TECHNICAL MANUAL

OPERATOR'S MANUAL

ARMY MODEL OH-58A HELICOPTER

This copy is a reprint which includes current pages from Changes 1 through 4.

This manual supersedes TM 55-1520-228-10, 22 July 1969, including all changes.

HEADQUARTERS, DEPARTMENT OF THE ARMY 13 OCTOBER 1970

TM 55-1520-228-10
Changes No. 4

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

SAFETY OF FLIGHT

OPERATOR'S MANUAL

ARMY MODEL OH-58A HELICOPTER

Headquarters, Department of the Army, Washington, D. C.
29 April 1971

NOTE: COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS SAFETY INFORMATION TO THE ATTENTION OF ALL PERSONNEL CLEARED FOR OPERATION OF SUBJECT AIRCRAFT.

TM 55-1520-228-10, 13 October 1970, is changed as follows:

1. Purpose. To restrict flight during inclement weather such as falling or blowing snow.

2. Instructions. Page 7-4. Paragraph 7-19 is added as follows:

7-19. FLIGHT RESTRICTIONS. Flight in falling or blowing snow is prohibited.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:
VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31 (qty rqr block no. 109) requirements for Operator and Crew Maintenance Instructions for OH-58 aircraft.

*These changes supersedes USAAVSCOM Msg 171600Z March 71.

LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Total number of pages in this manual is 154 consisting of the following:

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LIST OF EFFECTIVE PAGES

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Total number of pages in this manual is 154 consisting of the following:

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WARNING

Personnel performing operations, procedures and practices which are included or implied in this technical manual shall observe the following instructions. Disregard of these warnings and precautionary information can cause serious injury, death, or an aborted mission.

STARTING ENGINE

Coordinate all cockpit actions with ground observer. Insure that rotor and blast areas are clear and fire guard is posted.

FIRE EXTINGUISHER

Exposure to high concentrations of monobromotrifluoromethane (CF_3Br) extinguishing agent or decomposition products should be avoided. The liquid should not be allowed to come into contact with the skin, as it may cause frost bite or low temperature burns.

GROUND OPERATION

Engine will be started and operated only by authorized personnel. Reference AR 95-13.

ARMAMENT

Loaded weapons, or weapons being loaded or unloaded, shall be pointed in a direction which offers the least exposure to personnel or property in the event of accidental firing. Personnel should remain clear of hazardous area of all loaded weapons.

ANY ROTATION OF THE GUN ARMAMENT SUBSYSTEM BARRELS WILL CAUSE THE GUN TO FIRE.

Upon landing, immediately alert personnel to probable presence of live rounds in the gun. Summon armament repairman to clear weapon.

ACIDS

Battery electrolyte is harmful to the skin and clothing. Neutralize any spilled electrolyte by flushing contacted areas thoroughly with water.

NOISE

Operating and maintenance personnel should wear ear protective devices when in or around aircraft while aircraft is operating.

HIGH VOLTAGE

Do not make contact with exposed radio wires or connectors. Turn all power switches off before making any connections or disconnections.

CARBON MONOXIDE

When smoke, suspected carbon monoxide fumes, or symptoms of anoxia exist, the crew should immediately ventilate cabin and shut off heater.

HANDLING FUEL AND OILS

Turbine fuels and lubricating oil contain additives which are poisonous and readily absorbed through the skin. Do not allow them to remain on skin longer than necessary.

RADIOACTIVE MATERIALS

Those instruments having radioactive self-luminous instrument dials will have a radioactive warning legend proceeding maintenance instructions. If such an instrument is broken or becomes unsealed, avoid personal contact with the instrument. Use forceps or gloves made of rubber or polyethylene to pick up contaminated material. Place the material and the gloves in a plastic bag, seal the bag and dispose of it as radioactive waste in accordance with AR755-15 and TM3-261. (Refer to TB 55-1500-314-25)

Warnings, Cautions and Notes shall be used to emphasize important and critical instructions and shall be used for the following conditions.

WARNING

An operating procedure, practice, etc. which, if not correctly followed, could result in personnel injury or loss of life.

CAUTION

An operating procedure, practice, etc., which if not strictly observed, could result in damage to or destruction of equipment.

NOTE

An operating procedure, condition, etc., which it is essential to highlight.

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CHAPTER 1

INTRODUCTION

SECTION I GENERAL

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. Scope.

This manual, issued expressly for operators, is an official document for Army Model OH-58A aircraft, serial No. 68-16687 through 68-16986, 69-16080 through 69-16379, 70-15050 through 70-15649, 71-15400 through 71-15999. The purpose of this manual is to supply you with the latest information and performance data derived from flight test programs and operational experiences. The study and use of this manual will enable you to perform the assigned missions and duties with maximum efficiency and safety. Your ability and experience are recognized. It is not the function of this manual to teach the pilot how to fly; basic flight principles and elementary instructionsare not included. The contents of this manual will provide you with a general knowledge of Army Model OH-58A aircraft, its flight characteristics, and specific normal and emergency operating procedures.

a. Reports. Reports necessary to comply with the Army Safety Program are prescribed in detail in AR 385-40.

b. Forms. DA Forms and procedures used for equipment maintenance will be only those prescribed by TM 38-750.

c. Equipment. Equipment serviceability criteria applicable to Army Model OH-58A aircraft are presented in TM 55-1520-228-ESC.

SECTION II DISTRIBUTION, REVISION AND IMPROVEMENTS

1-2. Distribution And Revision System.

