descents to maintain a safe airspeed. Increasing the airspeed above normal approach speed can cause the rate of descent to increase very rapidly. Low airspeed may also result in a high rate of descent, and when the nose is lowered in recovery the condition is aggravated.

c. Power applications should be anticipated because this helicopter does not respond to power at high altitudes as rapidly as at a lower elevation.

10-60. Landing. All approaches to landings should be planned and performed in an area of suitably level ground.

10-61. Autorotations. Autorotations at high altitudes are characterized by higher rates of descent and less effective collective pitch control available to cushion the landing. An airspeed of approximately 60 knots should be maintained during autorotation. At an altitude of 75 to 85 feet, initiate a flare to decrease airspeed and rate of descent. At approximately 10 to 12 feet, a small amount of pitch should be applied with the helicopter still in a flare attitude. Maintain approximately 20 to 25 knots forward speed to further decrease the rate of descent. The helicopter should then be leveled and when about 6 to 12 inches above the ground, sufficient collective pitch should be applied to cushion the touchdown. Avoid a vertical descent during the last 5 to 10 feet.

Caution

> Practice autorotations at high altitudes should be made only to prepared landing areas, even when a power recovery is anticipated. Power recoveries should not be initiated below 400 to 500 feet altitudes, depending upon helicopter weight and field elevation, due to a combination of slow

engine acceleration characteristics, high rotor blade angle of attack, and accompanying high rate of descent. The presence of these factors makes a quick power recovery impossible. The altitude at which safe power recovery should be initiated increases with helicopter gross weight and/or field elevation.

10-62. Ice and Rain. In heavy rain, a properly adjusted wiper can be expected to adequately clear the windshield throughout the entire speed range. However, when poor visibility is encountered while cruising in rain, it is recommended that the pilot fly by reference to the flight instruments and the copilot attempt to maintain visual reference. Rain has no noticeable effect on handling or performance of the helicopter.

Note

If the windshield wiper does not start in LOW or MED position, turn the control to HIGH. After the wiper starts, the control may be set at the desired position.

Warning

This helicopter is restricted from flight in moderate to heavy icing conditions under provisions of AR 95-2.

10-63. Before entering icing conditions (visible moisture and below-freezing temperatures), the pilot should actuate the pitot heat, windshield defrosters and de-icing system.

Caution

To preclude the possibility of icing, it is recommended that the engine inlet air filters be removed when it is anticipated that the aircraft will be flown under atmospheric conditions conducive to icing.

Caution

Continuous flight in light icing conditions is not recommended because the ice shedding induces rotor blade vibrations, adding greatly to the pilot's work load.

10-64. During flight in icing conditions, the pilot can expect one or all of the following to occur.

a. At any temperature below freezing, a low frequency main blade vibration, caused by asymmetric self-shedding ice.

b. To maintain airspeed, the torque will have to be increased.

c. An increase in engine egt.

Warning

If the ENGINE ICING light fails to illuminate in known icing conditions, or if for any other reason, the engine ice detector system is suspected to be inoperative, pull the ANTI-ICE ENG circuit breaker and check the ENGINE ICE DET light. Ensure DE-ICE switch is ON. If this light does not illuminate, the pilot can be reasonably certain the engine ice detector system is inoperative.

d. Illumination of the ENGINE ICING light.

Note

If the windshield defrosters fail to keep the windshield clear of ice, the side windows may be opened for clear visibility in landing.

Section IV — Desert and Hot Weather Operation

10-65. Hot Weather Operation. Operations, when outside air temperatures are above standard day temperatures require closer monitoring of oil temperatures and EGT.

Note

At very high ambient temperatures, the helicopter loses efficiency with high gross weights.

Section V — Turbulence and Thunderstorm Operation

10-66. Turbulence. The helicopter instrument handling qualities are very poor in turbulence. If moderate to severe turbulence is unavoidably encountered, the pilot should not attempt to maintain a definite altitude. All attention should be directed to maintaining track and level attitude indication. The helicopter should be set up for normal instrument cruise conditions. Do not make a collective pitch change unless the airspeed varies ±10 knots IAS.

Warning

The pilot is not to intentionally encounter moderate to severe turbulence while on instruments.

Note

The turbulence penetration speed is 80 knots IAS.

CHAPTER 11

CREW DUTIES

Section I — Scope

11-1. Scope. This chapter covers the responsibilities of each crew member and the primary and alternate functions of each.

11-2. The purpose of this chapter is to provide a compact collection of material and the steps of procedure that must be followed wherein each crew member can readily determine his complete duties.

11-3. Sequence of phases and actions is arranged chronologically and designed to avoid requiring that the crew member retrace any steps.

11-4. A condensed version of these procedures is contained in the condensed checklist Technical Manual TM 55-1520-210-10 CL.

Section II — Responsibilities

11-5. Rescue Hoist Operating Procedure — Hoist Operator. The following sets forth the necessary steps for the hoist operator to actuate the hoist boom outboard, lower cable, retract cable and return hoist boom to the stowed position. The pilot's hoist controls have priority over the hoist operator's controls.

Note

> The hoist cable is color coded as follows: The first 25 feet is yellow, the next 181 feet is unpainted, the next 35 feet is yellow and the last 15 feet is red.

a. Check with the pilot (use intercom) that rescue hoist cable cutter, rescue hoist control and rescue hoist power circuit breakers are "IN".

b. After pilot has established zero airspeed over the desired location, move boom toggle switch to "OUT" position to swing hoist boom outboard.

c. Move variable speed control knob (labeled DOWN/UP) on the hoist control pendant to "DOWN" to lower the hoist cable. The knob must be moved to the right then forward.

Note

> The further the DOWN/UP knob is moved from its spring loaded neutral position, the faster the hoist will run. The hoist should normally be operated at full speed as slow speed operation will cause the motor and gear box to heat excessively. Hoist cable is painted at each end to provide visual indication of cable footage that is extended.

d. Move control knob (DOWN/UP) to "UP" to raise the hoist load. The knob must be moved to the left then aft.

Note

> In case the extended portion of the hoist cable has to be jettisoned, a CABLE CUT switch is provided on the control box. The cable cutter is an electrically initiated ballistic charge type.

e. Move boom toggle switch to "IN" position to swing hoist boom inboard.

f. Bring hoist load into cabin and swing hoist boom to stowed position (fully inboard).

12-10. ***Arm.*** For balance purposes, arm is the horizontal distance in inches from the reference datum to the cg of a given item. Arms may be determined from the helicopter diagram contained in Chart E.

12-11. ***Moment.*** Moment is the weight of an item multiplied by its arm. Moment divided by a constant (moment/100) is generally used to simplify balance calculations by reducing the number of digits.

Note

> Inches from reference datum and moment/100 has been used in Charts A, C, and E for calculating weight and balance on Models YUH-1D and UH-1D helicopters. The same units of dimension and moment/constant shall be used in additions or changes to these charts.

12-12. ***Average Arm.*** Average arm is the arm obtained by adding the weights and adding the moments of a number of items and then dividing the total moment by the total weight.

12-13. ***Basic Moment.*** Basic moment is the sum of the moment of all items making up the basic weight. When using data from an actual weighing of a helicopter, the basic moment is the total moment of the basic helicopter with respect to the reference datum.

12-14. ***Center of Gravity (CG).*** The center of gravity is a point about which a helicopter would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the gross weight of the helicopter. To find cg of an individual item at a specific location, divide the moment of the item by its weight.

12-15. ***CG Limits.*** CG limits are the extremes of movement which the cg can have without making the helicopter unsafe to fly. The cg of the loaded helicopter must be within these limits at take-off, in the air, and on landing. In some cases, separate take-off and landing limits may be specified.

12-16. ***Balance Computer Index.*** Balance computer index is a number representing the moment which, when considered in conjunction with the weight, gives the cg position.

Section IV — Chart Explanations

12-17. Chart Explanations. Necessary chart explanations are set forth in the following paragraphs.

12-18. Chart C — Basic Weight and Balance Record — DD Form 365C. Chart C is a continuous history of the basic weight and moment resulting from structural and equipment changes. The last weight and moment/constant entry is the current weight and balance status of the basic helicopter.

12-19. ***Use.*** See chart 12-1 for a sample of DD Form 365C. At time of delivery of a new helicopter, the manufacturer enters the basic weight and moment/constant of the individual helicopter. This chart becomes a part of the "G" file of the helicopter. Subsequent additions to or subtractions from the basic weight and moment/constant in Chart C, are made by the weight and balance technician.

12-20. Chart E — Loading Data. The loading data in Chart E provides information necessary to work a loading problem for the helicopter.

12-21. ***Use.*** From the loading data tables contained in Chart E (chart 12-2 for 44 foot rotor configuration or chart 12-3 for 48 foot rotor configuration) weight and moment/constant are obtained for all variable load items and are added arithmetically to the current basic weight and moment/constant (from Chart C) to obtain the gross weight and moment.

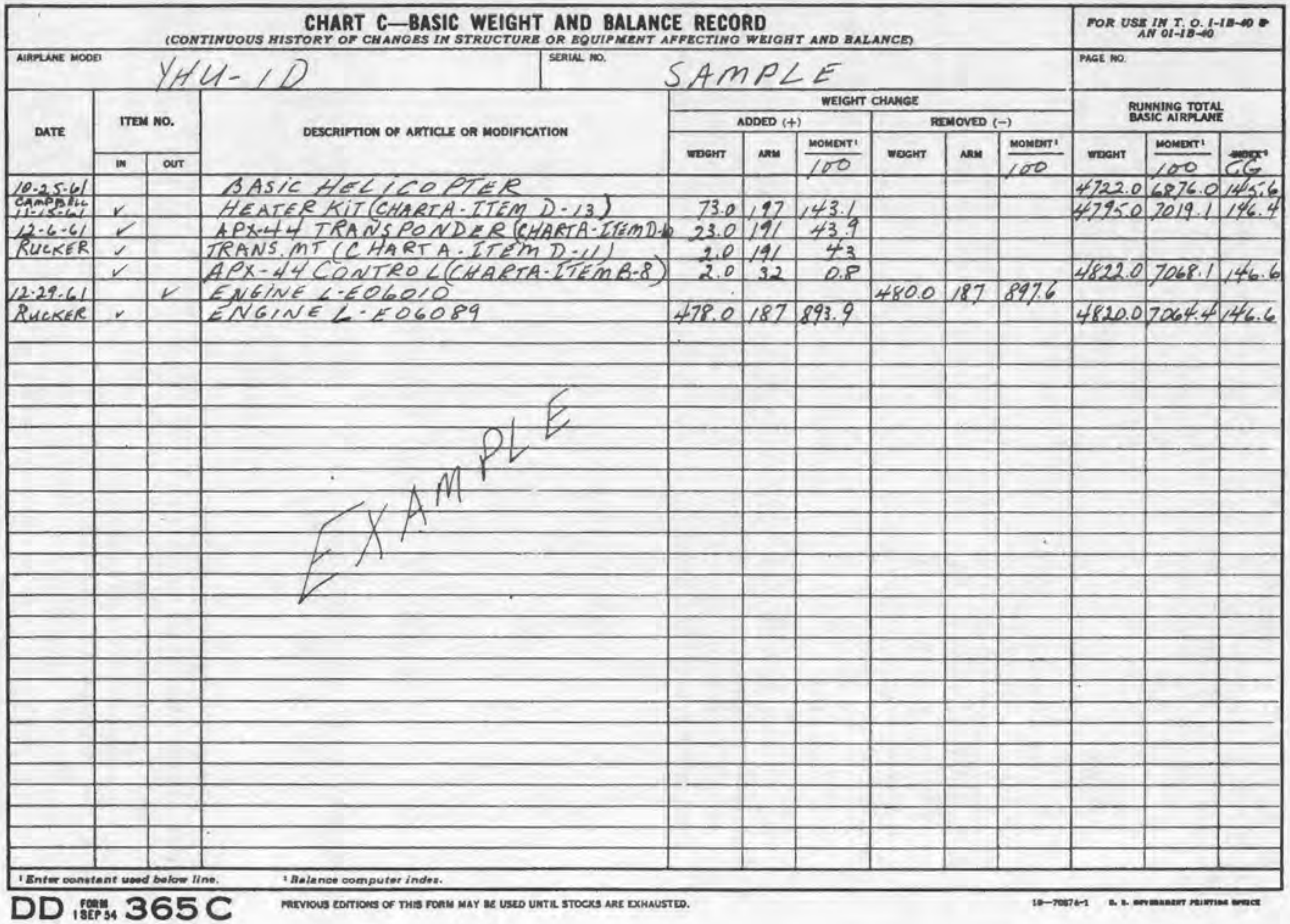


CHART C—BASIC WEIGHT AND BALANCE RECORD

(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT AND BALANCE)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

AIRPLANE MODEL: YHU-1D

SERIAL NO.: SAMPLE

PAGE NO.:

DATE	ITEM NO.		DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE						RUNNING TOTAL BASIC AIRPLANE		
				ADDED (+)			REMOVED (−)					
	IN	OUT		WEIGHT	ARM	MOMENT[1] 100	WEIGHT	ARM	MOMENT[1] 100	WEIGHT	MOMENT[1] 100	~~INDEX~~[2] CG
10-25-61			BASIC HELICOPTER							4722.0	6876.0	145.6
CAMPBELL 11-15-61	✓		HEATER KIT (CHART A - ITEM D-13)	73.0	197	143.1				4795.0	7019.1	146.4
12-6-61	✓		APX-44 TRANSPONDER (CHART A - ITEM D-10	23.0	191	43.9						
RUCKER	✓		TRANS. MT (CHART A - ITEM D-11)	2.0	191	4.3						
	✓		APX-44 CONTROL (CHART A - ITEM B-8)	2.0	32	0.8				4822.0	7068.1	146.6
12-29-61		✓	ENGINE L-E06010				480.0	187	897.6			
RUCKER	✓		ENGINE L-E06089	478.0	187	893.9				4820.0	7064.4	146.6

EXAMPLE

[1] Enter constant used below line.

[2] Balance computer index.

DD FORM 1 SEP 54 365C

PREVIOUS EDITIONS OF THIS FORM MAY BE USED UNTIL STOCKS ARE EXHAUSTED.

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Chart 12-1. Sample DD form 365C

CHART E
SHEET 6 of 16
MODEL UH-1D (48)
CHART DATE: SEE SHEET 1

CARGO TIE DOWN FITTING DATA

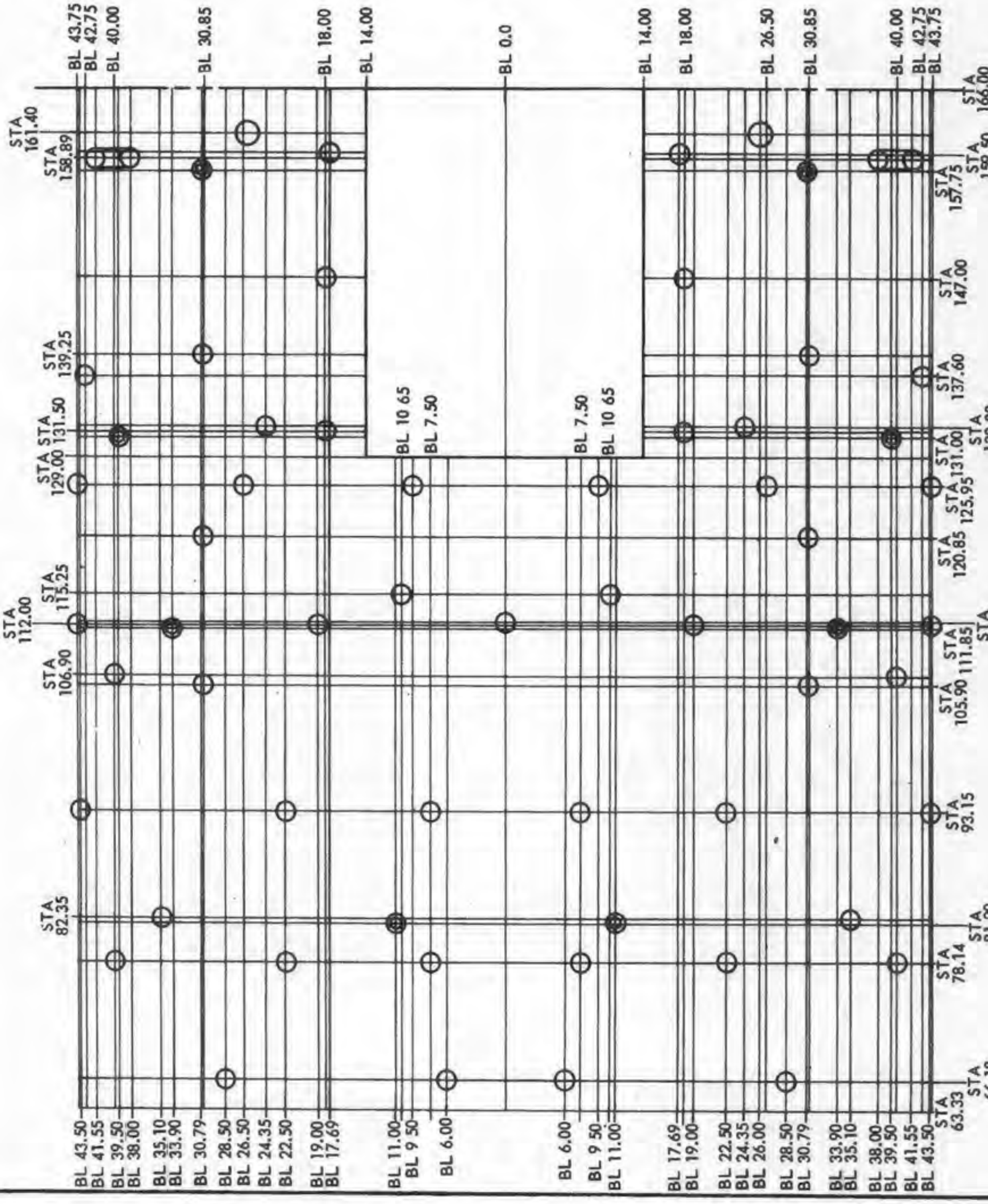


Chart 12-3. Chart E — loading data, 48 foot rotor (Sheet 6 of 16)

CHART E
SHEET 7 of 16
MODEL UH-1D (48)
CHART DATE: See Sheet 1

INTERNAL CARGO LOADING TABLE

MOMENT/100

CARGO WEIGHT (POUNDS)	CARGO CENTER OF GRAVITY (FUS STA)					
	75.0	90.0	105.0	120.0	135.0	150.0
50	38	45	53	60	68	75
100	75	90	105	120	135	150
150	113	135	158	180	203	225
200	150	180	210	240	270	300
250	188	225	263	300	338	375
300	225	270	315	360	405	450
350	263	315	368	420	473	525
400	300	360	420	480	540	600
450	338	405	473	540	608	675
500	375	450	525	600	675	750
550	413	495	578	660	743	825
600	450	540	630	720	810	900
650	488	585	683	780	878	975
700	525	630	735	840	945	1050
750	563	675	788	900	1013	1125
800	600	720	840	960	1080	1200
850	638	765	893	1020	1148	1275
900	675	810	945	1080	1215	1350
950	713	855	998	1140	1283	1425
1000	750	900	1050	1200	1350	1500
1050	788	945	1103	1260	1418	1575
1100	825	990	1155	1320	1485	1650
1150	863	1035	1208	1380	1553	1725
1200	900	1080	1260	1440	1620	1800
1250	938	1125	1313	1500	1688	1875
1300	975	1170	1365	1560	1755	1950
1350	1013	1215	1418	1620	1823	2025
1400	1050	1260	1470	1680	1890	2100
1450	1088	1305	1523	1740	1958	2175
1500	1125	1350	1575	1800	2025	2250
1550	1163	1395	1628	1860	2093	2325
1600	1200	1440	1680	1920	2160	2400
1650	1238	1485	1733	1980	2228	2475
1700	1275	1530	1785	2040	2295	2550
1750	1313	1575	1838	2100	2363	2625
1800	1350	1620	1890	2161	2430	2700
1850	1388	1665	1943	2220	2498	2775
1900	1425	1710	1995	2280	2565	2850
1950	1463	1755	2048	2340	2633	2925
2000	1500	1800	2100	2400	2700	3000
2050	1538	1845	2153	2460	2768	3075
2100	1575	1890	2205	2520	2835	3150
2150	1613	1935	2258	2580	2903	3225
2200	1650	1980	2310	2640	2970	3300
2250	1688	2025	2363	2700	3038	3375
2300	1725	2070	2415	2760	3105	3450
2350	1763	2115	2468	2820	3173	3525
2400	1800	2160	2520	2880	3240	3600
2450	1838	2205	2573	2940	3308	3675
2500	1875	2250	2625	3000	3375	3750
2550	1913	2295	2678	3060	3443	3825
2600	1950	2340	2730	3120	3510	3900
2650	1988	2385	2783	3180	3578	3975
2700	2025	2430	2835	3240	3645	4050
2750	2063	2475	2888	3300	3713	4125
2800	2100	2520	2940	3360	3780	4200
2850	2138	2565	2993	3420	3848	4275
2900	2175	2610	3045	3480	3915	4350
2950	2213	2655	3098	3540	3983	4425
3000	2250	2700	3150	3600	4050	4500

CAUTION

It is possible to exceed the cg limits by improper loading. Fuel consumption, cargo weight and placement, and correct crew weight must be determined for satisfactory balance. All necessary information may be obtained from this manual.