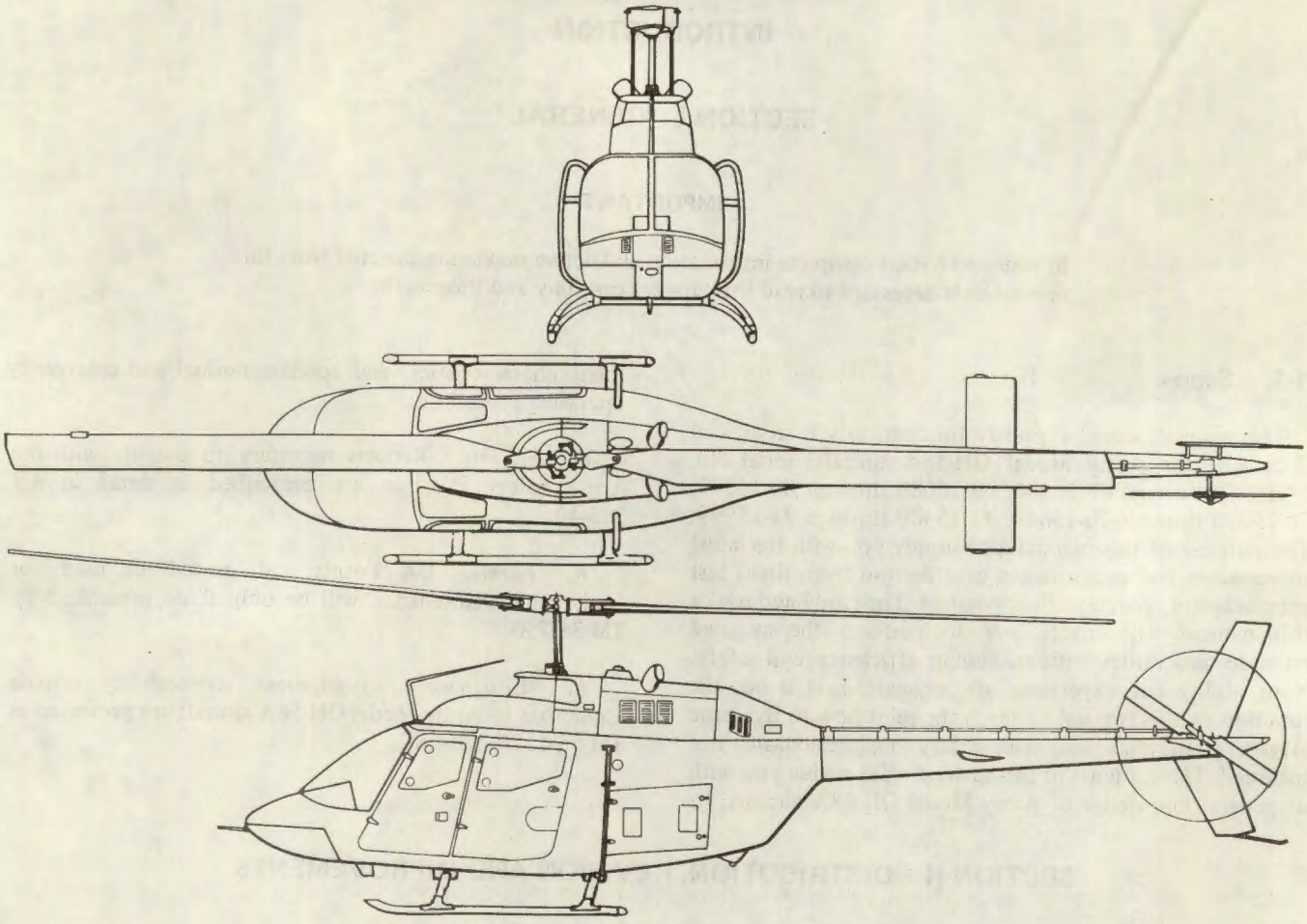
a. Distribution, revision, and mandatory requirements are accomplished in accordance with AR 310-1.

b. Authorization for issue is accomplished in accordance with AR 310-1.

1-3. Reporting of Improvements.

Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended changes to DA Publications) and forwarded direct to: Commanding General, U.S. Army Aviation Systems Command, ATTN: AMSAV-R-M P.O. Box 209, St. Louis, Mo. 63166.

OH-58A HELICOPTER



AV 053340

Figure 1-1. OH-58A helicopter

CHAPTER 2

DESCRIPTION

SECTION I GENERAL

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. 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

2-2. General Configuration And Arrangement.

The OH-58A helicopter, is a single engine, observation type helicopter designed for landing and take off from prepared or unprepared surfaces. The fuselage consists of the forward section, intermediate or transition section and the aft or tail boom section. The forward section provides the cabin and fuel cell enclosure as well as pylon support. Entrance to the cabin is provided by two doors on each side. The pilot's station is located on the right and the copilot/observer's station is located on the left side of the helicopter. The area aft of the pilot and copilot may be used as a cargo/passenger compartment and provides support for the XM27E1 armament system. The intermediate section supports the engine and includes the equipment and electronic compartment. The tail boom supports the horizontal stabilizer, vertical stabilizer, and tail rotor. The basic structure of the fuselage forward section consists of a lower-curved honeycomb sandwich panel and an upper longitudinal aluminum beam. The core of the sandwich structure is aluminum alloy throughout. The faces are aluminum alloy except in the fuel cell region, where they are fiberglass. The aluminum alloy sandwich panel is capable of withstanding the specified design cargo loadings, while the fiberglass sandwich supports the fuel cell pressures. The rotor, transmission and engine are supported by the upper longitudinal beam. The upper and lower structures are interconnected by three fuselage bulkheads and a centerpost to form an integrated structure. The most forward and aft bulkheads act as carry-through structure for the skid landing gear crosstubes. The tail boom is a full monocoque structure with aluminum skin and aluminum substructure. The missions for which the OH-58A helicopters are to be employed are visual observation, target acquisition, armed reconnaissance and command and control. In the armed configuration, the helicopter is used to provide ground forces at the lowest practicable echelon with an organic capability for armed reconnaissance, observation and screening observations where high mobility is required. The helicopter is readily adaptable to utility tasks at the combat company level without the use of special kits or special arrangements. Additionally, the helicopter is organic to division, brigade, battalion or equivalent level and is capable of continuous daily operation in forward areas with maximum availability to the tactical commander.

2-3. Passive Defense.

The armor protection is a combination of ceramic and fiberglass composite with a small amount of dual hardness steel. The armor protection is removable.

2-4. Crew Protection.

Armor protection is furnished for the pilot and copilot and consists of panels on seat bottom, seat back and outboard side of each seat.

2-5. Component Protection.

Armor protection is furnished for the compressor section of the engine and consists of a panel on each side of the engine. The fuel lines, and oil cell are self sealing. The fuel cell is 50% self sealing.