Chart 12-3. Chart E — loading data, 48 foot rotor (Sheet 7 of 16)

CHAPTER 13

AIRCRAFT LOADING

Section I — Scope

13-1. Scope of Loading Instructions. All essential information for loading, securing, and unloading personnel and cargo is contained in this chapter.

13-2. This chapter outlines the cargo features of the helicopter and contains planning data which shall be used to obtain maximum utility.

Section II — Aircraft Cargo Features

13-3. Introduction. The purpose of this chapter is to provide complete information and instructions, with complementary illustrations, to accomplish safe loading of the helicopter for the numerous types of missions the helicopter can reasonably be expected to perform. A typical loading example is also given and can be used as a guide when loading calculations need to be computed.

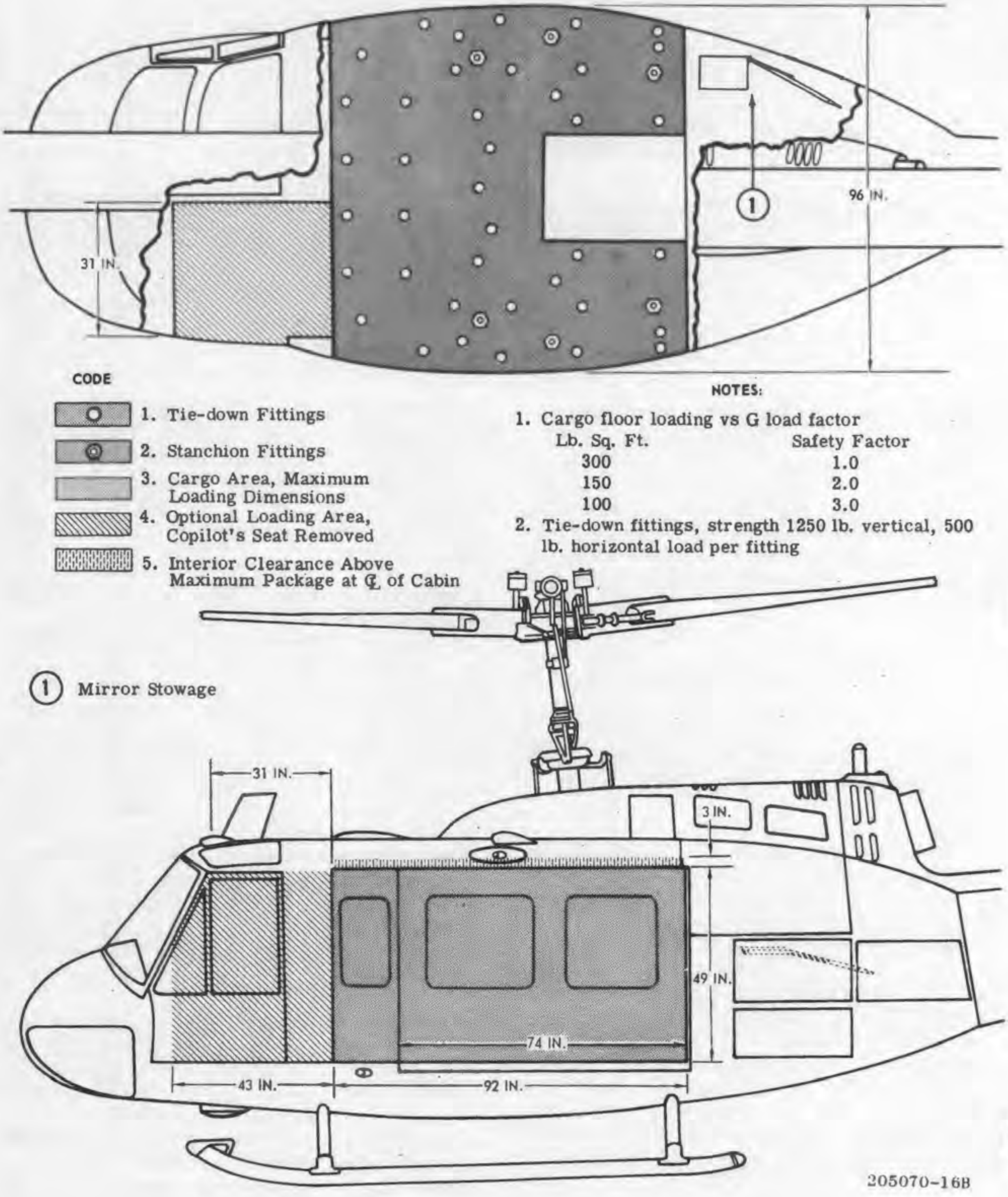
13-4. General Cargo Features. Cargo loading areas and dimensions, location of tie-down fittings, interior clearances, and various other cargo features are shown in figure 13-1. The cargo area, doors, tie-down equipment, and storage provisions are described in the following paragraphs.

13-5. *Cabin Area.* A large area of approximately 220 cubic feet located aft of the pilot is available for normal cargo, straight-through cargo, or personnel loading. Access to this area is provided by two doors which roll aft to open. Additional cargo loading area within the cabin may be made available by removal of the copilot's seat. Total weight in this area, however, shall be limited to 230 pounds and shall be located at station 56.6 (inches aft of reference datum). Tie-down fittings have not been provided for cargo located at the copilot's station; therefore, such cargo shall be secured to other cargo to prevent shifting.

13-6. *Crew Doors.* Access to the crew compartment is through two swingout doors hinged on the forward side (see figure 4-3). Each door has three transparent plastic windows, called the forward, upper, and adjustable window. A latch assembly, which may be opened from either side of the door, secures the door in the closed position. In an emergency, doors may be jettisoned by pulling EMERGENCY RELEASE — PULL handle on inside of each door.

13-7. *Cargo — Troop Doors.* A large sliding door, operating on rollers and tracks, gives access to cargo-troop area on each side of cabin, and a hinged panel (removable door post on YUH-1D) just ahead of sliding door will provide a wider opening. Each sliding door has a latch for closed position, and two jettisonable windows which can be used as emergency escape hatches. On YUH-1D, door can be secured in open position by manually releasing the lock of a spring-loaded plunger, at the top front corner, which engages a guide in the upper frame. Plunger is automatically retracted, by means of a cable, when door latch is operated. On UH-1D, door can be secured in open position by a retractable stop located on rear bulkhead of cabin.

13-8. *Cargo Tie-Down Equipment.* Cargo tie-down rings are provided on cabin aft bulkhead and pylon island structure, and in recessed fittings on cabin floor aft of crew seats. A three-piece cargo net is available, as loose equipment, for use in securing cargo to rings. Adjustable non-swiveling hooks with keepers are used on forward and outboard edges, and on two aft straps of center net. Fixed hooks are used on aft and inboard edges of right and left nets. Reefing rings and hooks are provided on nets for adjustment to size and shape of cargo.



CODE

- ○ 1. Tie-down Fittings
- ◎ 2. Stanchion Fittings
- ░ 3. Cargo Area, Maximum Loading Dimensions
- ▨ 4. Optional Loading Area, Copilot's Seat Removed
- ▦ 5. Interior Clearance Above Maximum Package at ℄ of Cabin

① Mirror Stowage

NOTES:

1. Cargo floor loading vs G load factor

Lb. Sq. Ft.	Safety Factor
300	1.0
150	2.0
100	3.0

2. Tie-down fittings, strength 1250 lb. vertical, 500 lb. horizontal load per fitting

Fig. 13-1. Cargo area and tie-down fittings.

13-9. ***Storage Provisions.*** A compartment on the right aft side of the forward fuselage between stations 178 and 211 contains bracketry for stowing the cargo rear view mirror.

Section III — Preparation of Aircraft and Personnel Cargo for Loading and Unloading.

13-10. Troop Transport. Description of the troop seats, and seat and litter installation and arrangement is presented in the following paragraphs.

13-11. ***Troop Seats.*** The troop seats are of tubular construction with reinforced canvas webbing for support areas. The seats are attached to the floor and transmission support structure. Seats can be quickly installed for rescue missions, then folded and stowed flat; or they can be folded for cargo missions as required.

13-12. ***Arrangement of Troop Seats.*** Eleven passengers can be seated in the aft area of the forward fuselage section. Either of the two following arrangements may be used for passenger seating (see figures 13-2 and 13-3).

a. Three seats facing forward, and accommodating five passengers, may be placed across

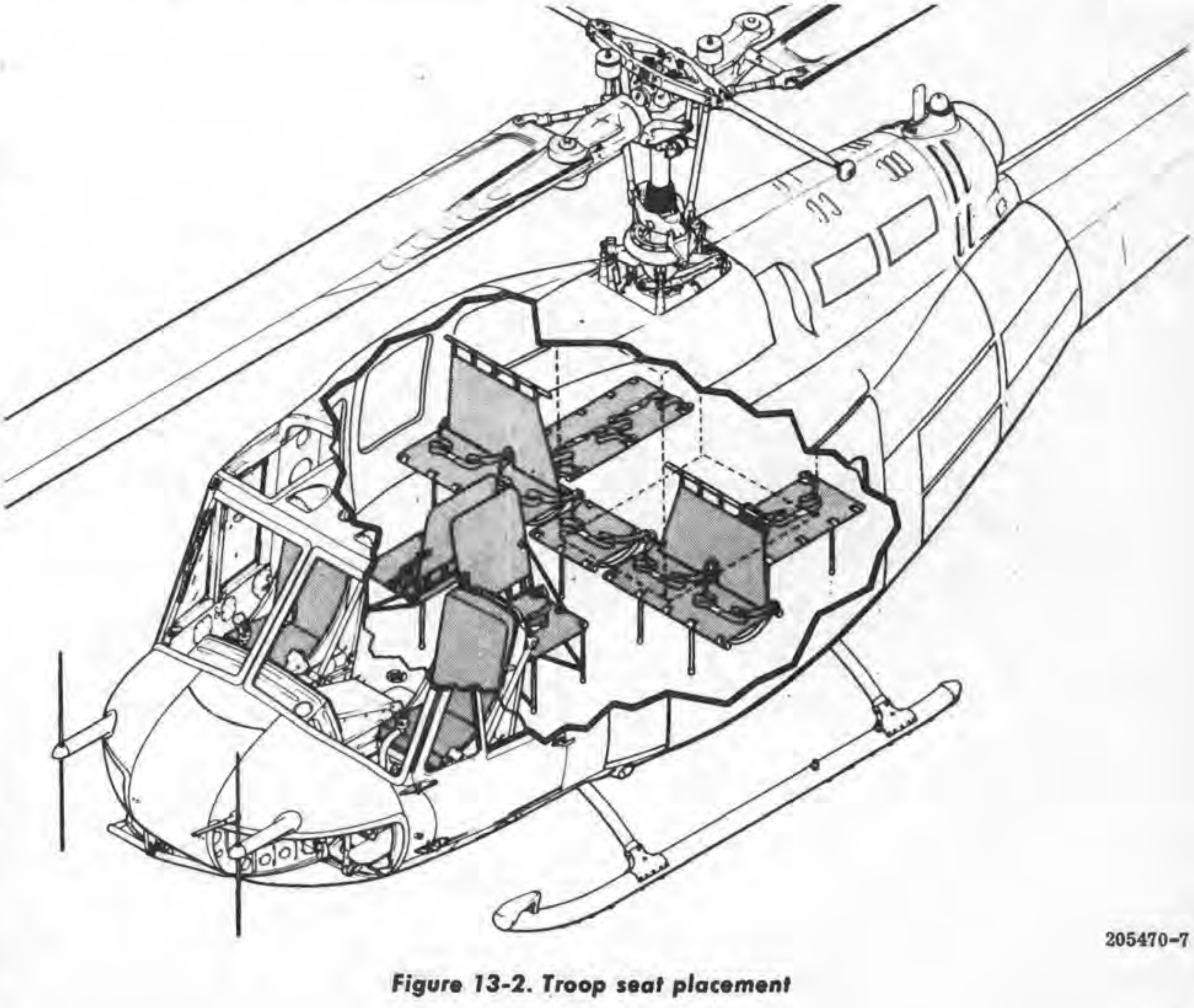


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Figure 13-2. Troop seat placement

the cabin immediately forward of the transmission support structure. A one-passenger seat, without back rest, is located between two-man seats which have backs. Two more two-man seats, without backs are located aft of the five-passenger seats parallel to the helicopter centerline. Passengers in these seats face outboard. Two single passenger folding seats, with backs, are located just aft of the crew seats.

b. Four two-man seats, facing outboard, may be placed, two on each side of the helicopter centerline, approximately in line with the side faces of the transmission support structure. The two forward seats are equipped with backs. A one-passenger seat, without back rest, is located immediately forward of the transmission support structure on the helicopter centerline and faces forward. Two single-passenger folding seats, with backs, are located aft of the pilot's and copilot's seats.

Note

> Single-passenger seats can be installed facing forward, aft, or toward either side of the helicopter.

13-13. *Troop Seat Belts*. Individual lap-type seat belts are provided for all troop seats. These same belts, with web extensions, are provided for litter patients when helicopter is used for mercy rescue missions.

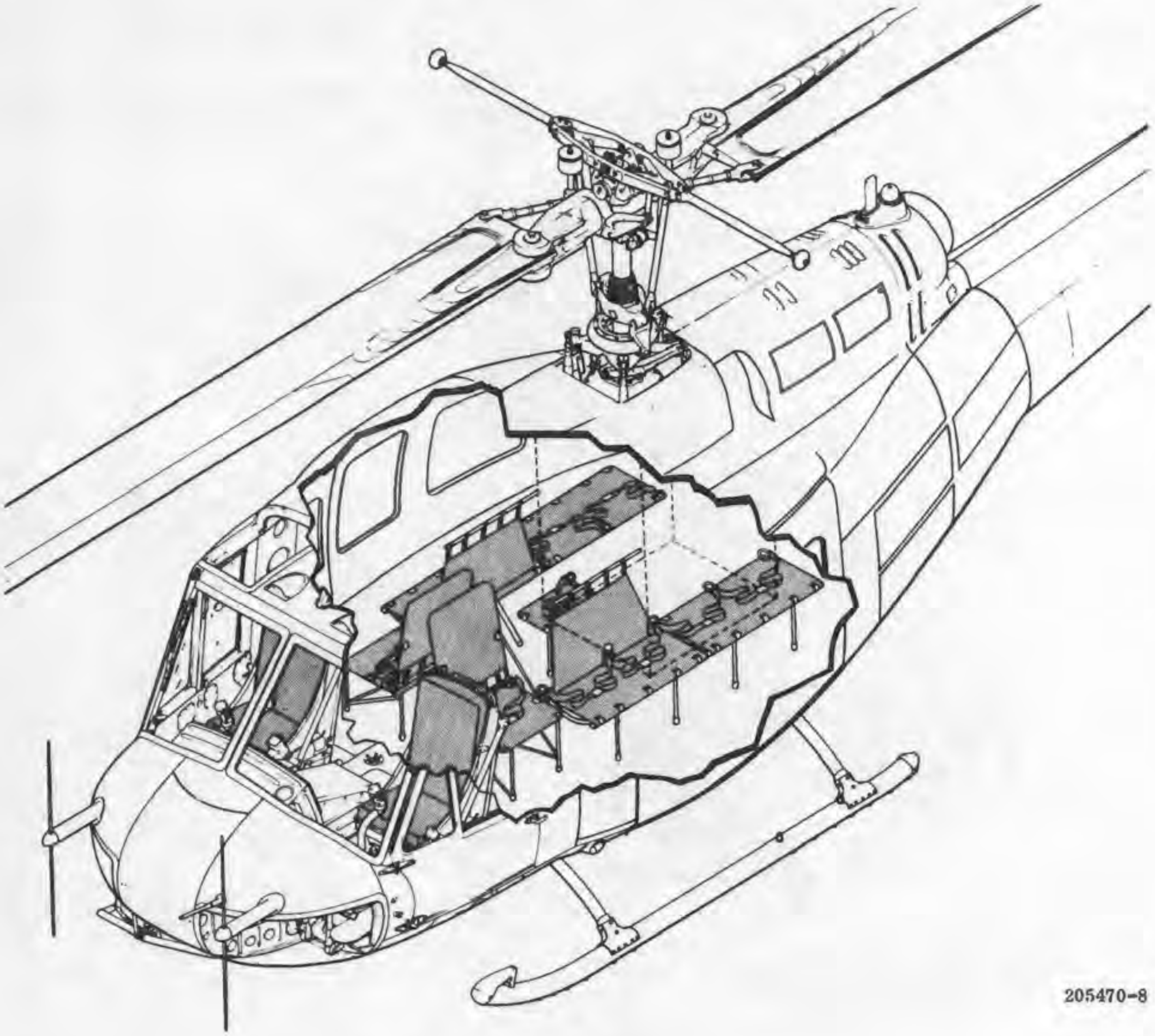


Fig. 13-3. Alternate troop seat placement.

13-14. ***Litter Racks.*** The litter rack installation (see figure 13-4) accommodates six stretchers (three on a side one above the other) parallel to cabin center line in aft cabin passenger compartment and outboard of the transmission support structure. They can be quickly installed for transporting litter patients or may be rapidly removed for carrying cargo or personnel. The medical attendant's seat is attached to the forward side of the transmission support structure in the cabin area. It is a part of the regular troop or passenger seat installation.

13-15. Cargo Loading. The large cargo doors, open loading area and low floor level preclude the need for special loading aids. Through loading may be accomplished by securing cargo doors in the fully open position. (Refer to paragraph13-7.) Thirty-nine cargo tie-town fittings are located on the cabin floor for securing cargo to prevent cargo shifting during flight.

13-16. ***Preparation of General Cargo.*** The loading crew shall assemble the cargo and baggage to be transported. At time of assembly and prior to loading, the loading crew shall compile data covering weight, dimensions, center of gravity location and contact areas for each item. Heavier packages to be loaded shall be loaded first and placed in the aft section against the bulkhead for cg range purposes. Helicopter floor loading in this area shall not exceed 300 pounds per square foot maximum package size and

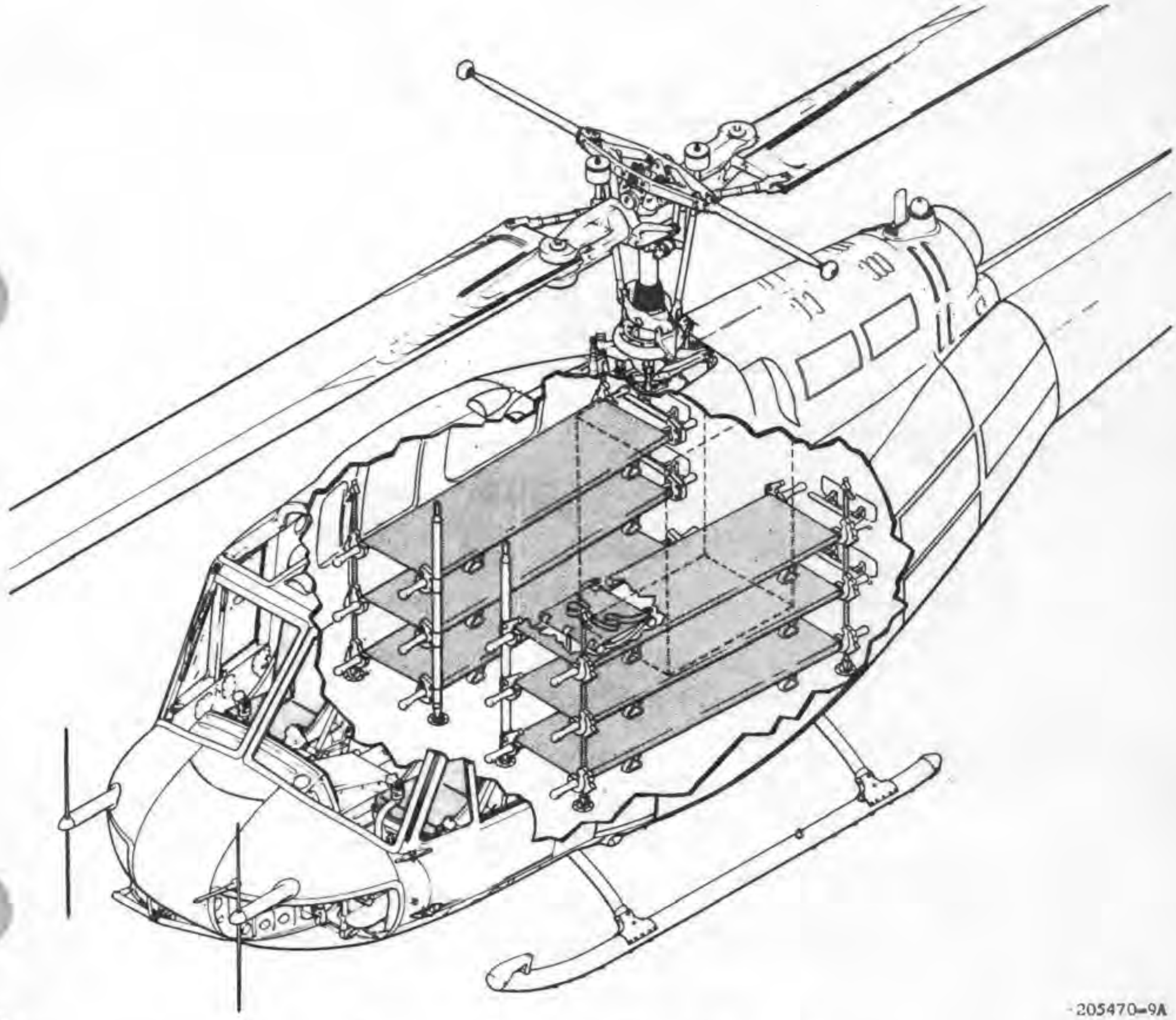


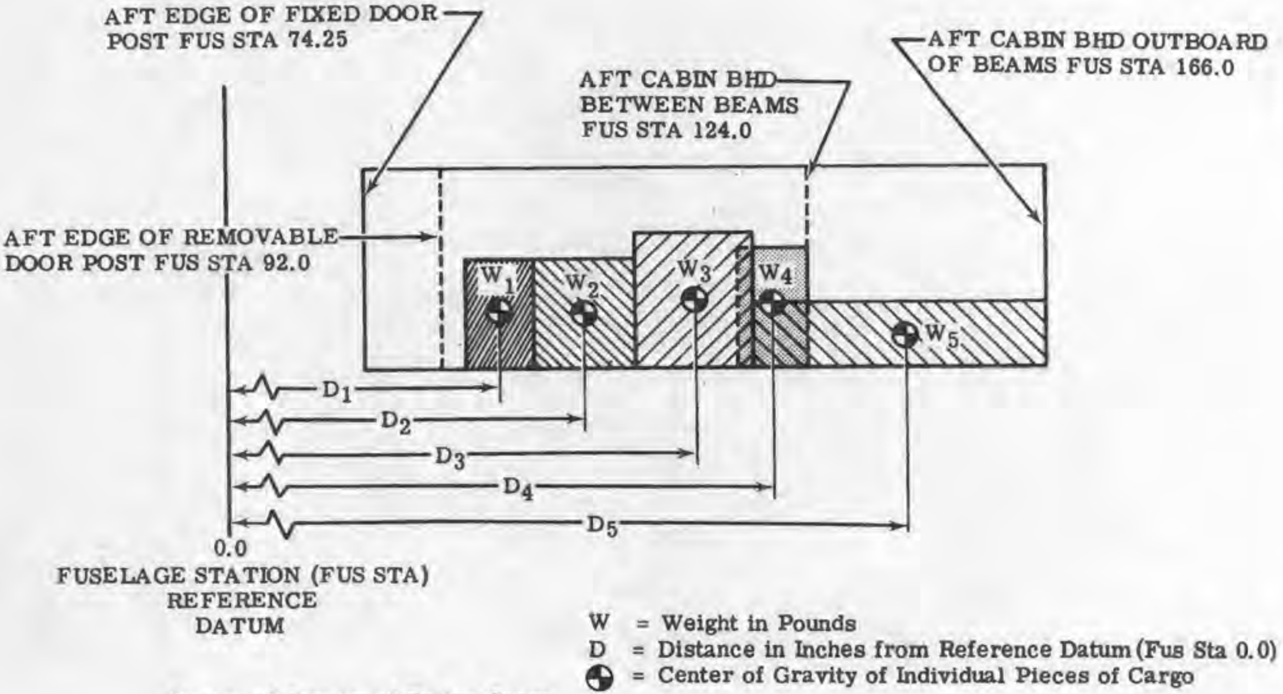
Figure 13-4. Litter installation — typical.

gross weight limits. Calculation of the allowable load and loading distribution shall be accomplished by referring to Chapter 12 to determine the final cg location and remain within the allowable limits for safe operating conditions. A loading chart is located on the right-hand hinged door post (see figure 7-5).

Section IV — General Instructions for Loading, Securing and Unloading Cargo

13-17. Cargo Center of Gravity Planning. The items to be transported should be assembled for loading after the weight and dimensions have been recorded. Loading time will be gained if the packages are positioned as they are to be located in the helicopter. To assist in determining the locations of the various items, the individual weights and total weight must be known. When these factors are known the Loading Problem Example (see figure 13-5) can be used as a guide to determine the helicopter station at which the package cg shall be located. The information presented on the loading chart will not be affected by fuel quantity, as full to empty fuel load has been considered during data computation. Final analysis of helicopter cg location for loading shall be computed from the data presented in Chapter 12.

13-18. Computation of Cargo Center of Gravity. The loading data in Chart E in Chapter 12, will provide information to work a loading problem. From the loading tables, weight and moment/100 are obtained for all variable load items and



Center of Gravity of Entire Cargo

$$CG = \frac{(W_1 \times D_1) + (W_2 \times D_2) + (W_3 \times D_3) + (W_4 \times D_4) + (W_5 \times D_5)}{W_1 + W_2 + W_3 + W_4 + W_5}$$

Fig. 13-5. Example loading problem.

are added mathematically to the current basic weight and moment/100 obtained from Chart C to arrive at the gross weight and moment. The cg of the loaded helicopter is represented by a moment figure in the center of gravity table. If the helicopter is loaded within the forward and aft cg limits, the figure will fall numerically between the limiting moments. The effect on the cg of the usable in-flight items of fuel and oil may be checked by subtracting the weights and moments of such items from the take-off gross weight and moment and checking the new moment with the cg table. This check will be made to determine whether or not the cg will remain within limits during the entire flight.

13-19. Loading Procedure. The helicopter requires no special loading preparation. The loading procedure consists of placing the heaviest items to be loaded as far aft as possible. Such placement locates the cargo nearer the helicopter cg and allows maximum cargo load to be transported, as well as maintaining the helicopter within the safe operating cg limits for flight. The mission to be performed should be known to determine if cargo, troop transport, or litter patients are to be carried on the return trip. If troops or litter patients are to be carried, troop seats and litter racks shall be loaded aboard and stowed.

13-20. *Securing Loads.* Equipment for securing cargo consists of a three piece cargo tie-down net, which attaches to tie-down rings. Nets are tightened to slip straps (refer to paragraph 13-8).

Section V — Loading and Unloading of Other Than General Cargo

13-21. General. The information normally contained under this heading is not applicable to this helicopter.

13-22. The helicopter is capable of transporting nuclear weapons, if required.

Warning

Before transporting nuclear weapons, the pilot shall be familiar with AR 95-55 and AR 385-25.

CHAPTER 14

PERFORMANCE DATA

Section I — Scope

14-1. Scope of Performance Data. The charts contained in this chapter are intended to provide you with the latest operating information.

a. The data shown on these charts originates from flight test programs and the operational experience gained through actual helicopter usage. The performance charts are presented in tabular, graphic or profile form. Calculated figures are shown in red.

b. The charts are arranged to give maximum facility of use for pre-flight and in-flight mission planning in a safe, efficient manner.

Section II — Instruction for Chart Use

14-2. Interpretation of the Charts. Data is given for planning the various types of missions which can reasonably be expected to be performed with the Model UH-1D helicopters. Familiarization with the charts and their functions will be necessary for proper understanding and to derive maximum benefit from their use. A description of each chart and its use is also included.

14-3. ***Reading the Charts.*** It is of the utmost importance that the charts be read accurately, especially in the case of multi-variable graphs. In this type of presentation, errors in reading can be cumulative, with resulting large final errors. A hard, fine-pointed pencil should be used at all times when reading the curves, and close attention should be paid to subdivisions of the grid.

14-4. True Altitude. True altitude is the actual height above sea level. It is sometimes called the "tapeline" altitude; that is, the altitude that would be measured by a tapeline dropped from the helicopter perpendicularly to the earth's surface at sea level.

14-5. Pressure Altitude. The pressure of air at a given tapeline altitude may depart considerably from standard. If the atmospheric pressure is measured at the helicopter level, an altitude corresponding to this pressure can be determined from a standard air table. This altitude is known as the pressure altitude of the helicopter. It is also the altitude recorded by the altimeter if the altimeter has no instrument error and is set to 29.92 inches of mercury at sea level. It will therefore indicate higher or lower than the true altitude in a nonstandard atmosphere.

14-6. Density Altitude. As with pressure, density of the air at a given true altitude may vary widely from the standard; the less dense the air, the higher density altitude. If the density is measured at the helicopter level, an altitude corresponding to this density can be determined from a standard air table. This altitude is known as the density altitude of the helicopter.

14-7. Density Altitude Chart. A high density altitude affects the performance of both the main rotor and the engine. When density altitude is high, less lift is developed by the rotor blades for any given power setting, and the engine is incapable of producing sea level rated power. Chart 14-1 shows temperature and pressure altitude versus density altitude. An example of the use of the chart is contained in the chart. Knowing pressure altitude and temperature, the density altitude can be determined. The explanation of ($\frac{1}{\sqrt{\sigma}}$) used in chart 14-1 is as follows: The reciprocal of the square root of density ratio, at the appropriate density altitude. The Greek letter sigma (σ) is used to represent the density ratio.

14-8. Standard Atmospheric Chart. To provide a convenient reference, the National Advisory Committee for Aeronautics (NACA) has established a set of values for temperature, density, and pressure at sea level (zero tapeline altitude). This is known as standard atmosphere, or just "standard day." The first row of numbers in chart 14-2 lists this relationship at sea level for standard air. In addition, a variation of these values with an increase in tapeline altitude has been established.

14-9. Psychrometric Chart. The psychrometric chart (chart 14-3) provides information to determine the specific humidity (pounds of water per pound of dry air), vapor pressure in inches of Hg, dew point temperature, and relative humidity when the dry bulb and wet bulb temperatures (either in degrees F or degrees C) are known for a given pressure altitude. An example of the use of the chart is contained in the chart.

14-10. Airspeed Installation Correction Chart. An airspeed installation correction chart (chart 14-4) is provided to supply the correction required to determine calibrated airspeed (CAS). (For helicopter with 48 foot rotor configuration, refer to paragraph 14-45.) Indicated airspeed (IAS), as read from the instrument and corrected for instrument error, plus or minus installation correction, equals calibrated airspeed. Because of the speed range at which the helicopter operates, compressibility correction is negligible; therefore, it has been intentionally omitted. An approximate true airspeed (TAS) for a standard day can be obtained from CAS by adding 1½ percent of CAS per 1000 feet density altitude to CAS.

14-11. Engine Operating Limits Chart. Maximum power available for these T53-L-9, -9A, and -11 engines is given in chart 14-5. (For helicopter with 48 foot rotor configuration, refer to paragraph 14-45.) These powers are based on the engine manufacturer's specifications and guarantees. Corrections based on flight tests are included for installation losses of the engine in the helicopter.

14-12. Performance data given in this manual are based on an engine which can produce specification or rated power. Ordinarily, the engine installed in the helicopter is capable of producing more power; therefore, unless engine deterioration has occurred, adequate power should be available for loading and ceiling limits given in this manual. If deterioration in engine output is suspected, the curves in chart 14-5 may be used to make a rough comparison of actual and rated engine performance, using the flight instruments available to the pilot. To make the comparison, mentally record pressure altitude and OAT; and, at the same time, apply full power. Now, note the torquemeter reading. Enter the curves at the recorded pressure altitude and temperature, and read torque pressure available. The torquemeter reading attained in flight should be at least as great as that shown on the curve. It is emphasized that such comparisons are approximate, and they can result in low engine power indications. This is due to several factors: (1) the high rate of climb when full power is applied, which in turn results in rapidly changing air pressure and temperatures; (2) manufacturing tolerances in the torquemeter and flight instruments; (3) readability of flight instruments; (4) and pilot techniques. In addition, two precautions should be observed by the pilot when making the flight check. (1) Avoid hovering with full power inground effect, except for take-off and translational lift, due to the decrease in power caused by an engine inlet temperature rise when inground effect (2) more torque will be obtained if engine rpm is allowed to drop below 6700 when full power is applied.

4-13. If the engine does not appear to be producing specification power and torque, allowable hovering ceiling or load limits as given in this manual will be decreased. Conservative rules of thumb in this event are to reduce gross weight 200 pounds for each psig of deficient torque — or reduce hovering ceiling 1000 feet for each psig of deficient torque. These increments may be subtracted directly from the maximum take-off gross weight and ceiling which the pilot determines from the curves and tables given elsewhere in the manual. The curves and tables are entered normally at the actual or anticipated air temperature and pressure altitude of the flight, then the increments in gross weight or altitude are subtracted.

14-14. Take-Off Distance Chart. The take-off distance charts (chart 14-6) list minimum take-off distances for various pressure altitudes, air temperatures, and gross weights. (For helicopter with 48 foot rotor configuration, refer to paragraph 14-45.) Take-off distances are given for maximum performance take-off procedures only, as distinguished from normal take-off procedures described in Chapter 3. Maximum performance take-offs resu in the minimum take-off distance.

Caution

Deleted

14-15. The first set of charts lists take-off distances using the maximum performance hover and level acceleration method. Engine speed is maintained at 6600 rpm. If the helicopter can hover out-of-ground effect, take-off distances and climb-out airspeeds are given as zero. This procedure requires a vertical lift-off and a vertical climb to an altitude above the obstacle before accelerating into forward flight. If the take-off distance is greater than zero, this means the helicopter cannot hover out-of-ground effect. In these cases, the helicopter takes off vertically to a skid height of two feet above the ground, accelerates to the climb-out airspeed given in the charts, and climbs over the obstacle at that airspeed. If the climb-out airspeed is greater or less than the value given in the chart, take-off distances will be increased. If the skid height is greater than two feet prior to obtaining climb-out airspeed, the take-off distances will be greater. Under power limited conditions (two foot hover and full power available) a greater than normal nose-down flight attitude is required during acceleration. If loss of lift occurs in the area just prior to translational lift, the helicopter shall be leveled to avoid ground contact with the forward portion of the skids. If ground contact does occur, take-off distances will be greatly increased in addition to possible skid damage. If the helicopter cannot hover two feet off the ground, take-off distances are not shown and the gross weight should be reduced.

Note

> When the take-off distance is zero, the climb-out airspeed is also zero (vertical climb is possible). In the charts, the accelerating run column is deleted and the climb-out airspeed is given adjacent to each take-off distance.

14-16. The second method involves hovering with the helicopter light on skids and then increasing airspeed and altitude simultaneously. Engine speed is maintained at 6600 rpm. If the helicopter can hover out-of-ground effect, take-off distances and climb-out airspeed are given as zero. This procedure requires a vertical lift-off and a vertical climb to an altitude above the obstacle before accelerating into forward flight. If the take-off distance is greater than zero, this means the helicopter cannot hover out-of-ground effect. In these cases, the helicopter is brought to light on skids. As power is applied and the helicopter leaves the ground, hold constant pitch attitude until airspeed starts to register. When this occurs, fine pitch attitude adjustments are required to obtain the desired airspeed. Once airborne, the pilot should allow airspeed and altitude to increase simultaneously until the obstacle is cleared. The airspeed and altitude should then be increased as soon as possible to avoid operation in the restricted area of the height-velocity diagram. If the climb-out airspeed is greater or less than the value given in the chart, take-off distances will be increased. If the helicopter cannot be brought to light on skids, take-off distances are not shown and the gross weight should be reduced.

14-17. The third method involves hovering the helicopter at a 15-foot skid height and then increasing airspeed and altitude simultaneously. Engine speed is maintained at 6600 rpm. This is primarliy for use when carrying external cargo on the sling. When the helicopter can hover out-of-ground effect, take-off distances and climb-out airspeeds are given as zero in the charts. For these cases, climb vertically until the sling load will clear the obstacle, then proceed into forward flight. When take-off distances are greater than zero, the take-off procedure is as follows: Apply sufficient power to hover at a skid height of 15 feet. Apply power and allow airspeed and altitude to increase simultaneously until the obstacle is cleared. As power is applied, hold a constant pitch attitude until the airspeed starts to register. When this occurs, fine pitch attitude adjustments are required to obtain the desired airspeed. When the obstacle is cleared, the airspeed and altitude should be increased as soon as possible to avoid operation in the restricted area of the height-velocity diagram. If the climb-out airspeed is greater or less than the value given in the chart, take-off distances will be increased. If the helicopter cannot hover at 15 feet, take-off distances are not shown and the gross weight should be reduced.

14-18. The last set of charts, with the red border, lists take-off distances using rpm bleed-off. As in the first set of charts, the take-off distance is given as zero when the helicopter can hover out-of-ground effect. It is when the helicopter cannot hover out-of-ground effect that use of the bleed-off technique can reduce take-off distances or permit a greater load to be carried by experienced pilots. When take-off distances are greater than zero, the take-off procedure is as follows: Apply sufficient power at 6600 engine rpm to maintain helicopter light on the skids. Increase collective pitch to lift the helicopter off the ground and apply forward cyclic control to start forward movement of the helicopter. Accelerate into forward flight, allowing the engine speed to decrease to a minimum of 6400 rpm. When translational lift is attained, increase collective pitch to decrease engine speed to a minimum of 5900 rpm. Just prior to obtaining climb-out airspeed given in the chart, rotate the helicopter nose up and climb at that airspeed, maintaining 5900 engine rpm. When clear of obstacle, reduce pitch slightly to regain 6600 engine rpm. If the climb-out airspeed is greater or less than the chart value, take-off distance will be increased. If the helicopter has insufficient power to hover light on the skids, take-off distances are not shown and gross weight should be reduced.

Note

> The procedure for maximum performance take-off using rpm bleed-off requires precise application and timing with respect to rpm control and obtaining optimum climb-out airspeed.
> All charts with red borders are for emergency use only.

14-19. For the helicopter with the 48 foot rotor, only one take-off method is shown. (Refer to paragraph 14-45.) This is the hover and level acceleration method. Engine speed is maintained at 6600 rpm. If the helicopter can hover out-of-ground effect, take-off distances and climb-out airspeeds are given as zero. This procedure requires a vertical lift-off and a vertical climb to an altitude above the obstacle before accelerating into forward flight. If the take-off distance is greater than zero, this means the helicopter cannot hover out-of-ground effect. In these cases, the helicopter takes off vertically to a skid height of four feet above the ground, accelerates to the climb-out airspeed given in the charts, and climbs over the obstacle at that airspeed. If the skid height is greater than four feet prior to obtaining climb-out airspeed, the take-off distances will be greater. If the helicopter cannot hover four feet off the ground, take-off distances are not shown and the gross weight should be reduced.