2-6. Crew Configuration.

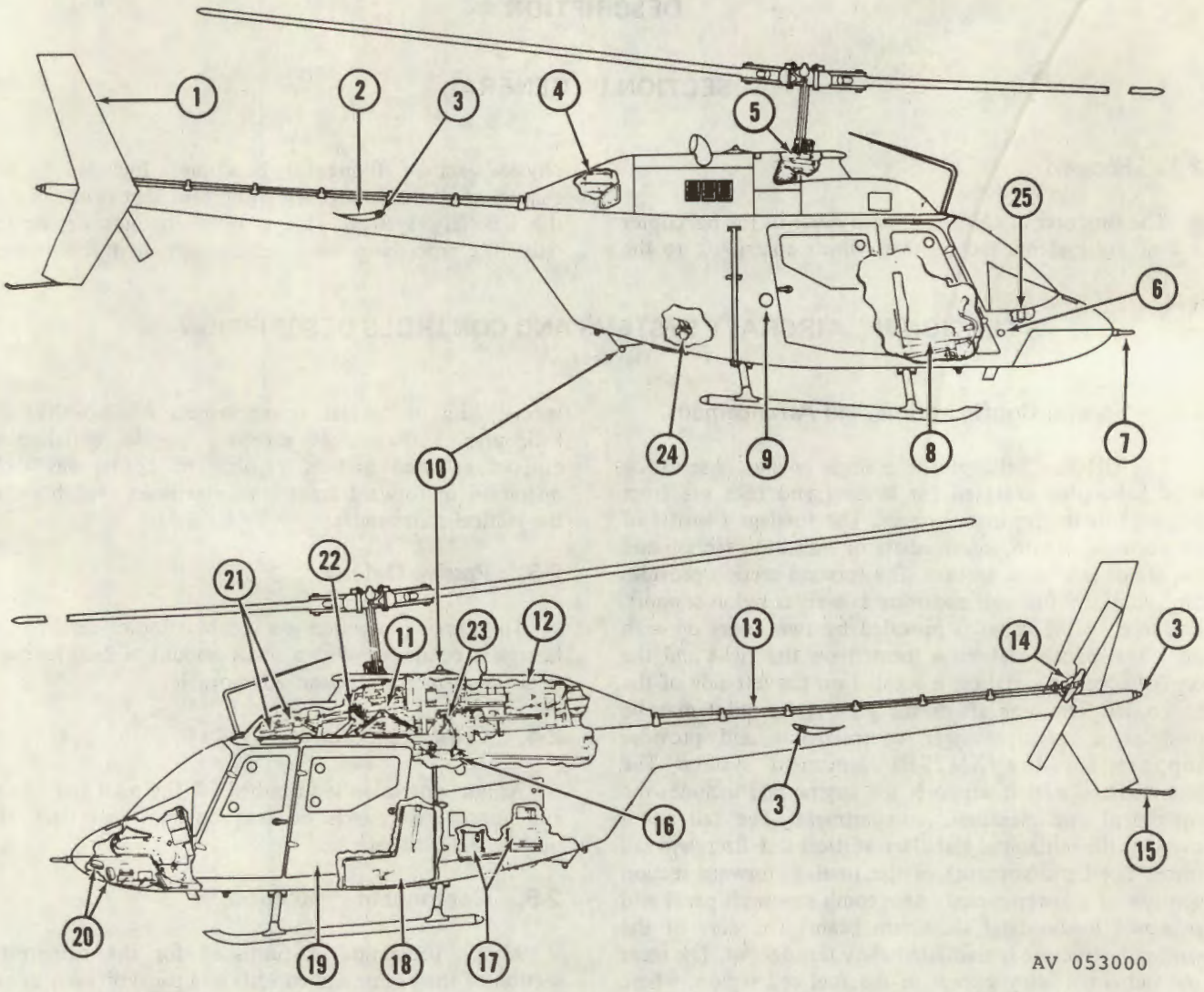
The crew consists of the pilot alone or pilot and copilot, or pilot and gunner.

2-7. 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.

2-8. Principal Dimensions - Maximum.

Principal dimensions of the helicopter areas are specified in figure 2-3.



1. Vertical Fin
2. Horizontal Stabilizer
3. Navigation Lights
4. Oil Tank Filler
5. Swashplate
6. Static Port
7. Pitot Tube
8. Pilot's Station
9. Fuel Tank Filler
10. Anti-Collision Lights
11. Transmission Assembly
12. Engine
13. Tail Rotor Drive Shaft
14. Tail Rotor Gearbox
15. Tail Skid
16. Bleed Air Heater
17. Battery and Avionics
18. Fuel Cell
19. Passenger Station
20. Landing Lights
21. Cyclic and Collective Servo Actuators
22. Hydraulic Pump and Reservoir
23. Freewheeling Unit
24. APU Plug
25. Standby Compass