14-20. Take-Off Gross Weight Limitation. The take-off gross weight limitation curve (chart 14-7) is used in determining maximum take-off gross weight as limited by vertical climb performance. (For helicopter with 48 foot rotor configuration, refer to paragraph 14-45.) Maximum take-off gross weights are given as a function of pressure altitude, outside air temperature, and the desired vertical rate of climb. Engine speed is 6600 rpm and take-off power is used. The take-off gross weight which, for a given altitude and temperature, results in a 100 foot-per-minute vertical rate of climb is the overload limit. The gross weight, altitude, and temperature which results in a 300-foot-per-minute rate of climb is the normal limit.

14-21. Hovering Chart. The hovering charts (charts 14-8 and 14-9) provide information to determine the maximum gross weights at which the helicopter can hover. (For helicopter with 48 foot rotor configuration, refer to paragraph 14-45.)The first charts are for hovering out-of-ground effect at various pressure altitudes, temperatures, and wind velocities. The last charts are for hovering in-ground effect at a skid height of two feet for helicopters with 44 foot rotor and at a skid height of four feet for helicopters with 48 foot rotor. (Refer to paragraph 14-45.) Both sets of charts are for operation at 6600 rpm.

14-22. Charts for hovering out-of-ground effect are shown for both take-off and normal rated power. The chart for normal rated power should be used if prolonged hovering is to be accomplished. Charts for hovering in-ground effect are shown for take-off power only but for both a normal 2°C inlet temperature rise and a 10°C inlet tempertaure rise. For short periods of hovering in-ground effect (less than one minute) the 2°C temperature rise chart should be used. For longer periods the 10°C temperature chart should be used since for prolonged periods of hovering in-ground effect the inlet temperature rises due to recirculation of the air into the engine inlet.

14-23. The known conditions necessary to use the out-of-ground effect with take-off powe chart, are pressure altitude, temperature, an wind velocity. The chart contains two graphs, both of which are used to determine the operating capabilities of the helicopter. The top graph contains the pressure altitude scale and temperature gradient curves which are used fo the initial entrance into the chart for problem

AIRSPEED INSTALLATION CORRECTION TABLE

CLEAN CONFIGURATION

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test, FTC-TDR-64-27.

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

	Indicated Airspeed* (IAS)-Kts	Airspeed Correction --Kts	Calibrated Airspeed (CAS)-Kts
Level Flight & Climb*	20	4.5	24.5
	30	4.5	34.5
	40	4.5	44.5
	50	4.5	54.5
	60	4.5	64.5
	70	4.5	74.5
	80	4.5	84.5
	90	4.5	94.5
	100	4.5	104.5
	110	4.5	114.5
	120	4.5	124.5
	130	4.5	134.5
Autorotation	40	7	47
	50	6	56
	60	6	66
	70	5	75
	80	6	86
	90	6	96
	100	7	107

Add Correction To Indicated Airspeed*
To Obtain Calibrated Airspeed

*Corrected For Instrument Error

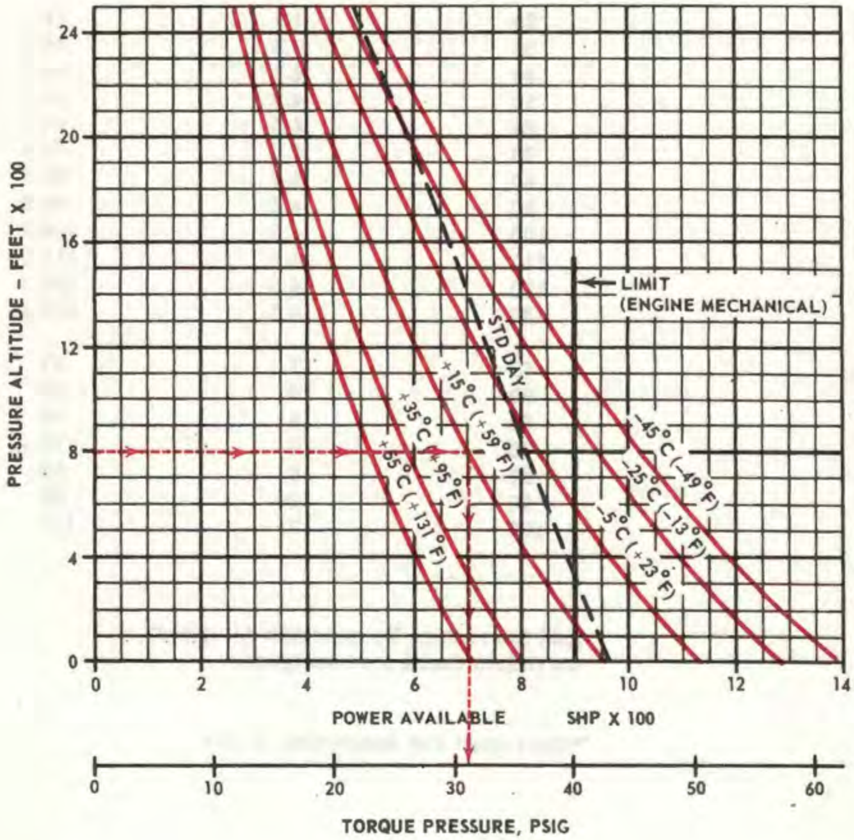
Chart 14-18. Airspeed installation correction — 48 foot rotor

ENGINE OPERATING LIMITS

NORMAL POWER AVAILABLE

2°C INLET TEMPERATURE RISE

ARMY MODEL(S)	UH-1D	ENGINES: Lycoming T53-L-9/9A/11
DATA AS OF:	MARCH 1963	ENGINE SPEED: 6400 RPM
DATA BASIS:	CALCULATED FROM FTC-TDR-62-21 "YUH-1B CATEGORY II PERFORMANCE TESTS" AND LYCOMING ENGINE SPECIFICATION NO. 104.28	FUEL GRADE: JP-4
		FUEL DENSITY: 6.5 LB/GAL



REMARKS:

Chart 14-19. Engine operating limits — 48 foot rotor

TAKE-OFF DISTANCE — FEET

LIGHT ON SKIDS

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take-off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
5000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	21.4	387.	----	----				
	16000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	18000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	20000	0.0	0.	19.7	282.	----	----	----	----	----	----				
5500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.7	343.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	14000	0.0	0.	0.0	0.	18.9	243.	----	----	----	----				
	16000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	18000	0.0	0.	----	----	----	----	----	----	----	----				
	20000	19.6	279.	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 1 of 20)

TAKE-OFF DISTANCE — FEET

LIGHT ON SKIDS

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take-off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Grade: JP-4
Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
6000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	21.4	386.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	19.3	266.	----	----	----	----				
	14000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	16000	0.0	0.	----	----	----	----	----	----	----	----				
	18000	19.8	289.	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
6500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	21.8	414.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	19.6	277.	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	----	----	----	----	----	----	----	----				
	16000	19.6	279.	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 2 of 20)

TAKE-OFF DISTANCE – FEET

LIGHT ON SKIDS

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
7000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	21.9	422.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	19.6	277.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	----	----	----	----	----	----	----	----				
	14000	19.1	255.	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
7500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	21.7	408.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	19.4	268.	----	----	----	----				
	8000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	10000	0.0	0.	19.8	288.	----	----	----	----	----	----				
	12000	18.5	225.	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 3 of 20)

TAKE-OFF DISTANCE — FEET

LIGHT ON SKIDS

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take-off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
8000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	4000	0.0	0.	0.0	0.	19.0	249.	----	----	----	----				
	6000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	8000	0.0	0.	19.2	256.	----	----	----	----	----	----				
	10000	17.7	193.	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
8500	0	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	4000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	6000	0.0	0.	18.4	224.	----	----	----	----	----	----				
	8000	0.0	0.	----	----	----	----	----	----	----	----				
	10000	----	----	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 4 of 20)

TAKE-OFF DISTANCE – FEET

LIGHT ON SKIDS

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
9000	0	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	2000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	4000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	6000	0.0	0.	----	----	----	----	----	----	----	----				
	8000	----	----	----	----	----	----	----	----	----	----				
	10000	----	----	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
9500	0.	0.0	0.	0.0	0.	20.3	319.	----	----	----	----				
	2000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	4000	0.0	0.	----	----	----	----	----	----	----	----				
	6000	19.0	251.	----	----	----	----	----	----	----	----				
	8000	----	----	----	----	----	----	----	----	----	----				
	10000	----	----	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 5 of 20)

TAKE-OFF DISTANCE — FEET

2 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take-off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
5000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	20.0	322.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	16000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	18000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	20000	0.0	0.	20.0	286.	----	----	----	----	----	----				
5500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	307.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	14000	0.0	0.	0.0	0.	20.0	272.	----	----	----	----				
	16000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	18000	0.0	0.	----	----	----	----	----	----	----	----				
	20000	20.0	285.	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 6 of 20)

TAKE-OFF DISTANCE — FEET

2 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)	
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.
6000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	321.
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----
	12000	0.0	0.	0.0	0.	20.0	280.	----	----	----	----
	14000	0.0	0.	0.0	0.	----	----	----	----	----	----
	16000	0.0	0.	----	----	----	----	----	----	----	----
	18000	20.0	289.	----	----	----	----	----	----	----	----
	20000	----	----	----	----	----	----	----	----	----	----
6500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	330.
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----
	10000	0.0	0.	0.0	0.	20.0	284.	----	----	----	----
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----
	14000	0.0	0.	----	----	----	----	----	----	----	----
	16000	20.0	285.	----	----	----	----	----	----	----	----
	18000	----	----	----	----	----	----	----	----	----	----
	20000	----	----	----	----	----	----	----	----	----	----

REMARKS:
1. No. wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 7 of 20)

TAKE-OFF DISTANCE – FEET

2 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take-off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
7000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	333.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	20.0	284.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	----	----	----	----	----	----	----	----				
	14000	20.0	276.	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
7500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	328.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	20.0	281.	----	----	----	----				
	8000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	10000	0.0	0.	20.0	288.	----	----	----	----	----	----				
	12000	20.0	264.	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 8 of 20)

TAKE-OFF DISTANCE — FEET

2 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
8000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	4000	0.0	0.	0.0	0.	20.0	274.	----	----	----	----				
	6000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	8000	0.0	0.	20.0	277.	----	----	----	----	----	----				
	10000	20.0	251.	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
8500	0	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	4000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	6000	0.0	0.	20.0	264.	----	----	----	----	----	----				
	8000	0.0	0.	----	----	----	----	----	----	----	----				
	10000	----	----	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 9 of 20)

TAKE-OFF DISTANCE – FEET

2 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 5.6 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)	
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.
9000	0	0.0	0.	0.0	0.	0.0	0.	----	----	----	----
	2000	0.0	0.	0.0	0.	----	----	----	----	----	----
	4000	0.0	0.	0.0	0.	----	----	----	----	----	----
	6000	0.0	0.	----	----	----	----	----	----	----	----
	8000	----	----	----	----	----	----	----	----	----	----
	10000	----	----	----	----	----	----	----	----	----	----
	12000	----	----	----	----	----	----	----	----	----	----
	14000	----	----	----	----	----	----	----	----	----	----
	16000	----	----	----	----	----	----	----	----	----	----
	18000	----	----	----	----	----	----	----	----	----	----
	20000	----	----	----	----	----	----	----	----	----	----
9500	0	0.0	0.	0.0	0.	20.0	299.	----	----	----	----
	2000	0.0	0.	0.0	0.	----	----	----	----	----	----
	4000	0.0	0.	----	----	----	----	----	----	----	----
	6000	20.0	275.	----	----	----	----	----	----	----	----
	8000	----	----	----	----	----	----	----	----	----	----
	10000	----	----	----	----	----	----	----	----	----	----
	12000	----	----	----	----	----	----	----	----	----	----
	14000	----	----	----	----	----	----	----	----	----	----
	16000	----	----	----	----	----	----	----	----	----	----
	18000	----	----	----	----	----	----	----	----	----	----
	20000	----	----	----	----	----	----	----	----	----	----

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown wher hovering at 2 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50-foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 10 of 20)

TAKE-OFF DISTANCE — FEET

15 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)	
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.
5000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----
	14000	0.0	0.	0.0	0.	0.0	0.	20.0	767.	----	----
	16000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----
	18000	0.0	0.	0.0	0.	----	----	----	----	----	----
	20000	0.0	0.	20.0	378.	----	----	----	----	----	----
5500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	566.
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----
	12000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----
	14000	0.0	0.	0.0	0.	20.0	310.	----	----	----	----
	16000	0.0	0.	0.0	0.	----	----	----	----	----	----
	18000	0.0	0.	20.0	480.	----	----	----	----	----	----
	20000	20.0	372.	----	----	----	----	----	----	----	----

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 11 of 20)

TAKE-OFF DISTANCE — FEET

15 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
6000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	759.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	20.0	346.	----	----	----	----				
	14000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	16000	0.0	0.	20.0	539.	----	----	----	----	----	----				
	18000	20.0	396.	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
6500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	915.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	20.0	368.	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	20.0	529.	----	----	----	----	----	----				
	16000	20.0	372.	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 12 of 20)

TAKE-OFF DISTANCE – FEET

15 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
7000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	969.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	20.0	369.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	20.0	469.	----	----	----	----	----	----				
	14000	20.0	327.	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
7500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	883.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	20.0	350.	----	----	----	----				
	8000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	10000	0.0	0.	20.0	393.	----	----	----	----	----	----				
	12000	20.0	289.	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeec (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 13 of 20)

TAKE-OFF DISTANCE – FEET

15 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
8000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	4000	0.0	0.	0.0	0.	20.0	318.	----	----	----	----				
	6000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	8000	0.0	0.	20.0	330.	----	----	----	----	----	----				
	10000	20.0	267.	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
8500	0	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	4000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	6000	0.0	0.	20.0	288.	----	----	----	----	----	----				
	8000	0.0	0.	----	----	----	----	----	----	----	----				
	10000	20.0	759.	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 14 of 20)

TAKE-OFF DISTANCE – FEET

15 FOOT SKID HEIGHT

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
9000	0	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	2000	0.0	0.	0.0	0.	20.0	764.	----	----	----	----				
	4000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	6000	0.0	0.	20.0	940.	----	----	----	----	----	----				
	8000	20.0	461.	----	----	----	----	----	----	----	----				
	10000	----	----	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
9500	0	0.0	0.	0.0	0.	20.0	480.	----	----	----	----				
	2000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	4000	0.0	0.	20.0	568.	----	----	----	----	----	----				
	6000	20.0	321.	----	----	----	----	----	----	----	----				
	8000	----	----	----	----	----	----	----	----	----	----				
	10000	----	----	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:

1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering at 15 foot skid height is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 15 of 20)

TAKE-OFF DISTANCE — FEET

BLEED OFF TECHNIQUE

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Tests, (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
5000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	12000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	14000	0.0	0.	0.0	0.	0.0	0.	20.0	276.	----	----				
	16000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	18000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	20000	0.0	0.	20.0	248.	----	----	----	----	----	----				
5500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	265.				
	10000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	12000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	14000	0.0	0.	0.0	0.	20.0	236.	----	----	----	----				
	16000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	18000	0.0	0.	----	----	----	----	----	----	----	----				
	20000	20.0	247.	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 16 of 20)

TAKE-OFF DISTANCE — FEET

BLEED OFF TECHNIQUE

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Tests, (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
6000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.	276.				
	8000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	10000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	12000	0.0	0.	0.0	0.	20.0	243.	----	----	----	----				
	14000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	16000	0.0	0.	----	----	----	----	----	----	----	----				
	18000	20.0	250.	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
6500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	283.				
	6000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	8000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	10000	0.0	0.	0.0	0.	20.0	247.	----	----	----	----				
	12000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	14000	0.0	0.	----	----	----	----	----	----	----	----				
	16000	20.0	247.	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 17 of 20)

TAKE-OFF DISTANCE — FEET

BLEED OFF TECHNIQUE

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Tests, (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
7000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	285.				
	4000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	6000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	8000	0.0	0.	0.0	0.	20.	247.	----	----	----	----				
	10000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	12000	0.0	0.	----	----	----	----	----	----	----	----				
	14000	20.0	240.	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
7500	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	20.0	281.				
	2000	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	4000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	6000	0.0	0.	0.0	0.	20.0	244.	----	----	----	----				
	8000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	10000	0.0	0.	20.0	250.	----	----	----	----	----	----				
	12000	20.0	230.	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 18 of 20)

TAKE-OFF DISTANCE — FEET

BLEED OFF TECHNIQUE

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Tests, (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s):Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
8000	0	0.0	0.	0.0	0.	0.0	0.	0.0	0.	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	4000	0.0	0.	0.0	0.	20.0	238.	----	----	----	----				
	6000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	8000	0.0	0.	20.0	241.	----	----	----	----	----	----				
	10000	20.0	219.	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
8500	0	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	2000	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	4000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	6000	0.0	0.	20.0	230.	----	----	----	----	----	----				
	8000	0.0	0.	----	----	----	----	----	----	----	----				
	10000	----	----	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those shown if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in true airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 19 of 20)

TAKE-OFF DISTANCE — FEET

BLEED OFF TECHNIQUE

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II, Flight Tests, (FTC-TDR-64-27)
Take off Distance, Flight Test Method

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WT. LB.	PRESSURE ALTITUDE 1000 FEET	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.	CLIMB OUT SPEED KNOTS	DIST TO CLEAR 50 FT.				
9000	0	0.0	0.	0.0	0.	0.0	0.	----	----	----	----				
	2000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	4000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	6000	0.0	0.	----	----	----	----	----	----	----	----				
	8000	----	----	----	----	----	----	----	----	----	----				
	10000	----	----	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				
9500	0	0.0	0.	0.0	0.	20.0	259.	----	----	----	----				
	2000	0.0	0.	0.0	0.	----	----	----	----	----	----				
	4000	0.0	0.	----	----	----	----	----	----	----	----				
	6000	20.0	239.	----	----	----	----	----	----	----	----				
	8000	----	----	----	----	----	----	----	----	----	----				
	10000	----	----	----	----	----	----	----	----	----	----				
	12000	----	----	----	----	----	----	----	----	----	----				
	14000	----	----	----	----	----	----	----	----	----	----				
	16000	----	----	----	----	----	----	----	----	----	----				
	18000	----	----	----	----	----	----	----	----	----	----				
	20000	----	----	----	----	----	----	----	----	----	----				

REMARKS:
1. No wind.
2. Take-off distance is zero when hovering out-of-ground-effect is possible.
3. No take-off distance is shown where hovering light on skids is not possible.
4. Take-off distance will exceed those if hovering in-ground-effect is performed for over one minute immediately prior to take-off.
5. Speed over the 50 foot obstacle is in trud airspeed (TAS) because values of indicated airspeed (IAS) below 20 knots may not be reliable.

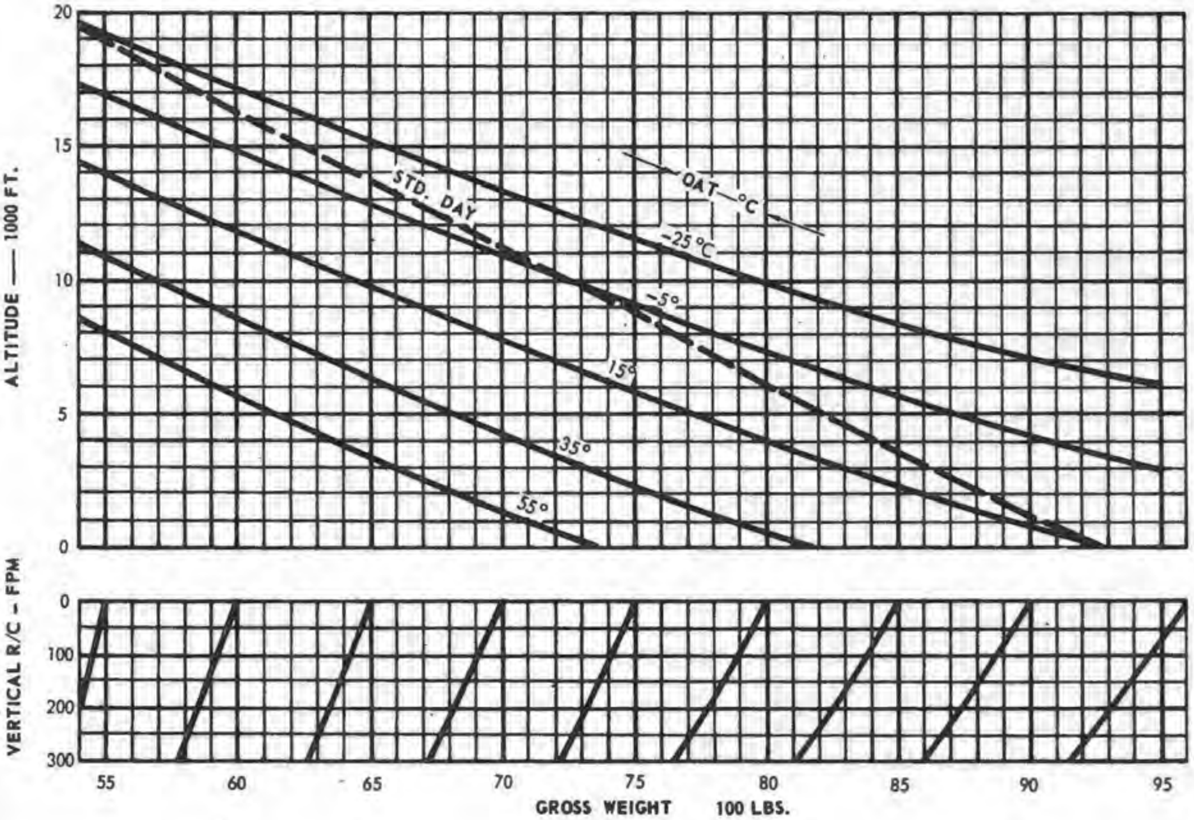
Chart 14-20. Take-off distance chart — 48 foot rotor (Sheet 20 of 20)

TAKE-OFF GROSS WEIGHT LIMITATIONS

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING
OUT-OF-GROUND EFFECT WITH TAKE-OFF POWER
2°C INLET TEMPERATURE RISE

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: UH-1D CAT. II FLIGHT TEST

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.



REMARKS:

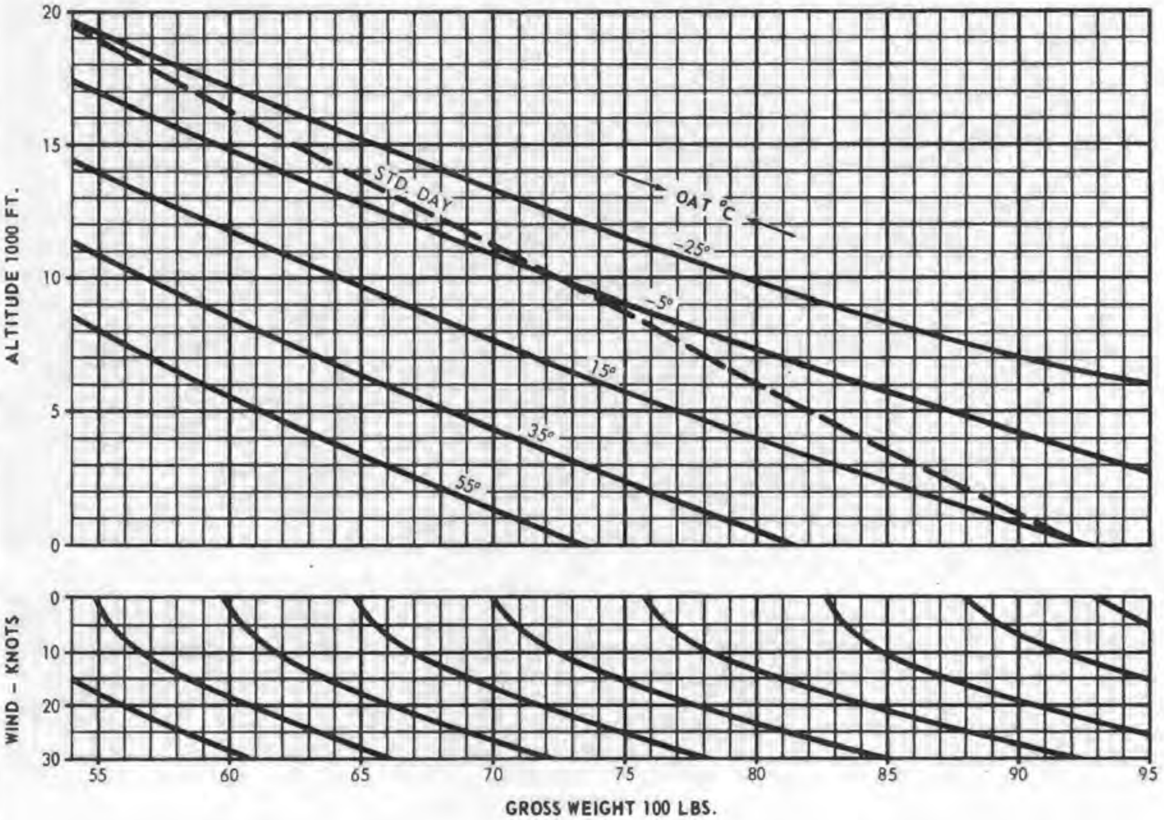
Chart 14-21. Take-off gross weight limitations curve — 48 foot rotor

HOVERING

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING
OUT-OF-GROUND EFFECT WITH TAKE-OFF POWER
2°C INLET TEMPERATURE RISE

Model(s):
Data as of: NOVEMBER 1964
DATA BASIS: UH-1D CAT. II FLIGHT TEST

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.



REMARKS:

Chart 14-22. Hovering out-of-ground effect chart — 48 foot rotor (Sheet 1 of 2)

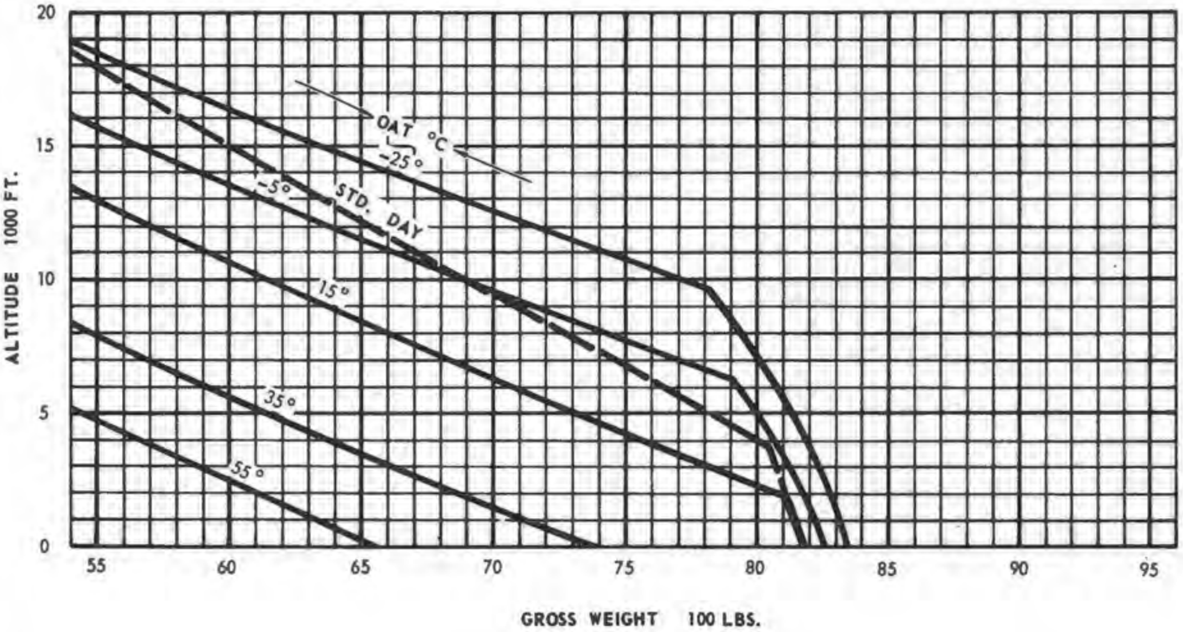
HOVERING

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING OUT OF GROUND EFFECT WITH NORMAL RATED POWER

2°C INLET TEMPERATURE RISE

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: UH-1D CAT. II FLIGHT TEST

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.



REMARKS:

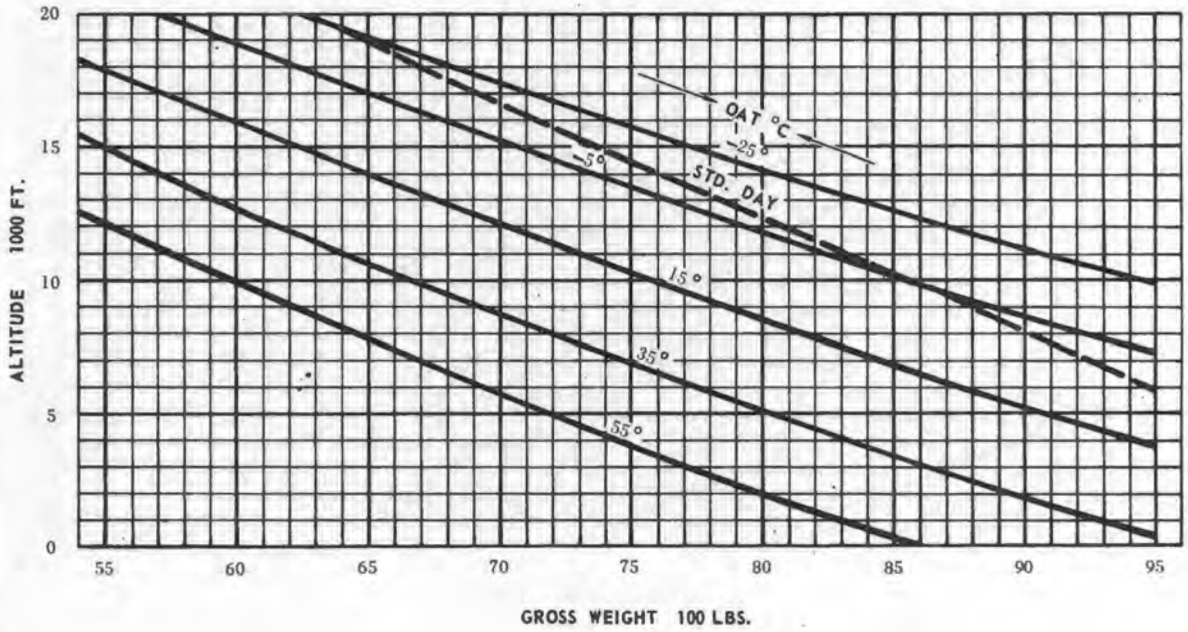
Chart 14-22. Hovering out-of-ground effect chart — 48 foot rotor (Sheet 2 of 2)

HOVERING

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING
IN GROUND EFFECT WITH TAKE-OFF POWER
2°C INLET TEMPERATURE RISE
2 FOOT SKID HEIGHT

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: UH-1D CAT. II FLIGHT TEST

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.



REMARKS:

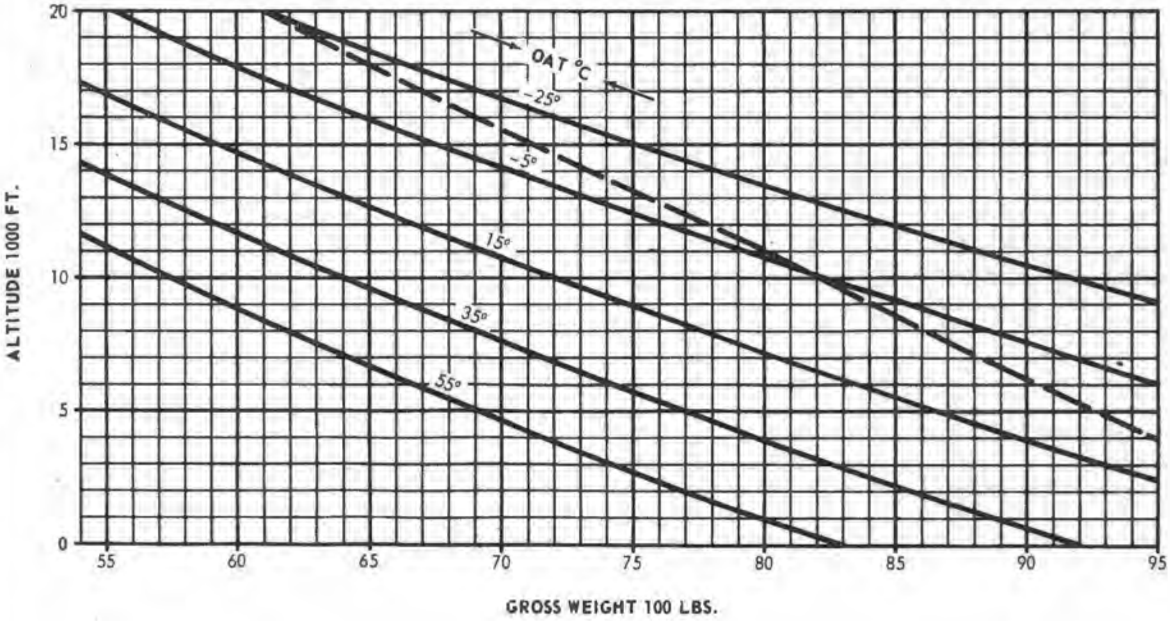
Chart 14-23. Hovering in-ground effect chart — 48 foot rotor (Sheet 1 of 2)

HOVERING

CLEAN CONFIGURATION
MAXIMUM GROSS WEIGHT FOR HOVERING
IN GROUND EFFECT WITH TAKE-OFF POWER
10°C INLET TEMPERATURE RISE
2 FOOT SKID HEIGHT

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: UH-1D CAT. II
FLIGHT TEST

Engine(s): Lycoming T53-L-11
Engine RPM: 6600
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.



REMARKS:

Chart 14-23. Hovering in-ground effect chart — 48 foot rotor (Sheet 2 of 2)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

CONFIGURATION: CLEAN
WEIGHT: 5000

CONFIGURATION: CLEAN
WEIGHT: 5500

APPROXIMATE				TORQUE PRESS PSIG	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	TORQUE PRESS PSIG	APPROXIMATE			
RATE OF CLIMB FT/MIN	FROM SEA LEVEL								FROM SEA LEVEL			RATE OF CLIMB FT/MIN.
	DIST. N. MI.	TIME MIN.	FUEL LBS.						FUEL LBS.	TIME MIN.	DIST. N. MI.	
3074	0.0	0.0	23	40.1	50.9	SL	52.8	40.1	23	0.0	0.0	2668
3066	0.5	0.7	30	40.1	50.5	2000	52.4	40.1	31	0.7	0.6	2666
3009	0.9	1.3	38	39.7	50.2	4000	52.1	39.7	40	1.5	1.2	2623
2817	1.5	2.0	45	37.9	50.1	6000	52.0	37.9	48	2.3	1.8	2455
2636	2.0	2.7	53	36.3	50.0	8000	51.8	36.3	57	3.1	2.6	2289
2458	2.7	3.5	60	34.6	49.8	10000	51.5	34.6	66	4.0	3.4	2121
2270	3.5	4.4	68	33.0	49.5	12000	51.1	33.0	75	5.0	4.4	1945
2075	4.3	5.3	76	31.3	49.1	14000	50.5	31.3	84	6.1	5.4	1765
1871	5.3	6.3	84	29.6	48.6	16000	49.8	29.6	94	7.3	6.6	1582
1675	6.5	7.4	92	27.9	47.8	18000	48.8	27.9	104	8.6	8.0	1398
1473	7.8	8.7	102	26.2	46.9	20000	47.5	26.2	115	10.2	9.7	1200
1255	9.3	10.2	111	24.4	45.7	22000	45.9	24.4	127	12.0	11.6	963
1029	11.2	11.9	122	22.7	44.2	24000	43.8	22.7	143	14.5	14.3	637
739	13.6	14.2	135	21.1	42.3	26000						
209	18.1	18.4	158	19.6	39.9	28000						

REMARKS:

1. Fuel used for warm-up and take-off is 23 pounds.
2. Engine specification fuel flow increased 5% per MIL-M-7700A.

Chart 14-24. Climb chart — 48 foot rotor (Sheet 1 of 5)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

CONFIGURATION: CLEAN **WEIGHT:** 6000							**CONFIGURATION: CLEAN** **WEIGHT:** 6500					
APPROXIMATE				**TORQUE PRESS PSIG**	**CAS KNOTS**	**PRESSURE ALTITUDE FEET**	**CAS KNOTS**	**TORQUE PRESS PSIG**	**APPROXIMATE**			
RATE OF CLIMB FT/MIN	**FROM SEA LEVEL**								**FROM SEA LEVEL**			**RATE OF CLIMB FT/MIN.**
	DIST. N. MI.	**TIME MIN.**	**FUEL LBS.**						**FUEL LBS.**	**TIME MIN.**	**DIST. N. MI.**	
2340	0.0	0.0	23	40.1	54.5	SL	56.3	40.1	23	0.0	0.0	2070
2344	0.7	0.9	33	40.1	54.2	2000	55.9	40.1	34	1.0	0.9	2080
2313	1.5	1.7	42	39.7	54.0	4000	55.7	39.7	45	1.9	1.7	2052
2156	2.3	2.6	52	37.9	53.8	6000	55.4	37.9	56	2.9	2.7	1902
1999	3.2	3.6	62	36.3	53.5	8000	55.0	36.3	67	4.0	3.8	1751
1840	4.2	4.6	72	34.6	53.1	10000	54.4	34.6	78	5.2	5.0	1600
1675	5.3	5.8	82	33.0	52.5	12000	53.6	33.0	90	6.5	6.3	1445
1508	6.6	7.0	93	31.3	51.7	14000	52.5	31.3	103	8.0	7.9	1285
1337	8.1	8.4	104	29.6	50.7	16000	51.2	29.6	116	9.7	9.7	1106
1149	9.8	10.0	116	27.9	49.2	18000	49.4	27.9	131	11.7	11.8	879
918	11.9	12.0	130	26.2	47.6	20000	47.2	26.2	152	14.5	14.9	536
567	14.7	14.6	148	24.4	45.4	22000						

REMARKS:

1. Fuel used for warm-up and take-off is 23 pounds.
2. Engine specification fuel flow increased 5% per MIL-M-7700A.

Chart 14-24. Climb chart — 48 foot rotor (Sheet 2 of 5)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

CONFIGURATION: CLEAN WEIGHT: 7000							CONFIGURATION: CLEAN WEIGHT: 7500					
APPROXIMATE				TORQUE PRESS PSIG	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	TORQUE PRESS PSIG	APPROXIMATE			
RATE OF CLIMB FT/MIN	FROM SEA LEVEL								FROM SEA LEVEL			RATE OF CLIMB FT/MIN.
	DIST. N. MI.	TIME MIN.	FUEL LBS.						FUEL LBS.	TIME MIN.	DIST. N. MI.	
1844	0.0	0.0	23	40.1	57.9	SL	59.5	40.1	23	0.0	0.0	1653
1857	1.0	1.1	35	40.1	57.6	2000	59.1	40.1	37	1.2	1.2	1662
1826	2.0	2.2	47	39.7	57.3	4000	58.7	39.7	50	2.4	2.4	1627
1682	3.2	3.3	60	37.9	56.9	6000	58.1	37.9	64	3.7	3.7	1486
1537	4.4	4.5	72	36.3	56.2	8000	57.3	36.3	79	5.1	5.1	1345
1392	5.8	5.9	86	34.6	55.4	10000	56.2	34.6	94	6.7	6.8	1200
1239	7.5	7.4	100	33.0	54.4	12000	54.9	33.0	110	8.5	8.8	1036
1069	9.3	9.2	114	36.3	53.0	14000	53.1	31.3	128	10.6	11.1	831
852	11.6	11.3	131	29.6	51.2	16000	50.8	29.6	152	13.6	14.3	532
523	14.7	14.2	153	27.9	48.9	18000						

REMARKS:

1. Fuel used for warm-up and take-off is 23 pounds.
2. Engine specification fuel flow increased 5% per MIL-M-7700A.

Chart 14-24. Climb chart — 48 foot rotor (Sheet 3 of 5)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