Figure 2-1. General arrangement

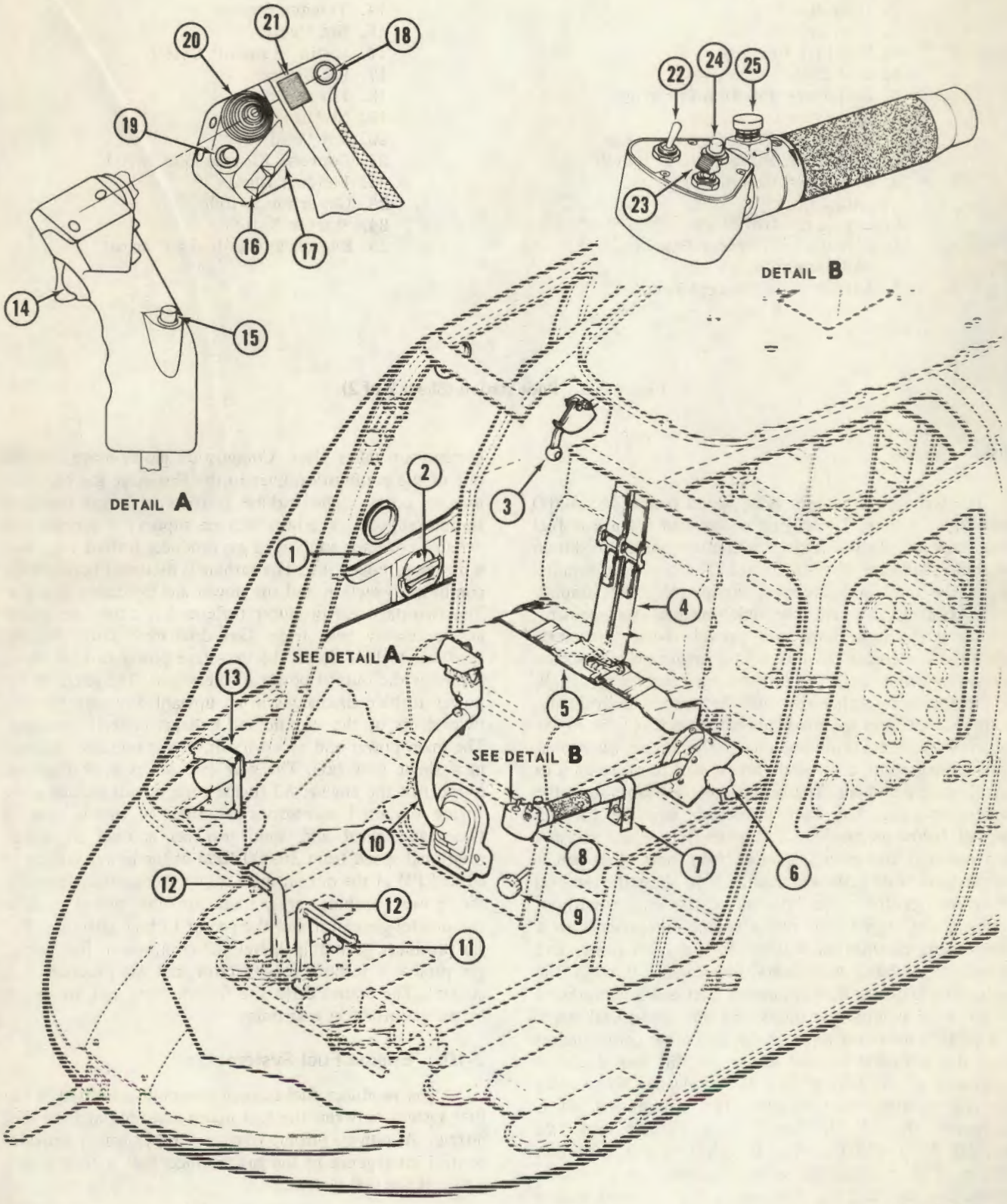


Figure 2-2. Pilot station (Sheet 1 of 2)

1. Pilot's Entrance Door
2. Door Handle
3. Fuel Shutoff Valve
4. Shoulder Harness
5. Seat Belt
6. Collective Friction Control Adjustment
7. Collective Pitch Control Strap
8. Collective Pitch Control Handle
9. Cyclic Friction Control Adjustment
10. Cyclic Control Stick
11. Directional Control Pedals Adjustment
12. Anti-Torque Control Pedals
13. Magnetic Compass
14. Trigger Switch
15. Not Used
16. Radio Transmit Switch
17. ICS Switch
18. Force Trim
19. Not Used
20. Not Used
21. Depress Elevate Gun Switch
22. Landing Lights
23. Governor Switch
24. Starter Switch
25. Engine Idle Release Control

Figure 2-2. Pilot station (Sheet 2 of 2)

2-9. Engine.