CONFIGURATION: CLEAN **WEIGHT:** 8000	**CONFIGURATION: CLEAN** **WEIGHT:** 8500

APPROXIMATE				TORQUE PRESS PSIG	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	TORQUE PRESS PSIG	APPROXIMATE			
RATE OF CLIMB FT/MIN	FROM SEA LEVEL								FROM SEA LEVEL			RATE OF CLIMB FT/MIN.
	DIST. N. MI.	TIME MIN.	FUEL LBS.						FUEL LBS.	TIME MIN.	DIST. N. MI.	
1486	0.0	0.0	23	40.1	61.0	SL	62.3	40.1	23	0.0	0.0	1335
1487	1.3	1.3	38	40.1	60.5	2000	61.9	40.1	40	1.5	1.5	1327
1448	2.7	2.7	53	39.7	59.9	4000	61.0	39.7	57	3.0	3.1	1282
1309	4.3	4.2	69	37.9	59.1	6000	59.9	37.9	75	4.7	4.9	1141
1166	6.0	5.8	86	36.3	58.1	8000	58.6	36.3	94	6.6	6.9	988
1009	8.0	7.6	104	34.6	56.7	10000	56.9	34.6	116	8.8	9.4	804
814	10.4	9.8	123	33.0	55.0	12000	54.7	33.0	143	11.7	12.6	553
544	13.6	12.8	159	31.3	52.8	14000	52.0	31.3	189	17.2	18.5	183
120	20.1	18.8	197	29.6	49.9	16000						

REMARKS:

1. Fuel used for warm-up and take-off is 23 pounds.
2. Engine specification fuel flow increased 5% per MIL-M-7700A.

Chart 14-24. Climb chart — 48 foot rotor (Sheet 4 of 5)

CLIMB CHART FOR NORMAL POWER

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

CONFIGURATION: CLEAN WEIGHT: 9000							CONFIGURATION: CLEAN WEIGHT: 9500					
APPROXIMATE				TORQUE PRESS PSIG	CAS KNOTS	PRESSURE ALTITUDE FEET	CAS KNOTS	TORQUE PRESS PSIG	APPROXIMATE			
RATE OF CLIMB FT/MIN	FROM SEA LEVEL								FROM SEA LEVEL			RATE OF CLIMB FT/MIN.
	DIST. N. MI.	TIME MIN.	FUEL LBS.						FUEL LBS.	TIME MIN.	DIST. N. MI.	
1193	0.0	0.0	23	40.1	63.5	SL	64.6	40.1	23	0.0	0.0	1059
1178	1.8	1.7	42	40.1	62.8	2000	63.6	40.1	45	1.9	2.0	1034
1125	3.6	3.4	61	39.7	61.8	4000	62.4	39.7	67	3.9	4.2	969
975	5.7	5.3	82	37.9	60.5	6000	60.7	37.9	91	6.2	6.7	801
799	8.2	7.6	105	36.3	58.8	8000	58.7	36.3	121	9.1	9.9	587
569	11.4	10.5	134	34.6	56.7	10000	56.1	34.6	165	13.6	14.8	290
235	16.8	15.5	179	33.0	54.0	12000						

REMARKS:

1. Fuel used for warm-up and take-off is 23 pounds
2. Engine specification fuel flow increased 5% per MIL-M-7700A

Chart 14-24. Climb chart — 48 foot rotor (Sheet 5 of 5)

RANGE CHART
STANDARD DAY

ENGINE SPEED 6400 RPM
LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
5000	SL	28.4	528	110	110	298	292	250	209	167	125	83	42						
	2000	26.8	497	108	105	312	305	262	218	174	131	87	44						
	4000	25.8	474	108	102	326	319	274	228	182	137	91	46						
	6000	24.7	447	107	98	342	335	287	239	191	144	96	48						
	8000	23.8	424	106	94	359	351	301	251	201	150	100	50						
	10000	23.2	406	107	92	374	367	314	262	210	157	105	52						
	12000	22.5	387	106	88	391	382	328	273	219	164	109	55						
	14000	20.4	353	101	82	410	402	344	287	230	172	115	57						
	16000	18.0	315	94	74	428	419	359	299	239	179	120	60						
	18000	16.0	286	87	66	435	426	365	304	243	183	122	61						
5000	20000	14.6	263	79	58	429	420	360	300	240	180	120	60						
5500	SL	29.0	534	110	110	294	288	247	206	165	124	82	41						
	2000	27.4	504	108	105	308	301	258	215	172	129	86	43						
	4000	26.5	482	108	102	321	314	269	224	179	135	90	45						
	6000	25.5	457	107	98	335	328	281	235	188	141	94	47						
	8000	24.5	433	106	94	351	343	294	245	196	147	98	49						
	10000	24.1	417	107	92	365	357	306	255	204	153	102	51						
	12000	23.4	398	106	88	380	372	319	266	212	159	106	53						
	14000	21.4	365	101	82	397	389	333	278	222	167	111	56						
	16000	19.0	328	94	74	412	403	345	288	230	173	115	58						
	18000	17.3	300	87	66	414	405	347	290	232	174	116	58						
5500	20000	16.1	280	79	58	403	395	338	282	226	169	118	56						

REMARKS:

1. Clean configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-25. Range chart — 48 foot rotor (Sheet 1 of 10)

RANGE CHART
STANDARD DAY

ENGINE SPEED 6400 RPM

LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
6000	SL	29.7	542	110	110	290	284	244	203	162	122	81	41						
	2000	28.7	519	109	106	302	295	253	211	169	127	84	42						
	4000	27.3	491	108	102	315	308	264	220	176	132	88	44						
	6000	26.3	467	107	98	328	321	275	229	184	138	92	46						
	8000	25.4	444	106	94	342	335	287	239	191	143	96	48						
	10000	25.1	428	107	92	355	348	298	248	199	149	99	50						
	12000	24.5	412	106	88	367	360	308	257	205	154	103	51						
	14000	22.6	379	101	82	382	374	321	267	214	160	107	53						
	16000	20.5	345	94	74	391	383	328	274	219	164	109	55						
	18000	19.1	322	87	66	386	378	324	270	216	162	108	54						
6000	20000	18.4	308	79	58	367	359	308	257	205	154	103	51						
6500	SL	31.0	557	111	111	285	279	239	199	159	120	80	40						
	2000	29.4	528	109	106	296	290	249	207	166	124	83	41						
	4000	28.1	501	108	102	308	302	258	215	172	129	86	43						
	6000	27.2	478	107	98	320	314	269	224	179	134	90	45						
	8000	26.4	457	106	94	333	326	279	233	186	140	93	47						
	10000	26.2	442	107	92	344	337	289	241	193	144	96	48						
	12000	25.8	428	106	88	353	346	296	247	198	148	99	49						
	14000	24.2	398	101	82	364	356	305	254	204	153	102	51						
	16000	22.6	371	94	74	364	356	305	254	203	153	102	51						
	18000	21.8	356	87	66	349	342	293	244	195	146	98	49						
6500	20000	22.4	359	79	58	314	308	264	220	176	132	88	44						

REMARKS:

1. Clean configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-25. Range chart — 48 foot rotor (Sheet 2 of 10)

RANGE CHART
STANDARD DAY

ENGINE SPEED 6400 RPM

LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
7000	SL	31.8	566	111	111	280	274	235	196	157	118	78	39						
	2000	30.3	539	109	106	290	284	244	203	162	122	81	41						
	4000	29.0	513	108	102	301	295	253	211	168	126	84	42						
	6000	28.2	491	107	98	312	305	262	218	174	131	87	44						
	8000	27.5	471	106	94	323	316	271	226	180	135	90	45						
	10000	27.6	460	107	92	331	324	278	232	185	139	93	45						
	12000	27.0	443	105	87	338	331	284	237	189	142	95	47						
	14000	26.6	429	101	82	337	330	283	236	089	142	94	47						
	16000	25.7	410	94	74	329	322	276	230	184	138	92	49						
	18000	26.0	412	87	66	302	295	253	211	169	127	84	42						
7000	20000	26.2	413	60	44	207	203	174	145	116	87	58	29						
7500	SL	32.7	577	111	111	275	269	231	192	154	115	77	42						
	2000	31.2	550	109	106	284	278	239	199	159	119	80	40						
	4000	30.1	526	108	102	294	287	246	205	164	123	82	41						
	6000	29.3	506	107	98	303	297	254	212	169	127	85	42						
	8000	28.9	489	106	04	311	304	261	217	174	130	87	43						
	10000	28.7	474	106	91	318	311	267	222	178	133	89	44						
	12000	28.6	465	103	86	316	310	265	221	177	133	88	44						
	14000	29.0	461	99	80	308	301	258	215	172	129	86	43						
	16000	29.0	461	94	73	288	282	241	201	161	121	80	43						
7500	18000	27.9	441	64	48	207	203	174	145	116	87	58	29						

REMARKS:

1. Clean configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-25. Range chart — 48 foot rotor (Sheet 3 of 10)

RANGE CHART
STANDARD DAY

ENGINE SPEED 6400 RPM

LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
8000	SL	33.3	585	111	111	270	264	227	189	151	113	76	38						
	2000	32.0	560	109	106	278	272	233	194	155	117	78	39						
	4000	31.3	543	108	102	285	280	240	200	160	120	80	40						
	6000	30.3	519	106	97	293	287	246	205	164	123	82	41						
	8000	30.1	505	106	94	299	292	251	209	167	125	84	42						
	10000	29.9	491	103	88	299	293	251	209	167	125	84	42						
	12000	30.5	491	100	83	291	285	244	204	163	122	81	41						
	14000	31.3	494	95	77	275	270	231	193	154	116	77	39						
8000	16000	29.6	466	68	53	210	205	176	147	117	88	59	29						
8500	SL	34.1	595	110	110	264	259	222	185	148	111	74	37						
	2000	33.3	578	109	106	271	265	227	189	151	114	76	38						
	4000	32.4	557	108	101	277	271	232	193	155	116	77	39						
	6000	31.4	534	106	97	283	277	237	198	158	119	79	40						
	8000	31.7	528	104	92	282	276	236	197	158	118	79	39						
	10000	31.6	515	100	86	278	272	233	194	155	117	78	39						
	12000	32.9	528	97	81	262	257	220	183	147	110	73	37						
8500	14000	31.3	494	73	59	211	206	177	147	118	88	59	29						

REMARKS:

1. Clean configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling

Chart 14-25. Range chart — 48 foot rotor (Sheet 4 of 10)

RANGE CHART
STANDARD DAY

ENGINE SPEED 6400 RPM

LONG RANGE - CRUISE SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
9000	SL	35.4	612	111	111	258	253	217	180	144	108	72	36						
	2000	34.4	591	109	106	263	257	221	184	147	110	74	37						
	4000	33.5	572	107	101	268	262	225	187	150	112	75	37						
	6000	32.7	553	104	95	268	263	225	188	150	113	75	38						
	8000	33.0	547	101	90	265	259	222	185	148	111	74	37						
	10000	33.6	548	97	83	253	248	212	177	141	106	71	35						
9000	12000	33.0	529	78	65	211	206	177	147	118	88	59	29						
9500	SL	35.8	618	109	109	252	247	212	176	141	106	71	35						
	2000	35.4	606	108	105	255	250	214	179	143	107	71	36						
	4000	34.6	588	105	99	256	251	215	179	143	107	72	36						
	6000	34.2	574	102	93	254	249	213	178	142	107	71	36						
	8000	35.2	581	99	88	243	238	204	170	136	102	68	34						
9500	10000	34.6	565	84	72	212	208	078	148	119	89	59	30						

REMARKS:

1. Clean configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-25. Range chart — 48 foot rotor (Sheet 5 of 10)

RANGE CHART

STANDARD DAY

ENGINE SPEED 6400 RPM

RANGE - MAXIMUM SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
5000	SL	34.2	596	120	120	288	282	242	201	161	121	81	40						
	2000	34.9	600	123	120	294	288	247	206	165	124	82	41						
	4000	32.4	557	121	114	311	304	261	217	174	130	87	43						
	6000	29.9	513	118	108	329	322	275	230	184	138	92	46						
	8000	27.2	467	114	101	349	342	293	244	195	147	98	49						
	10000	24.9	426	111	95	370	363	311	259	207	155	104	52						
	12000	22.8	392	107	89	390	381	327	272	218	163	109	54						
	14000	20.4	353	101	82	410	402	344	287	230	172	115	57						
	16000	18.0	315	94	74	428	419	359	299	239	179	120	60						
	18000	16.0	286	87	66	435	426	365	304	243	183	122	61						
5000	20000	14.6	263	79	58	429	420	360	300	240	180	120	60						
5500	SL	34.7	603	120	120	285	279	239	199	159	119	80	40						
	2000	35.4	605	123	120	292	285	245	204	163	122	82	41						
	4000	33.0	565	121	114	306	300	257	214	171	128	86	43						
	6000	30.6	523	118	108	323	316	271	226	181	135	90	45						
	8000	28.0	477	114	101	342	335	287	239	191	144	96	48						
	10000	25.8	437	111	95	361	353	303	252	202	150	101	50						
	12000	23.8	403	107	89	379	371	318	265	212	159	106	53						
	14000	21.4	365	101	82	397	389	333	278	222	167	111	56						
	16000	19.0	328	94	74	412	403	345	288	230	173	115	58						
	18000	17.3	300	87	66	414	405	347	290	232	174	116	58						
5500	20000	16.1	280	79	58	403	395	338	282	226	169	113	56						

REMARKS:

1. Clean Configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available)(Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-25. Range chart — 48 foot rotor (Sheet 6 of 10)

RANGE CHART

STANDARD DAY

ENGINE SPEED 6400 RPM

RANGE - MAXIMUM SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
6000	SL	35.3	610	120	120	281	275	236	197	157	118	79	39						
	2000	36.1	616	123	120	287	281	241	201	160	120	80	40						
	4000	33.7	575	121	114	301	294	252	210	168	126	84	42						
	6000	31.5	535	118	108	316	309	265	221	177	132	88	44						
	8000	29.0	490	114	101	333	326	280	233	186	140	93	47						
	10000	26.8	450	111	95	351	344	295	246	196	147	98	49						
	12000	24.9	417	107	89	366	359	307	256	205	154	102	51						
	14000	22.6	379	101	82	382	374	321	267	214	160	107	53						
	16000	20.5	345	94	74	391	383	328	274	219	164	109	55						
	18000	19.1	322	87	66	386	378	324	270	216	162	108	54						
6000	20000	18.4	308	79	58	367	359	308	257	205	154	103	51						
6500	SL	36.1	621	120	120	276	271	232	193	155	116	77	39						
	2000	36.8	627	123	120	282	276	236	197	158	118	79	39						
	4000	34.7	589	121	114	294	288	246	205	164	123	82	41						
	6000	32.5	550	118	108	307	301	258	215	172	129	86	43						
	8000	30.1	505	114	101	324	317	272	226	181	136	91	45						
	10000	27.9	465	110	95	340	333	285	238	190	143	95	48						
	12000	26.2	433	107	89	352	345	296	246	197	148	99	49						
	14000	24.2	398	101	82	364	356	305	254	204	153	102	51						
	16000	22.6	371	94	74	364	356	305	254	203	153	102	51						
	18000	21.8	356	87	66	349	342	293	244	195	146	98	49						
6500	20000	22.4	359	79	58	314	308	264	220	176	132	88	44						

REMARKS:

1. Clean configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-25. Range chart — 48 foot rotor (Sheet 7 of 10)

RANGE CHART

STANDARD DAY

ENGINE SPEED RPM

RANGE - MAXIMUM SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
7000	SL	36.9	632	120	120	272	266	228	190	152	114	76	38						
	2000	37.9	642	123	120	275	269	231	192	154	115	77	38						
	4000	35.8	605	121	114	286	280	240	200	160	120	80	40						
	6000	33.7	566	118	108	298	292	250	209	167	125	83	42						
	8000	31.3	521	114	101	313	307	263	219	175	131	88	44						
	10000	29.4	484	111	95	327	320	274	228	183	137	91	46						
	12000	27.8	454	107	89	336	329	282	235	188	141	94	47						
	14000	26.6	429	101	82	337	330	283	236	189	142	94	47						
	16000	25.7	410	94	74	329	322	276	230	184	138	92	46						
	18000	26.0	412	87	66	302	295	253	211	169	127	84	42						
7000	20000	26.2	413	60	44	207	203	174	145	116	87	58	29						
7500	SL	37.9	646	120	120	266	260	223	186	149	111	74	37						
	2000	39.0	659	123	120	268	262	225	187	150	112	75	37						
	4000	37.0	623	121	114	278	272	233	194	155	116	78	39						
	6000	34.9	585	118	108	289	283	242	202	161	121	81	40						
	8000	32.8	544	114	101	301	294	252	210	168	126	84	42						
	10000	31.0	507	111	95	312	305	262	218	174	131	87	44						
	12000	30.5	490	107	89	311	305	261	218	174	131	87	44						
	14000	30.0	475	101	82	305	298	256	213	171	128	85	43						
	16000	29.6	465	94	73	288	282	241	201	161	121	80	40						
7500	18000	27.9	441	64	48	207	203	174	145	116	87	58	29						

REMARKS:

1. Clean configuration
2. Engine Specification fuel flow increased 5% per MIL-M-7700A
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-25. Range chart — 48 foot rotor (Sheet 8 of 10)

RANGE CHART
STANDARD DAY

ENGINE SPEED 6400 RPM

RANGE - MAXIMUM SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
8000	SL	37.4	639	118	118	263	258	221	184	147	110	74	37						
	2000	38.8	655	121	117	264	258	221	185	148	111	74	37						
	4000	36.7	619	118	112	273	268	229	191	153	115	76	38						
	6000	35.0	586	115	105	281	275	236	197	157	118	79	39						
	8000	33.1	548	112	99	291	285	244	204	163	122	81	41						
	10000	32.4	527	108	93	292	286	245	204	163	123	82	41						
	12000	32.5	521	104	87	285	279	239	199	160	120	80	40						
	14000	31.3	494	95	77	275	270	231	193	154	116	77	39						
8000	16000	29.6	466	68	53	210	205	176	147	117	88	59	29						
8500	SL	37.0	633	115	115	260	254	218	182	145	109	73	36						
	2000	38.5	651	118	115	260	255	218	182	146	109	73	36						
	4000	36.8	620	116	109	267	261	224	187	149	112	75	37						
	6000	35.1	587	113	103	274	268	230	192	153	115	77	38						
	8000	34.3	566	109	97	275	269	231	192	154	115	77	38						
	10000	34.1	556	105	90	270	265	227	189	151	113	76	38						
	12000	32.9	528	97	81	262	257	220	183	147	110	73	37						
8500	14000	31.3	494	73	59	211	206	177	147	118	88	59	29						

REMARKS:

1. Clean configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-25. Range chart — 48 foot rotor (Sheet 9 of 10)

RANGE CHART
STANDARD DAY

ENGINE SPEED 6400 RPM

RANGE - MAXIMUM SPEED

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				RANGE - Nautical Airmiles													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
9000	SL	36.6	628	113	113	256	251	215	179	143	108	72	36						
	2000	38.4	649	116	112	255	250	214	178	143	107	71	36						
	4000	36.8	620	113	107	261	255	219	182	146	109	73	36						
	6000	35.9	601	110	100	261	256	219	183	146	110	73	37						
	8000	35.7	590	106	94	258	252	216	180	144	108	72	36						
	10000	34.6	565	99	85	250	245	210	175	140	105	70	35						
9000	12000	33.0	529	78	65	211	206	177	147	118	88	59	29						
9500	SL	36.4	626	110	110	251	246	211	176	141	105	70	35						
	2000	38.3	648	113	110	250	244	210	175	140	105	70	35						
	4000	37.5	630	110	104	250	245	210	175	140	105	70	35						
	6000	36.9	616	107	98	248	243	208	174	139	104	69	35						
	8000	36.3	599	101	89	241	236	202	169	135	101	67	35						
9500	10000	34.6	565	89	72	212	208	178	148	119	89	59	30						

REMARKS:

1. Clean configuration
2. Engine specification fuel flow increased 5% per MIL-M-7700A.
3. Range = $\frac{\text{(Fuel Available) (TAS)}}{\text{Fuel Flow}}$ = (Fuel Available) (Specific Range)
4. Range not shown above 20,000 feet or cruise ceiling.

Chart 14-25. Range chart — 48 foot rotor (Sheet 10 of 10)

MAXIMUM ENDURANCE

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNOTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
5000	SL	13.5	376	51	51	3.8	3.7	3.2	2.7	2.1	1.6	1.1	0.5						
	2000	13.6	361	52	51	4.0	3.9	3.3	2.8	2.2	1.7	1.1	0.6						
	4000	13.6	345	53	50	4.1	4.1	3.5	2.9	2.3	1.7	1.2	0.6						
	6000	13.5	328	55	50	4.4	4.3	3.7	3.0	2.4	1.8	1.2	0.6						
	8000	13.4	313	56	50	4.6	4.5	3.8	3.2	2.6	1.9	1.3	0.6						
	10000	13.3	296	58	50	4.8	4.7	4.1	3.4	2.7	2.0	1.4	0.7						
	12000	13.3	285	60	50	5.0	4.9	4.2	3.5	2.8	2.1	1.4	0.7						
	14000	13.4	275	61	49	5.2	5.1	4.4	3.6	2.9	2.2	1.5	0.7						
	16000	13.4	266	62	49	5.4	5.3	4.5	3.8	3.0	2.3	1.5	0.8						
	18000	13.4	257	63	48	5.6	5.4	4.7	3.9	3.1	2.3	1.6	0.8						
5000	20000	13.4	250	64	47	5.7	5.6	4.8	4.0	3.2	2.4	1.6	0.8						
5500	SL	14.7	387	53	53	3.7	3.6	3.1	2.6	2.1	1.5	1.0	0.5						
	2000	14.7	371	54	52	3.9	3.8	3.2	2.7	2.2	1.6	1.1	0.5						
	4000	14.7	356	55	52	4.0	3.9	3.4	2.8	2.3	1.7	1.1	0.6						
	6000	14.5	339	57	52	4.2	4.1	3.5	3.0	2.4	1.8	1.2	0.6						
	8000	14.5	323	58	52	4.4	4.3	3.7	3.1	2.5	1.9	1.2	0.6						
	10000	14.4	308	60	52	4.6	4.5	3.9	3.2	2.6	1.9	1.3	0.6						
	12000	14.5	298	61	51	4.8	4.7	4.0	3.4	2.7	2.0	1.3	0.7						
	14000	14.5	287	63	51	5.0	4.9	4.2	3.5	2.8	2.1	1.4	0.7						
	16000	14.6	277	64	50	5.2	5.1	4.3	3.6	2.9	2.2	1.4	0.7						
	18000	14.6	270	65	49	5.3	5.2	4.4	3.7	3.0	2.2	1.5	0.7						
5500	20000	14.7	265	65	48	5.4	5.3	4.5	3.8	3.0	2.3	1.5	0.8						

REMARKS:

1. Fuel used for warm-up and take-off is 23 pounds.
2. Specification fuel flow increased 5% per MIL-M-7700A.
3. Endurance not shown where power required exceeds normal rated power available.

Chart 14-26. Maximum endurance chart — 48 foot rotor (Sheet 1 of 5)

MAXIMUM ENDURANCE
STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNOTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
6000	SL	15.8	398	55	55	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	2000	15.8	381	56	54	3.8	3.7	3.1	2.6	2.1	1.6	1.0	0.5						
	4000	15.6	365	57	54	3.9	3.8	3.3	2.7	2.2	1.6	1.1	0.5						
	6000	15.5	349	59	54	4.1	4.0	3.4	2.9	2.3	1.7	1.1	0.6						
	8000	15.5	334	60	54	4.3	4.2	3.6	3.0	2.4	1.8	1.2	0.6						
	10000	15.5	320	62	53	4.5	4.4	3.8	3.1	2.5	1.9	1.3	0.6						
	12000	15.6	310	63	53	4.6	4.5	3.9	3.2	2.6	1.9	1.3	0.6						
	14000	15.6	299	64	52	4.8	4.7	4.0	3.3	2.7	2.0	1.3	0.7						
	16000	15.7	290	65	51	4.9	4.8	4.1	3.5	2.8	2.1	1.4	0.7						
	18000	16.0	286	65	49	5.0	4.9	4.2	3.5	2.8	2.1	1.4	0.7						
6000	20000	16.0	286	65	49	5.0	4.9	4.2	3.5	2.8	2.1	1.4	0.7						
6500	SL	16.8	408	56	56	3.5	3.4	2.9	2.5	2.0	1.5	1.0	0.5						
	2000	16.7	390	58	56	3.7	3.6	3.1	2.6	2.1	1.5	1.0	0.5						
	4000	16.6	374	59	56	3.8	3.7	3.2	2.7	2.1	1.6	1.1	0.5						
	6000	16.5	359	61	55	4.0	3.9	3.3	2.8	2.2	1.7	1.1	0.6						
	8000	16.5	344	62	55	4.2	4.1	3.5	2.9	2.3	1.7	1.2	0.6						
	10000	16.6	331	63	54	4.3	4.2	3.6	3.0	2.4	1.8	1.2	0.6						
	12000	16.7	322	64	54	4.4	4.4	3.7	3.1	2.5	1.9	1.2	0.6						
	14000	16.9	312	65	53	4.6	4.5	3.8	3.2	2.6	1.9	1.3	0.6						
	16000	17.2	306	66	51	4.7	4.6	3.9	3.3	2.6	2.0	1.3	0.7						
	18000	18.0	309	65	49	4.6	4.5	3.9	3.2	2.6	1.9	1.3	0.6						
6500	20000	20.1	329	65	47	4.3	4.3	3.6	3.0	2.4	1.8	1.2	0.6						

REMARKS:
1. Fuel used for warm-up and take-off is 23 pounds.
2. Specification fuel flow increased 5% per MIL-M-7700A.
3. Endurance not shown where power required exceeds normal rated power available.

Chart 14-26. Maximum endurance chart — 48 foot rotor (Sheet 2 of 5)

MAXIMUM ENDURANCE

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Categoty II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNOTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
7000	SL	17.8	417	58	58	3.4	3.4	2.9	2.4	1.9	1.4	1.0	0.5						
	2000	17.6	398	59	58	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	4000	17.5	383	61	57	3.7	3.7	3.1	2.6	2.1	1.6	1.0	0.5						
	6000	17.5	369	62	57	3.9	3.8	3.3	2.7	2.2	1.6	1.1	0.5						
	8000	17.6	355	64	56	4.0	3.9	3.4	2.8	2.3	1.7	1.1	0.6						
	10000	17.8	343	65	55	4.2	4.1	3.5	2.9	2.3	1.7	1.2	0.6						
	12000	18.0	335	65	54	4.3	4.2	3.6	3.0	2.4	1.8	1.2	0.6						
	14000	18.4	329	66	53	4.3	4.3	3.6	3.0	2.4	1.8	1.2	0.6						
	16000	19.3	331	66	51	4.3	4.2	3.6	3.0	2.4	1.8	1.2	0.6						
7000	18000	21.5	353	65	49	4.1	4.0	3.4	2.8	2.3	1.7	1.1	0.6						
7500	SL	18.6	426	60	60	3.4	3.3	2.8	2.3	1.9	1.4	0.9	0.5						
	2000	18.5	408	61	59	3.5	3.4	2.9	2.5	2.0	1.5	1.0	0.5						
	4000	18.5	394	62	59	3.6	3.6	3.0	2.5	2.0	1.5	1.0	0.5						
	6000	18.6	380	64	58	3.8	3.7	3.2	2.6	2.1	1.6	1.1	0.5						
	8000	18.8	367	65	57	3.9	3.8	3.3	2.7	2.2	1.6	1.1	0.5						
	10000	19.0	357	65	56	4.0	3.9	3.4	2.8	2.2	1.7	1.1	0.6						
	12000	19.5	353	66	55	4.1	4.0	3.4	2.8	2.3	1.7	1.1	0.6						
	14000	20.5	354	66	53	4.0	4.0	3.4	2.8	2.3	1.7	1.1	0.6						
	16000	22.7	372	65	51	3.8	3.8	3.2	2.7	2.1	1.6	1.1	0.5						
7500	18000	27.6	436	64	48	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						

REMARKS:

1. Fuel used for warm-up and take-off is 23 pounds.
2. Specification fuel flow increased 5% per MIL-M-7700A.
3. Endurance not shown where power required exceeds normal rated power available.

Chart 14-26. Maximum endurance chart — 48 foot rotor (Sheet 3 of 5)

MAXIMUM ENDURANCE

STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASISAFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE FUEL FLOW	APPROXIMATE SPEED/KNOTS		1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
8000	SL	19.5	434	61	61	3.3	3.2	2.8	2.3	1.8	1.4	0.9	0.5						
	2000	19.5	418	62	61	3.4	3.3	2.9	2.4	1.9	1.4	1.0	0.5						
	4000	19.6	405	64	60	3.5	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	6000	19.8	392	65	59	3.6	3.6	3.1	2.6	2.0	1.5	1.0	0.5						
	8000	20.1	381	66	58	3.8	3.7	3.2	2.6	2.1	1.6	1.1	0.5						
	10000	20.6	376	66	57	3.8	3.7	3.2	2.7	2.1	1.6	1.1	0.5						
	12000	21.7	378	66	55	3.8	3.7	3.2	2.6	2.1	1.6	1.1	0.5						
	14000	23.8	393	66	53	3.6	3.6	3.1	2.5	2.0	1.5	1.0	0.5						
8000	16000	28.0	442	64	50	3.2	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
8500	SL	20.5	444	62	62	3.2	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	2000	20.6	429	64	61	3.3	3.3	2.8	2.3	1.9	1.4	0.9	0.5						
	4000	20.8	417	65	61	3.4	3.4	2.9	2.4	1.9	1.4	1.0	0.5						
	6000	21.1	406	66	60	3.5	3.4	3.0	2.5	2.0	1.5	1.0	0.5						
	8000	21.7	399	66	59	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	10000	22.8	401	66	57	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	12000	24.8	416	66	55	3.4	3.4	2.9	2.4	1.9	1.4	1.0	0.5						
8500	14000	28.6	456	65	52	3.1	3.1	2.6	2.2	1.8	1.3	0.9	0.4						

REMARKS:

1. Fuel used for warm-up and take-off is 23 pounds.
2. Specification fuel flow increased 5% per MIL-M-7700A.
3. Endurance not shown where power required exceeds normal rated power available.

Chart 14-26. Maximum endurance chart — 48 foot rotor (Sheet 4 of 5)

MAXIMUM ENDURANCE
STANDARD DAY

ENGINE SPEED 6400 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: AFFTC Category II Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROXIMATE			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNOTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
9000	SL	21.5	455	64	64	3.1	3.1	2.6	2.2	1.8	1.3	0.9	0.4						
	2000	21.8	441	65	63	3.2	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	4000	22.1	431	66	62	3.3	3.2	2.8	2.3	1.9	1.4	0.9	0.5						
	6000	22.7	424	66	61	3.4	3.3	2.8	2.4	1.9	1.4	0.9	0.5						
	8000	23.8	424	66	59	3.4	3.3	2.8	2.4	1.9	1.4	0.9	0.5						
	10000	25.8	437	66	57	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
9000	12000	29.3	474	65	54	3.0	3.0	2.5	2.1	1.7	1.3	0.8	0.4						
9500	SL	22.7	467	65	65	3.1	3.0	2.6	2.1	1.7	1.3	0.9	0.4						
	2000	23.1	456	66	64	3.1	3.1	2.6	2.2	1.8	1.3	0.9	0.4						
	4000	23.7	449	66	62	3.2	3.1	2.7	2.2	1.8	1.3	0.9	0.4						
	6000	24.8	448	66	61	3.2	3.1	2.7	2.2	1.8	1.3	0.9	0.4						
	8000	26.6	459	66	59	3.1	3.0	2.6	2.2	1.7	1.3	0.9	0.4						
9500	10000	29.8	490	65	56	2.9	2.9	2.4	2.0	1.6	1.2	0.8	0.4						

REMARKS:

1. Fuel used for warm-up and take-off is 23 pounds.
2. Specification fuel flow increased 5% per MIL-M-7700A.
3. Endurance not shown where power required exceeds normal rated power available.

Chart 14-26. Maximum endurance chart — 48 foot rotor (Sheet 5 of 5)

HOVERING ENDURANCE

STANDARD DAY

ENGINE SPEED 6600 RPM

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROX.			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
5000	2000	23.3	467	0	0	3.1	3.0	2.6	2.1	1.7	1.3	0.9	0.4						
	4000	23.2	453	0	0	3.2	3.1	2.6	2.2	1.8	1.3	0.9	0.4						
	6000	23.2	438	0	0	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	8000	23.1	424	0	0	3.4	3.3	2.8	2.4	1.9	1.4	0.9	0.5						
	10000	23.1	413	0	0	3.5	3.4	2.9	2.4	1.9	1.5	1.0	0.5						
	12000	23.2	403	0	0	3.5	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	14000	23.4	395	0	0	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	16000	23.7	392	0	0	3.7	3.6	3.1	2.6	2.0	1.5	1.0	0.5						
	18000	24.2	395	0	0	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
	20000	24.7	400	0	0	3.6	3.5	3.0	2.5	2.0	1.5	1.0	0.5						
5500	0	25.6	507	0	0	2.8	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	2000	25.5	493	0	0	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	4000	25.5	478	0	0	3.0	2.9	2.5	2.1	1.7	1.3	0.8	0.4						
	6000	25.4	465	0	0	3.1	3.0	2.6	2.2	1.7	1.3	0.9	0.4						
	8000	25.5	453	0	0	3.2	3.1	2.7	2.2	1.8	1.3	0.9	0.4						
	10000	25.7	443	0	0	3.2	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	12000	25.9	437	0	0	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	14000	26.3	432	0	0	3.3	3.2	2.8	2.3	1.9	1.4	0.9	0.5						
	16000	26.8	433	0	0	3.3	3.2	2.8	2.3	1.8	1.4	0.9	0.5						
	18000	27.3	439	8	6	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	20000	25.6	413	14	10	3.5	3.4	2.9	2.4	1.9	1.5	1.0	0.5						

REMARKS:
1. Fuel used for warm-up and take-off is 23 pounds.
2. Specification fuel flow increased 5% per MIL-M-7700A.
3. Endurance not shown where power required exceeds normal rated power available.

Chart 14-27. Hovering endurance chart — 48 foot rotor (Sheet 1 of 4)

HOVERING ENDURANCE

STANDARD DAY

ENGINE SPEED 6600 RPM

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROX. FUEL FLOW	APPROX. SPEED/KNTS		1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
6000	0	27.8	533	0	0	2.7	2.6	2.3	1.9	1.5	1.1	0.8	0.4						
	2000	27.7	518	0	0	2.8	2.7	2.3	1.9	1.5	1.2	0.8	0.4						
	4000	27.8	506	0	0	2.8	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	6000	27.9	494	0	0	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	8000	28.1	486	0	0	2.9	2.9	2.5	2.1	1.6	1.2	0.8	0.4						
	10000	28.4	479	0	0	3.0	2.9	2.5	2.1	1.7	1.3	0.8	0.4						
	12000	28.9	477	0	0	3.0	2.9	2.5	2.1	1.7	1.3	0.8	0.4						
	14000	29.5	477	0	0	3.1	2.9	2.5	2.1	1.7	1.3	0.8	0.4						
	16000	28.9	463	11	9	3.1	3.0	2.6	2.2	1.7	1.3	0.9	0.4						
	18000	27.3	439	16	12	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	20000	25.6	413	20	15	3.5	3.5	2.9	2.4	1.9	1.5	1.0	0.5						
6500	0	30.1	559	0	0	2.6	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
	2000	30.1	547	0	0	2.6	2.6	2.2	1.8	1.5	1.1	0.7	0.4						
	4000	30.3	537	0	0	2.7	2.6	2.2	1.9	1.5	1.1	0.7	0.4						
	6000	30.5	529	0	0	2.7	2.6	2.3	1.9	1.5	1.1	0.8	0.4						
	8000	30.9	525	0	0	2.7	2.7	2.3	1.9	1.5	1.1	0.8	0.4						
	10000	31.4	523	0	0	2.7	2.7	2.3	1.9	1.5	1.1	0.8	0.4						
	12000	32.1	526	0	0	2.7	2.7	2.3	1.9	1.5	1.1	0.8	0.4						
	14000	30.6	494	13	10	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	16000	28.9	463	17	13	3.1	3.0	2.6	2.2	1.7	1.3	0.9	0.4						
	18000	27.3	439	21	16	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
	20000	25.6	413	26	19	3.5	3.4	2.9	2.4	1.9	1.5	1.0	0.5						

REMARKS: 1. Fuel used for warm-up and take-off is 23 pounds.
2. Specification fuel flow increased 5% per MIL-M-7700A.
3. Endurance not shown where power required exceeds normal rated power available.

Chart 14-27. Hovering endurance chart — 48 foot rotor (Sheet 2 of 4)

HOVERING ENDURANCE

STANDARD DAY

ENGINE SPEED 6600 RPM

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROX.			1430 LBS	1400 LBS	1200 LBS	1000 LBS	800 LBS	600 LBS	400 LBS	200 LBS	LBS	LBS	LBS	LBS	LBS	LBS
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL	FUEL
7000	0	32.5	587	0	0	2.4	2.4	2.0	1.7	1.4	1.0	0.7	0.3						
	2000	32.6	580	0	0	2.5	2.4	2.1	1.7	1.4	1.0	0.7	.0.3						
	4000	32.9	574	0	0	2.5	2.4	2.1	1.7	1.4	1.0	0.7	0.3						
	6000	33.4	571	0	0	2.5	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
	8000	34.0	572	0	0	2.5	2.4	2.1	1.7	1.4	1.0	0.7	0.3						
	10000	33.9	563	10	8	2.5	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
	12000	32.2	528	14	12	2.7	2.7	2.3	1.9	1.5	1.1	0.8	0.4						
	14000	30.6	494	18	14	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	16000	28.9	463	22	17	3.1	3.0	2.6	2.2	1.7	1.3	0.9	0.4						
	18000	27.3	439	27	20	3.3	3.2	2.7	2.3	1.8	1.4	0.9	0.5						
7500	0	35.0	620	0	0	2.3	2.3	1.9	1.6	1.3	1.0	0.6	0.3						
	2000	35.4	617	0	0	2.3	2.3	1.9	1.6	1.3	1.0	0.6	0.3						
	4000	35.9	618	0	0	2.3	2.3	1.9	1.6	1.3	1.0	0.6	0.3						
	6000	36.5	622	0	0	2.3	2.3	1.9	1.6	1.3	1.0	0.6	0.3						
	8000	35.7	600	11	10	2.4	2.3	2.0	1.7	1.3	1.0	0.7	0.3						
	10000	33.9	563	15	13	2.5	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
	12000	32.2.	528	19	15	2.7	2.7	2.3	1.9	1.5	1.1	0.8	0.4						
	14000	30.6	494	23	18	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
	16000	28.9	27	21	3.1	3.0	2.6	2.2	1.7	1.7	1.3	0.9	0.4						

REMARKS:
1. Fuel used for warm-up and take-off is 23 pounds.
2. Specification fuel flow increased 5% per MIL-M-7700A.
3. Endurance not shown where power required exceeds normal rated power available.

Chart 14-27. Hovering endurance chart — 48 foot rotor (Sheet 3 of 4)

HOVERING ENDURANCE

STANDARD DAY

ENGINE SPEED 6600 RPM

Model(s): UH-1D (48)
Data as of: November 1964
DATA BASIS: AFFTC Category II Flight Test (FTC-TDR-64-27)

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LBS/GAL.