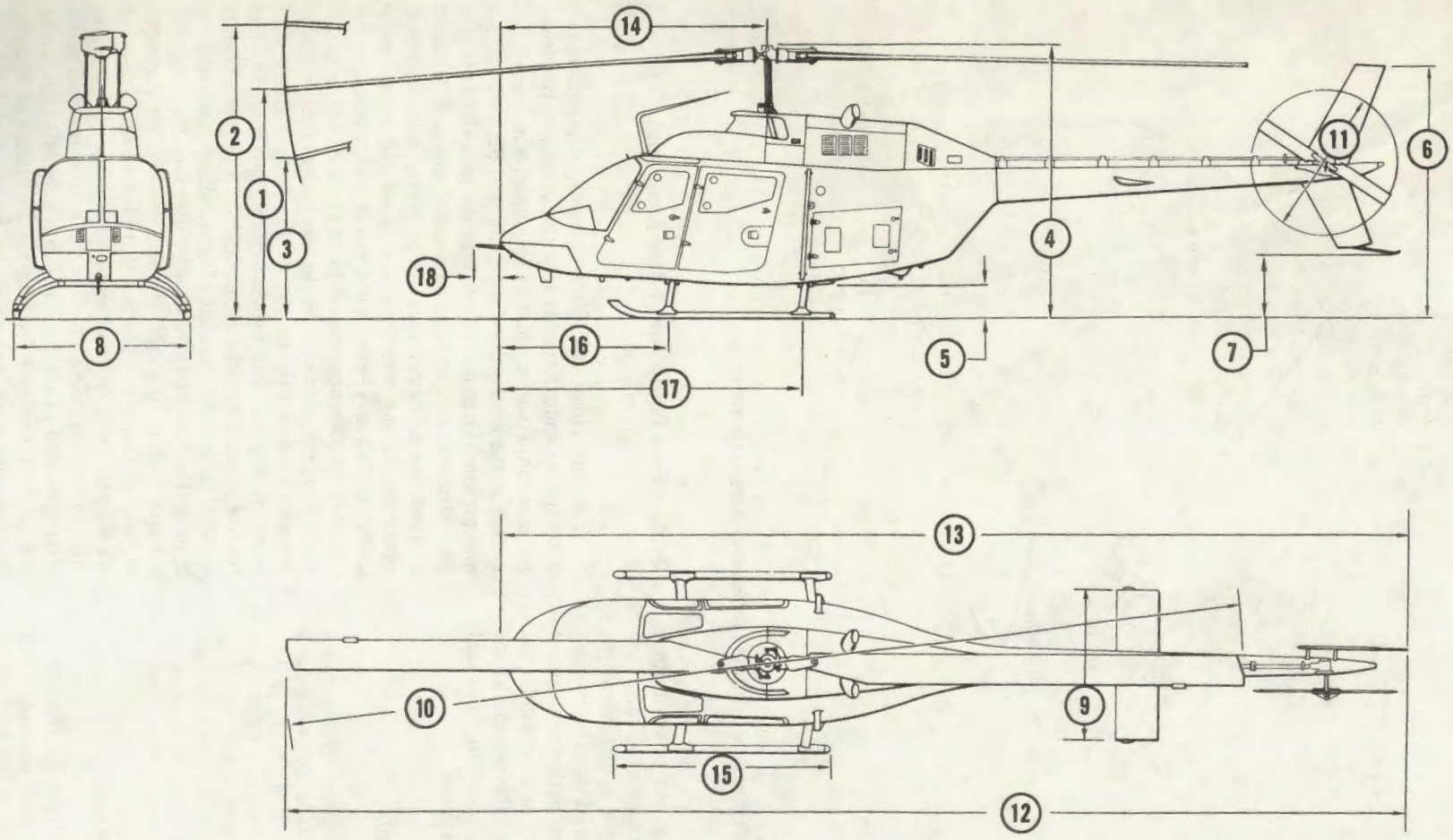
The OH-58A helicopter is equipped with a T63-A-700 gas turbine engine. The engine is designed for a low fuel consumption, light weight, minimum size, maximum reliability and ease of maintenance. The engine is installed aft of the mast and passenger compartment to simplify drive system, improve the inlet-exhaust arrangement, reduce cabin noise level and provide better structural integrity. The engine cowl aft of the engine air inlet screen is removable as a single unit or the hinged section the length of the engine on either side may be opened individually. Louvered openings are provided on both sides of the engine for cooling. The aft fairing covers the engine oil cooler, provides tail rotor drive shaft access and provides an area for oil cooler exit air. The center cowl section houses the engine air inlet, the inlet bellmouth and the forward firewall. Below the engine is a titanium floor which acts as a drip pan and also gives insulation from heat. This pan is curved to provide sufficient clearance to allow the removal of accessories from the bottom of the engine without removing the engine. The major engine components are a compressor, combustion section, turbine, and power and accessory gearbox. Air enters the engine through the particle separator to the compressor inlet and is compressed by six axial compressor stages and one centrifugal stage. The particle separator removes dirt and other contaminates from the incoming air and ejects the dirt out ducts on either side of the fairing. This allows cleaned air to enter the engine compressor section. The compressed air is discharged through the scroll type diffuser into two external ducts which convey the air to the combustion section. The combustion section consists of the outer combustion case and the combustion liner. A spark igniter and a fuel nozzle are mounted in the aft end of the outer combustion case. Air enters the single combustion liner at the aft end, through holes in the liner dome and skin. The air is mixed with fuel sprayed from the fuel nozzle and combustion takes place. Combustion gasses move forward out of the combustion liner to the first-stage gas producer turbine nozzle. The turbine consists of a gas producer turbine support, a power turbine support, a turbine and exhaust collector support, a gas producer turbine rotor and a power turbine rotor. The turbine is mounted between the combustion section and the power and accessory gearbox. The two-stage gas producer turbine drives the compressor and accessory gear train. Gas discharged from the gas producer turbine drives the two-stage power turbine which furnishes the output power of the engine. The gas from the power turbine discharges in an upward direction through twin ducts in the turbine and exhaust collector support. The main power and accessory drive gear train are enclosed in a single gear case. The gear case serves as a structural support of the engine. All engine components including the engine mounted accessories are attached to the case. A two-stage helical and spur gear set is used to reduce rotational speed from 36,000 RPM at the power turbine to 6180 RPM at the output drive spline. Accessories driven by the power turbine gear train are the power turbine tachometer-generator and the power turbine governor. The gas producer gear train drives the compressor, fuel pump, gas producer tachometer-generator and gas producer fuel control. The starter drive and freewheeling unit are driven by the gas producer gear train.

2-10. Engine Fuel System.

A gas producer fuel control assembly is located in the fuel system between the fuel pump assembly and the fuel nozzle. A power turbine fuel governor, which provides control intelligence to the gas producer fuel control, is also a part of the fuel system.

2-11. Fuel System Control.

The system controls engine power output by controlling the gas producer speed. Gas producer speed



HEIGHT

1. Forward Tip ofMain Rotor (Static Position) to Ground with Droop . . . . . 9 ft. 6.0 in.
2. Forward Tip of Main Rotor to Ground (Tiedown) . . . . . 12 ft. 0.0 in.
3. Forward Tip of Main Rotor to Ground (Forward Down) . . . . . 6 ft. 8.0 in.
4. Ground to Top of Main Rotor Reservoirs . . . . . 9 ft. 7.0 in.
5. Bottom of Cabin* . . . . . 13.0 in.
6. Top of Vertical Stabilizer . . . . . 8 ft. 1.5 in.
7. Tail Skid To Ground . . . . . 1 ft. 4.4 in.

WIDTH

8. Skid Gear . . . . . 6 ft. 5.4 in.
9. Horizontal Stabilizer . . . . 6 ft. 5.2 in.

* Check antennas that may protrude lower.

DIAMETERS

10. Main Rotor . . . . . 35 ft. 4.0 in.
11. Tail Rotor . . . . . 5 ft. 2.0 in.

LENGTH

12. Overall (Main Rotor Fore and Aft) to Aft end of Tail Skid . . . . . 40 ft. 11.8 in.
13. Nose of Cabin to Aft end of Tail Skid . . . . . 32 ft. 2.0 in.
14. Nose of Cabin to Center Line of Main Rotor . . . . . 8 ft. 10.1 in.
15. Skid Gear . . . . . 8 ft. 1.3 in.
16. Nose of Cabin to Center Line of Forward Cross Tube . . . . . 6 ft. 0.0 in.
17. Nose of Cabin to Center Line of Aft Cross Tube . . . . . 10 ft. 9.0 in.
18. Pitot Tube . . . . . 6.8 in.