GROSS WEIGHT	PRESS. ALT.	POWER SETTINGS				ENDURANCE - Hours													
		TORQUE PRESS	APPROX.			1430 LBS FUEL	1400 LBS FUEL	1200 LBS FUEL	1000 LBS FUEL	800 LBS FUEL	600 LBS FUEL	400 LBS FUEL	200 LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL	LBS FUEL
			FUEL FLOW	SPEED/KNTS															
POUNDS	FEET	PSIG	LB/HR	TAS	CAS														
8000	0	37.8	658	0	0	2.2	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	2000	38.3	661	0	0	2.2	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	4000	39.0	668	0	0	2.1	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	6000	37.4	637	12	11	2.2	2.2	1.9	1.6	1.3	0.9	0.6	0.3						
	8000	35.7	600	15	14	2.4	2.3	2.0	1.7	1.3	1.0	0.7	0.3						
	10000	33.9	563	19	16	2.5	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
	12000	32.3	528	23	19	2.7	2.7	2.3	1.9	1.5	1.1	0.8	0.4						
	14000	30.6	494	27	22	2.9	2.8	2.4	2.0	1.6	1.2	0.8	0.4						
8500	0	40.7	704	0	0	2.0	2.0	1.7	1.4	1.1	0.9	0.6	0.3						
	4000	39.2	671	13	12	2.1	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	6000	37.4	637	16	15	2.2	2.2	1.9	1.6	1.3	0.9	0.6	0.3						
	8000	35.7	600	19	17	2.4	2.3	2.0	1.7	1.3	1.0	0.7	0.3						
	10000	33.9	563	23	20	2.5	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
	12000	32.2	528	27	23	2.7	2.7	2.3	1.9	1.5	1.1	0.8	0.4						
9000	4000	39.2	671	16	15	2.1	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	6000	37.4	637	19	18	2.2	2.2	1.9	1.6	1.3	0.9	0.6	0.3						
	8000	35.7	600	23	20	2.4	2.3	2.0	1.7	1.3	1.0	0.7	0.3						
	10000	33.9	563	27	23	2.5	2.5	2.1	1.8	1.4	1.1	0.7	0.4						
9500	2000	41.0	705	16	16	2.0	2.0	1.7	1.4	1.1	0.9	0.6	0.3						
	4000	39.2	671	20	18	2.1	2.1	1.8	1.5	1.2	0.9	0.6	0.3						
	6000	37.4	637	23	21	2.2	2.2	1.9	1.6	1.3	0.9	0.6	0.3						
	8000	35.7	600	27	24	2.4	2.3	2.0	1.7	1.3	1.0	0.7	0.3						

REMARKS:
1. Fuel used for warm-up and take-off is 23 pounds.
2. Specification fuel flow increased 5% per MIL-M-7700A.
3. Endurance not shown where power required exceeds normal rated power available.

Chart 14-27. Hovering endurance chart — 48 foot rotor (Sheet 4 of 4)

LANDING DISTANCE — FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 59 FT.				
5000	SL	0	0	0	0	0	0	0	0	0	0				
	2000	0	0	0	0	0	0	0	0	0	0				
	4000	0	0	0	0	0	0	0	0	0	0				
	6000	0	0	0	0	0	0	0	0	0	0				
	10000	0	0	0	0	0	0	0	0	0	0				
	12000	0	0	0	0	0	0	0	0	12	15				
	14000	0	0	0	0	0	0	11	12	17	29				
	16000	0	0	0	0	0	0	16	25	22	77				
	18000	0	0	0	0	13	18	20	72	26	98				
5000	20000	0	0	11	12	18	34	25	93	31	128				
5500	SL	0	0	0	0	0	0	0	0	0	0				
	2000	0	0	0	0	0	0	0	0	0	0				
	4000	0	0	0	0	0	0	0	0	0	0				
	6000	0	0	0	0	0	0	0	0	0	0				
	8000	0	0	0	0	0	0	0	0	9	8				
	10000	0	0	0	0	0	0	0	0	14	20				
	12000	0	0	0	0	0	0	12	16	18	36				
	14000	0	0	0	0	9	8	17	31	22	85				
	16000	0	0	0	0	14	22	21	79	27	109				
	18000	0	0	12	15	19	70	26	103	32	145				
5500	20000	11	14	18	34	24	95	32	139	41	217				

REMARKS:

1. No wind.
2. Clean configuration.
3. Distance to clear 50 feet are given as zero when helicopter can hover OGE. When helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.
4. Landing distances include a 30 foot estimated skid distance where it is not possible to hover at a 2 foot skid height (IGE)
5. Landing distances not shown above 20,000 feet or cruise ceiling.

Chart 14-28. Landing distance chart — power on — 48 foot rotor (Sheet 1 of 5)

LANDING DISTANCE — FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	−25° C (−13° F)		−5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 59 FT.				
6000	SL	0	0	0	0	0	0	0	0	0	0				
	2000	0	0	0	0	0	0	0	0	0	0				
	4000	0	0	0	0	0	0	0	0	0	0				
	6000	0	0	0	0	0	0	0	0	10	11				
	8000	0	0	0	0	0	0	0	0	14	25				
	10000	0	0	0	0	0	0	13	19	19	71				
	12000	0	0	0	0	9	10	17	35	23	92				
	14000	0	0	0	0	15	25	22	85	27	119				
	16000	0	0	12	17	19	75	26	111	33	159				
	18000	12	16	18	38	25	102	32	151	42	242				
6000	20000	18	39	24	98	31	146	46	288	-	-				
6500	SL	0	0	0	0	0	0	0	0	0	0				
	2000	0	0	0	0	0	0	0	0	0	0				
	4000	0	0	0	0	0	0	0	0	10	13				
	6000	0	0	0	0	0	0	0	0	15	28				
	8000	0	0	0	0	0	0	13	22	19	76				
	10000	0	0	0	0	9	12	17	39	23	98				
	12000	0	0	0	0	15	28	22	90	27	126				
	14000	0	0	12	19	19	79	26	117	33	169				
	16000	11	17	18	41	24	107	32	159	42	255				
	18000	18	41	23	101	31	153	45	293	-	-				
6500	20000	24	106	30	150	48	332	-	-	-	-				

REMARKS:

1. No wind.
2. Clean configuration.
3. Distance to clear 50 feet are given as zero when helicopter can hover OGE. When helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.
4. Landing distances include a 30 foot estimated skid distance where it is not possible to hover at a 2 foot skid height (IGE).
5. Landing distances not shown above 20,000 feet or cruise ceiling.

Chart 14-28. Landing distance chart — power on — 48 foot rotor (Sheet 2 of 5)

LANDING DISTANCE — FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 59 FT.				
7000	SL	0	0	0	0	0	0	0	0	0	0				
	2000	0	0	0	0	0	0	0	0	10	14				
	4000	0	0	0	0	0	0	0	0	15	31				
	6000	0	0	0	0	0	0	13	23	19	80				
	8000	0	0	0	0	9	12	17	42	23	103				
	10000	0	0	0	0	15	29	21	94	27	132				
	12000	0	0	12	19	19	81	26	122	32	176				
	14000	11	16	17	42	24	110	31	164	41	262				
	16000	17	41	23	103	30	156	42	281	-	-				
	18000	23	107	29	151	44	302	-	-	-	-				
7000	20000	31	161	-	-	-	-	-	-	-	-				
7500	SL	0	0	0	0	0	0	0	0	10	15				
	2000	0	0	0	0	0	0	0	0	15	32				
	4000	0	0	0	0	0	0	13	24	19	82				
	6000	0	0	0	0	9	12	17	43	23	107				
	8000	0	0	0	0	14	30	21	96	27	137				
	10000	0	0	11	18	19	52	25	126	32	180				
	12000	9	13	17	41	23	112	30	167	39	261				
	14000	16	39	22	103	29	157	40	265	-	-				
	16000	22	105	28	150	41	276	-	-	-	-				
7500	18000	29	158	43	312	-	-	-	-	-	-				

REMARKS:
1. No wind.
2. Clean configuration.
3. Distance to clear 50 feet are given as zero when helicopter can hover OGE. When helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.
4. Landing distances include a 30 foot estimated skid distance where it is not possible to hover at a 2 foot skid height (IGE).
5. Landing distances not shown above 20,000 feet or cruise ceiling.

Chart 14-28. Landing distance chart — power on — 48 foot rotor (Sheet 3 of 5)

LANDING DISTANCE — FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 F.T.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 59 FT.				
8000	SL	0	0	0	0	0	0	0	0	14	32				
	2000	0	0	0	0	0	0	12	24	18	83				
	4000	0	0	0	0	8	11	17	43	22	109				
	6000	0	0	0	0	14	29	21	97	26	140				
	8000	0	0	10	16	18	52	25	127	31	182				
	10000	8	10	16	39	23	112	29	168	38	255				
	12000	15	36	21	101	28	155	37	250	-	-				
	14000	21	71	27	146	37	249	-	-	-	-				
8000	16000	28	152	38	255	-	-	-	-	-	-				
8500	SL	0	0	0	0	0	0	11	22	18	53				
	2000	0	0	0	0	0	0	16	43	22	109				
	4000	0	0	0	0	13	28	20	97	26	141				
	6000	0	0	9	13	17	50	24	127	30	181				
	8000	0	0	15	36	22	110	28	166	36	248				
	10000	14	32	20	67	27	152	35	235	51	468				
	12000	20	65	26	141	34	228	-	-	-	-				
	14000	26	144	34	223	-	-	-	-	-	-				
8500	16000	36	248	-	-	-	-	-	-	-	-				

REMARKS: 1. No wind.

2. Clean configuration.

3. Distance to clear 50 feet are given as zero when helicopter can hover OGE. When helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.

4. Landing distances include a 30 foot estimated skid distance where it is not possible to hover at a 2 foot skid height (IGE).

5. Landing distances not shown above 20,000 feet or cruise ceiling.

Chart 14-28. Landing distance chart — power on — 48 foot rotor (Sheet 4 of 5)

LANDING DISTANCE — FEET

POWER ON

ENGINE SPEED 6600 RPM

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)					
		BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 50 FT.	BEST APPROACH TAS KNOTS	DIST AFTER CLEAR 59 FT.				
9000	SL	0	0	0	0	0	0	15	40	21	107				
	2000	0	0	0	0	12	25	19	95	25	140				
	4000	0	0	0	0	16	48	23	125	29	179				
	6000	0	0	13	32	21	107	27	162	34	242				
	8000	12	26	19	62	25	146	33	222	44	380				
	10000	18	59	24	133	31	207	48	436	-	-				
	12000	24	134	30	197	48	448	-	-	-	-				
9000	14000	31	206	-	-	-	-	-	-	-	-				
9500	SL	0	0	0	0	10	20	18	62	24	136				
	2000	0	0	0	0	15	44	22	122	28	176				
	4000	0	0	12	28	20	103	26	158	33	234				
	6000	10	20	17	56	24	140	31	212	41	342				
	8000	16	51	22	125	30	196	40	337	-	-				
	10000	22	123	28	181	40	339	-	-	-	-				
9500	12000	29	185	41	347	-	-	-	-	-	-				

REMARKS:
1. No wind.
2. Clean configuration.
3. Distance to clear 50 feet are given as zero when helicopter can hover OGE. When helicopter cannot hover OGE, MINIMUM possible distances and speeds to clear a 50 foot obstacle are given. These are minimum values and require good pilot technique. For a normal landing, the distances and speeds given for power off landings will provide safer operation within the height-velocity diagram for the helicopter.
4. Landing distances include a 30 foot estimated skid distance where it is not possible to hover at a 2 foot skid height (IGE).
5. Landing distances not shown above 20,000 feet or cruise ceiling.

Chart 14-28. Landing distance chart — power on — 48 foot rotor (Sheet 5 of 5)

LANDING DISTANCE — FEET
POWER OFF

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	BEST APPROACH	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
		KNOTS	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL		
5000	SL	46	-	-	-	-	-	-	307	30	320	30		
	2000	46	-	-	-	-	-	-	322	30	337	30		
	4000	46	-	-	339	30	331	30	339	30	355	30		
	6000	47	359	30	353	30	348	30	358	30	374	30		
	8000	46	371	30	368	30	368	30	378	30	395	30		
	10000	46	384	30	388	30	388	30	399	30	418	30		
	12000	45	399	30	402	30	409	30	422	30	440	30		
	14000	44	414	30	421	30	431	30	445	30	463	30		
	16000	44	430	30	439	30	452	30	468	30	483	30		
	18000	43	445	30	457	30	471	30	487	30	500	30		
5000	20000	41	459	30	472	30	487	30	501	30	508	30		
5500	SL	48	-	-	-	-	348	30	357	30	373	30		
	2000	49	-	-	374	30	366	30	376	30	393	30		
	4000	49	395	30	390	30	386	30	396	30	415	30		
	6000	49	409	30	407	30	407	30	418	30	438	30		
	8000	48	423	30	425	30	429	30	442	30	462	30		
	10000	47	439	30	444	30	452	30	467	30	487	30		
	12000	46	456	30	464	30	475	30	492	30	511	30		
	14000	46	473	30	484	30	498	30	516	30	532	30		
	16000	45	489	30	502	30	519	30	536	30	549	30		
	18000	43	503	30	519	30	535	30	550	30	557	30		
5500	20000	42	514	30	529	30	543	30	554	30	550	30		

REMARKS:
1. No wind.
2. Clean Configuration
3. Ground roll limited to 30 feet by skid gear
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-29. Landing distance chart — power off — 48 foot rotor (Sheet 1 of 5)

LANDING DISTANCE — FEET
POWER OFF

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6-5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	BEST APPROACH	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
		KNOTS	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL		
6000	SL	52	418	30	409	30	401	30	411	30	431	30		
	2000	52	431	30	426	30	422	30	434	30	454	30		
	4000	51	446	30	444	30	445	30	458	30	479	30		
	6000	50	461	30	464	30	469	30	483	30	505	30		
	8000	49	478	30	484	30	494	30	510	30	532	30		
	10000	49	496	30	506	30	519	30	537	30	557	30		
	12000	48	515	30	527	30	543	30	562	30	580	30		
	14000	47	532	30	547	30	565	30	584	30	597	30		
	16000	45	547	30	564	30	582	30	598	30	604	30		
	18000	45	558	30	575	30	590	30	601	30	596	30		
6000	20000	42	562	30	576	30	586	30	588	30	-	-		
6500	SL	54	466	30	460	30	457	30	470	30	492	30		
	2000	53	482	30	480	30	481	30	496	30	519	30		
	4000	52	499	30	501	30	507	30	523	30	547	30		
	6000	52	517	30	523	30	534	30	551	30	575	30		
	8000	51	536	30	546	30	560	30	580	30	602	30		
	10000	50	555	30	569	30	586	30	607	30	626	30		
	12000	49	574	30	590	30	609	30	630	30	645	30		
	14000	47	590	30	608	30	627	30	645	30	652	30		
	16000	46	602	30	620	30	637	30	649	30	644	30		
	18000	44	606	30	622	30	633	30	635	30	644	30		
6500	20000	42	599	30	609	30	610	30	-	-	-	-		

REMARKS:
1. No wind.
2. Clean Configuration
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available,

Chart 14-29. Landing distance chart — power off — 48 foot rotor (Sheet 2 of 5)

LANDING DISTANCE — FEET
POWER OFF

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	BEST APPROACH	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
		KNOTS	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	C	
7000	SL	55	517	30	515	30	517	30	532	30	557	30		
	2000	55	535	30	538	30	544	30	561	30	587	30		
	4000	54	554	30	561	30	572	30	591	30	617	30		
	6000	52	595	30	609	30	628	30	650	30	671	30		
	8000	52	595	30	609	30	628	30	650	30	671	30		
	10000	51	615	30	632	30	653	30	675	30	691	30		
	12000	50	632	30	652	30	672	30	692	30	700	30		
	14000	48	645	30	665	30	683	30	697	30	692	30		
	16000	47	651	30	668	30	680	30	684	30	659	30		
	18000	44	644	30	656	30	658	30	-	-	-	-		
7000	20000	42	623	30	625	30	-	-	-	-	-	-		
7500	SL	57	570	30	573	30	579	30	597	30	625	30		
	2000	56	590	30	597	30	609	30	629	30	656	30		
	4000	55	612	30	623	30	639	30	661	30	687	30		
	6000	54	633	30	648	30	668	30	692	30	715	30		
	8000	53	654	30	673	30	695	30	718	30	736	30		
	10000	52	673	30	694	30	716	30	738	30	748	30		
	12000	50	688	30	709	30	729	30	745	30	742	30		
	14000	47	695	30	714	30	728	30	734	30	711	30		
	16000	46	690	30	704	30	708	30	698	30	-	-		
	18000	44	671	30	675	30	-	-	-	-	-	-		
7500	20000	42	632	30	-	-	-	-	-	-	-	-		

REMARKS:
1. No wind.
2. Clean Configuration.
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-29. Landing distance chart — power off — 48 foot rotor (Sheet 3 of 5)

LANDING DISTANCE — FEET
POWER OFF

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	BEST APPROACH	-25° C (-13° F)		-5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
		KNOTS	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL		
8000	SL	58	625	30	632	30	644	30	665	30	694	30		
	2000	57	647	30	659	30	676	30	699	30	727	30		
	4000	56	670	30	686	30	706	30	732	30	757	30		
	6000	55	693	30	712	30	735	30	761	30	781	30		
	8000	54	713	30	735	30	759	30	782	30	795	30		
	10000	52	730	30	752	30	774	30	792	30	792	30		
	12000	50	739	30	759	30	776	30	785	30	766	30		
	14000	48	736	30	753	30	760	30	753	30	-	-		
	16000	46	719	30	726	30	717	30	-	-	-	-		
	18000	44	683	30	-	-	-	-	-	-	-	-		
8000	20000	-	-	-	-	-	-	-	-	-	-	-		
8500	SL	59	682	30	693	30	710	30	735	30	765	30		
	2000	58	706	30	722	30	743	30	770	30	797	30		
	4000	57	730	30	749	30	774	30	801	30	823	30		
	6000	56	752	30	774	30	800	30	825	30	840	30		
	8000	56	770	30	794	30	818	30	839	30	842	30		
	10000	52	782	30	804	30	824	30	836	30	821	30		
	12000	50	782	30	801	30	812	30	809	30	-	-		
	14000	48	769	30	779	30	774	30	-	-	-	-		
	16000	46	681	30	733	30	-	-	-	-	-	-		
	18000	43	681	30	-	-	-	-	-	-	-	-		
8500	20000	-	-	-	-	-	-	-	-	-	-	-		

REMARKS:
1. No wind.
2. Clean configuration
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-29. Landing distance chart — power off — 48 foot rotor (Sheet 4 of 5)

LANDING DISTANCE — FEET

POWER OFF

Model(s): UH-1D
Data as of: NOVEMBER 1964
DATA BASIS: ESTIMATED

Engine(s): Lycoming T53-L-11
Fuel Grade: 'JP-4
Fuel Density: 6.5 LB/GAL.

GROSS WEIGHT	PRESS. ALT	BEST APPROACH	−25° C (−13° F)		−5° C (+23° F)		+15° C (+59° F)		+35° C (+95° F)		+55° C (+131° F)			
		KNOTS	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL	CLEAR 50 FT	GROUND ROLL		
9000	SL	60	740	30	756	30	778	30	805	30	835	30		
	2000	59	765	30	785	30	810	30	839	30	864	30		
	4000	58	789	30	812	30	839	30	867	30	885	30		
	6000	56	809	30	834	30	861	30	884	30	891	30		
	8000	54	824	30	848	30	871	30	886	30	876	30		
	10000	53	828	30	849	30	864	30	865	30	-	-		
	12000	51	818	30	832	30	832	30	-	-	-	-		
	14000	48	790	30	791	30	-	-	-	-	-	-		
	16000	45	739	30	-	-	-	-	-	-	-	-		
	18000	-	-	-	-	-	-	-	-	-	-	-		
9000	20000	-	-	-	-	-	-	-	-	-	-	-		
9500	SL	61	800	30	819	30	845	30	876	30	904	30		
	2000	60	825	20	848	30	876	30	906	30	928	30		
	4000	58	847	30	873	30	901	30	928	30	939	30		
	6000	56	864	30	890	30	916	30	935	30	931	30		
	8000	56	872	30	896	30	914	30	921	30	892	30		
	10000	52	867	30	884	30	890	30	878	30	-	-		
	12000	51	844	30	850	30	-	-	-	-	-	-		
	14000	48	799	30	-	-	-	-	-	-	-	-		
	16000	-	-	-	-	-	-	-	-	-	-	-		
	18000	-	-	-	-	-	-	-	-	-	-	-		
9500	20000	-	-	-	-	-	-	-	-	-	-	-		

REMARKS:
1. No wind.
2. Clean configuration
3. Ground roll limited to 30 feet by skid gear.
4. Landing distances are not shown above 20,000 feet, cruise ceiling, or where flight test data are not available.

Chart 14-29. Landing distance chart — power off — 48 foot rotor (Sheet 5 of 5)

ALPHABETICAL INDEX

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