Figure 2-3. Principal dimensions

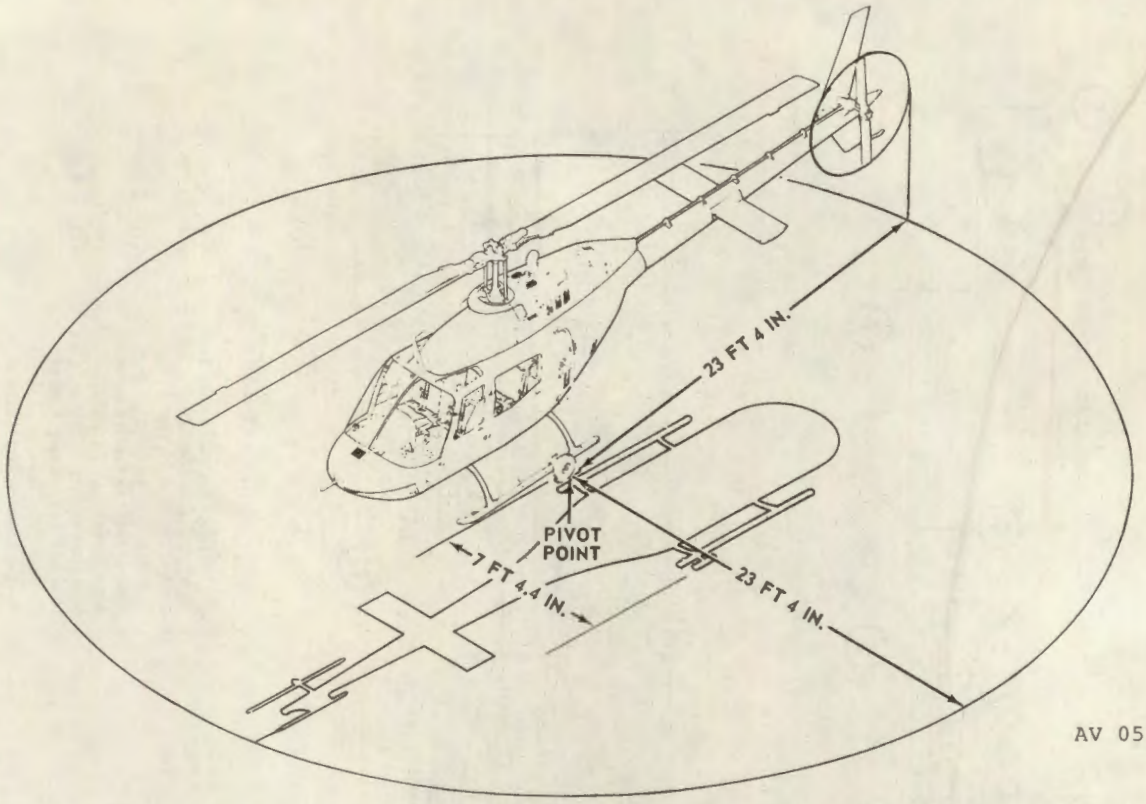


Figure 2-4. Turning radius and ground clearance

levels are established by the action of the power turbine fuel governor which senses power turbine speed. The power turbine (load) speed is selected by the operator and the power required to maintain this speed is automatically maintained by power turbine governor action on metered fuel flow. The power turbine governor lever schedules the power turbine governor requirements. The power turbine governor schedules the gas producer speed to a changed power output to maintain output shaft speed.

2-12. Gas Producer Fuel Control.

The gas producer fuel control has a bypass valve, metering valve, acceleration bellows, governing and enrichment bellows, manually operated cutoff valve, maximum pressure relief valve, and a torque tube seal and lever assembly. A maximum pressure relief valve is incorporated to protect the system from excessive fuel pressure. A heating system manually controlled to prevent icing.

2-13. Power Turbine Fuel Governor.

The power turbine speed is scheduled by the power turbine governor lever and the power turbine speed scheduling cam. The cam sets a governor spring load which opposes a speed-weight output.

2-14. Fuel Pump And Filter Assembly.

The fuel pump and filter assembly incorporates two gear-type pumping elements arranged in tandem and driven by a common drive shaft. Fuel enters the engine fuel system at the inlet port of the pump and passes through a low pressure filter before entering the gear elements. The gear elements are arranged in parallel and each pumping element has sufficient capacity to permit take-off power operation in the event of failure of the other pump element. Two discharge check valves are provided in the assembly to prevent reverse flow in event of failure of one gear pumping element. A bypass valve in the pump assembly allows fuel to bypass the filter element if it becomes clogged. The bypass return flow from the fuel control is passed back to the inlet of the gear elements through a pressure regulating valve which maintains the bypass flow pressure above inlet pressure. By means of passages leading to auxiliary filling ports on the periphery of the gear elements, a portion of the bypass flow is used to fill the gear teeth when vapor-liquid conditions exist at the inlet to the gear elements. The 10 micron nominal paper filter is located inside the fuel pump assembly upstream of the gear elements. It is retained by a threaded cover (distinguished by a hex) which can be found on the lower side of the pump assembly.

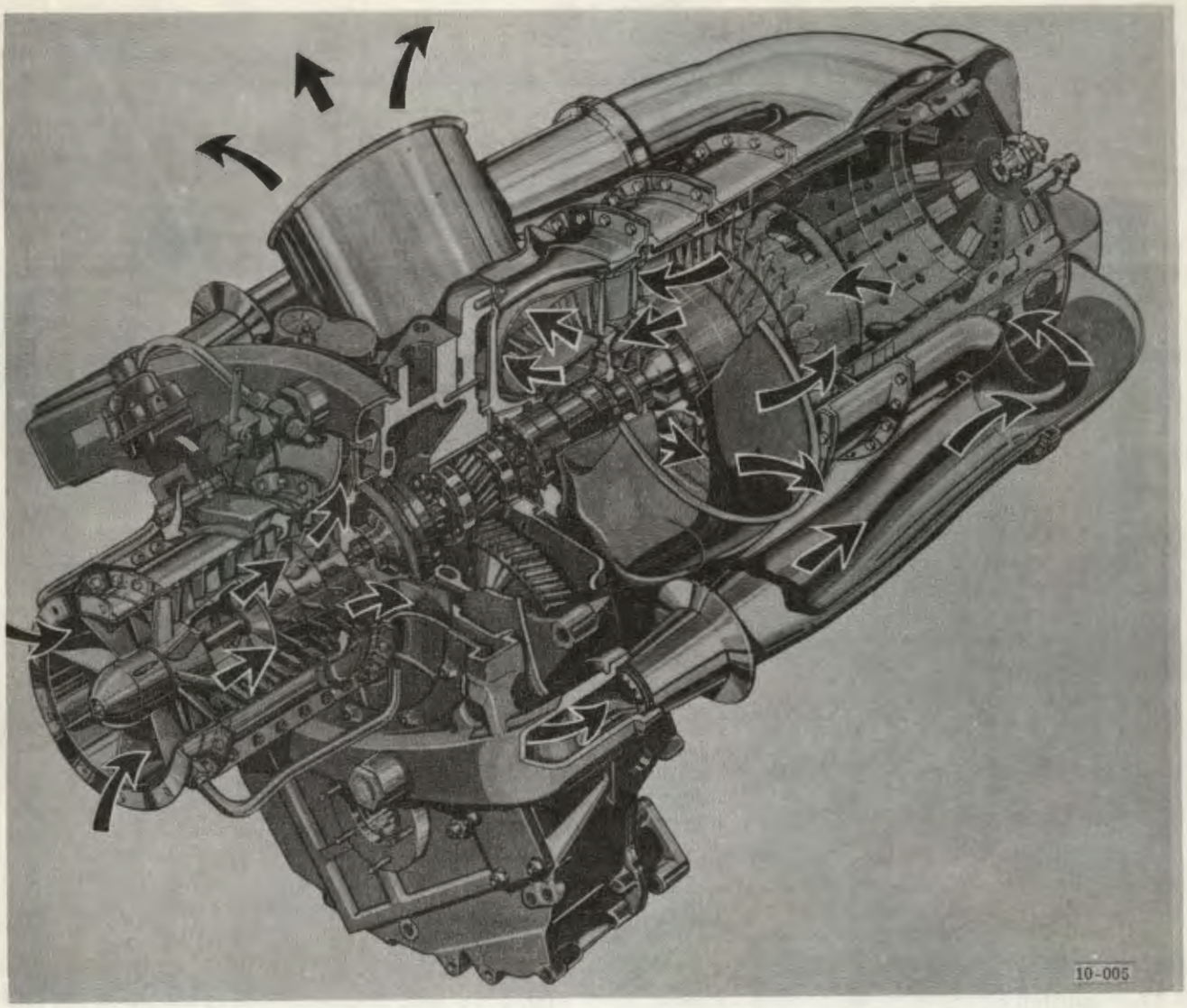


Figure 2-5. Engine airflow

2-15. Fuel Nozzle.

The fuel nozzle is a single-entry dual-orifice type unit which contains an integral valve for dividing primary and secondary flow. This same valve acts as a fuel shutoff valve when the fuel manifold pressure falls below a predetermined pressure, thus keeping fuel out of the combustion chamber at shut-down.

2-16. Lubrication System.

The lubrication system is a dry sump type with an external reservoir and heat exchanger. A gear type pressure and scavenge pump assembly is mounted within the power and accessory gearbox. The oil filter, filter bypass valve, and pressure regulating valve are in a unit which is located in the upper right-hand side of the power and accessory gearbox housing and are accessible from the top of the engine. The oil tank is mounted aft of the engine rear firewall on top of the intermediate cabin section and has a capacity of approximately 11.2 pints. A check valve is located between the housing and the filter unit. Probe type magnetic chip detectors are installed at the bottom of the power accessory gearbox, and at the engine oil outlet connection. All engine oil system lines and connections are internal with the exception of pressure and scavenge lines to the front compressor support, the gas producer turbine support and the power turbine support. The oil cooler blower is an integral part of the tail rotor drive and is located aft of the freewheeling unit. Air discharges from blower upward through oil cooler and exits overboard.

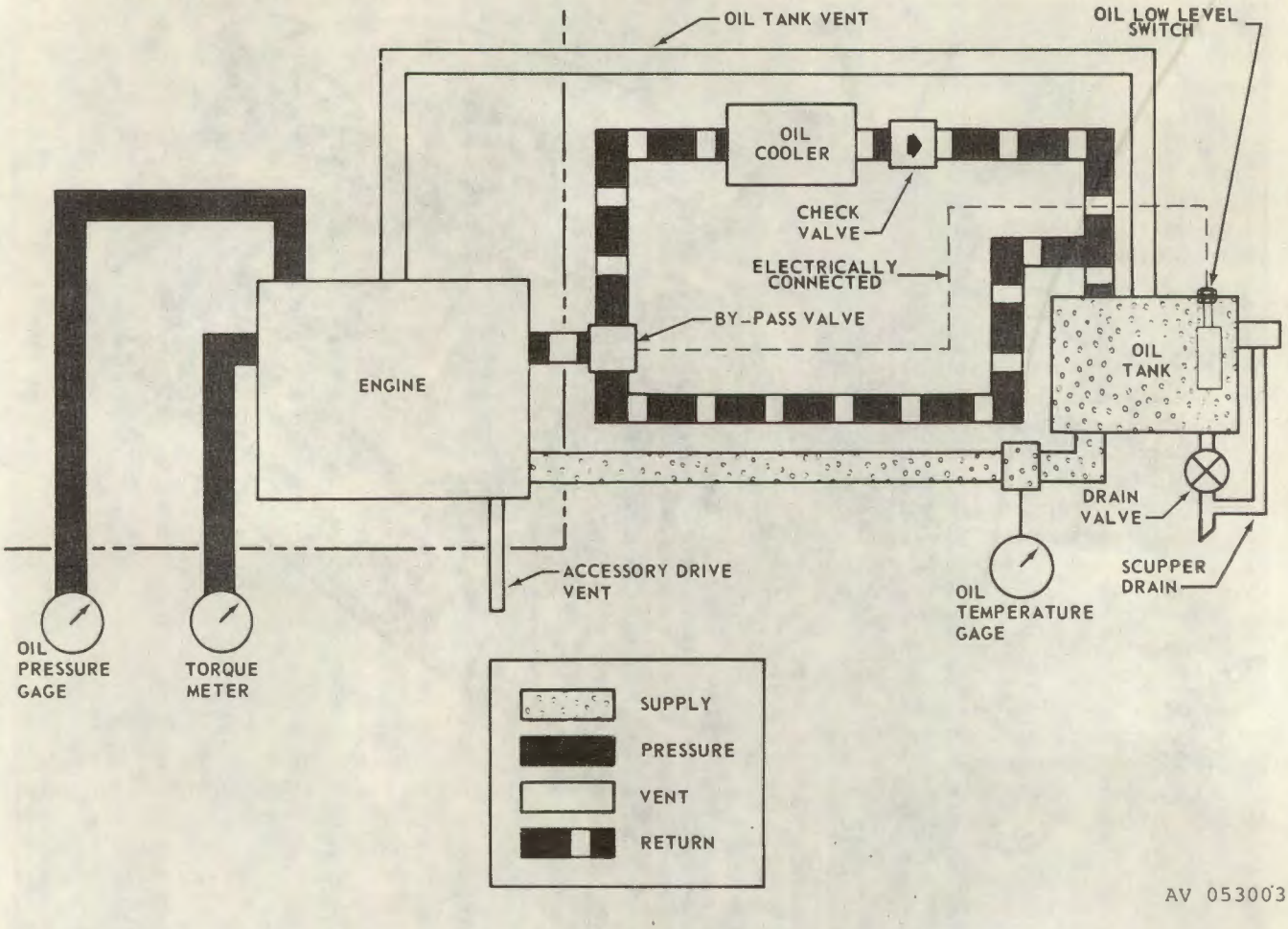


Figure 2-6. Oil system schematic

2-17. Ignition System.

The engine ignition system consists of a low tension capacitor discharge ignition exciter, a spark igniter lead, and a shunted surface gap spark igniter. The system derives its input power from the 28-volt DC helicopter electrical system.

2-18. Temperature Measurement System.

The temperature measurement system consists of four chromel-alumel single junction thermocouples in the gas producer turbine outlet and an associated integral harness. The voltages of the four thermocouples are electrically averaged in the assembly and delivered by the assembly lead to the airframe terminal block for attachment to the airframe temperature indicating system.

2-19. Anti-Icing System.

The compressor inlet guide vanes and front bearing support hub are the only engine components with anti-icing provisions. Anti-icing is provided by the use of compressor discharge.

2-20. Compressor Bleed Air System.

The compressor bleed air system permits rapid engine response. The system consists of a compressor discharge pressure sensing port on the scroll, tubing from the sensing port to the bleed valve, a compressor bleed control valve, and a bleed air manifold on the compressor case. Elongated slots between every other vane in the compressor fifth stage bleeds compressor air into a manifold which is an integral part of the compressor case. The manifold forms the mounting flange for the compressor bleed control valve when the compressor case halves are assembled. Compressor discharge air pressure sensing for bleed control valve operation is obtained at a sensing port on the compressor scroll. The bleed control valve is normally open; it is closed by compressor discharge pressure.

2-21. Particle Separator.

The self cleaning particle separator consists of individual filter elements using centrifugal force to clean

incoming air. One filter element consists of a vortex tube, vortex generators and outlet tube. The dirt laden air enters the vortex tube and is swirled by the vortex generators. Dirt particles are centrifuged to the outer wall of the vortex tube. Seven to ten percent of the incoming air is used to carry dirt through the annulus between the vortex and outlet tubes into a scavenge chamber. The dirt in the scavenge chamber is then purged overboard through six bleed air holes (three on each side of the aircraft) using bleed air from engine.

2-22. Droop Compensator.

A droop compensator is installed in the governor control linkage to maintain a constant N2 speed, selected by the pilot, as power is changed. Governor droop should not be confused with RPM variations (transient droop) due to the acceleration-deceleration limiters in the fuel control, or droop caused by attempting to use more than available power. Rapid movements of the collective stick may require power changes at a rate in excess of the capabilities of the engine.

2-23. Power Control (Throttle).

The power control (throttle) is a simple twist grip type on the collective stick. The throttle is rotated to the left to increase or to the right to decrease power.

2-24. Governor RPM Switch.

The GOV INCR/DECR switch is mounted in the pitch control lever. The switch is a three-position momentary type and is held in the INCR position (FWD) to increase the power turbine (N2) speed or DECR position (AFT) to decrease the power turbine (N2) speed. Regulated power turbine speed may be adjusted in flight through the operating range by movement of the switch as required. Electrical power for circuit operation is supplied by the 28-volt DC electrical system.

2-25. Engine Idle Release Control.

The engine idle release is a spring loaded plunger mounted in the switch box of the pilot's collective pitch lever. The plunger prevents the pilot from accidentally retarding the power control beyond flight idle position. This acts as a safety feature by preventing inadvertent engine shutdown. The plunger need not be depressed when performing an engine start or runup; however, the plunger must be depressed when accomplishing an engine shutdown or when it is desired to retard the power control below the flight idle position.

2-26. Engine Out Warning.

An RPM sensor is connected to the gas producer tachometer. Power is supplied from the CAUTION PNL circuit breaker and connections are made to the MASTER CAUTION light and ENGINE OUT warning light, and to a tone generator which produces a tone in the pilot's headset. The warning system is activated until N1 reaches 55 ±3% and is deactivated when this gas producer percent is reached.

2-27. Audio Warning Switch.

An engine out warning switch enables the pilot to prevent audio warning in the headset by lowering the collective pitch to the full down position.

2-28. Fuel Filter Caution Light.

When the fuel filter is blocked and is about to be bypassed, the FUEL FILTER caution light in the caution panel is illuminated.

2-29. Engine Chip Detector.

Engine chip detectors are located in the accessory gear case; one at the lowest part and one on the forward right side by the oil pump. They indicate evidence of ferrous metal particles in the engine lubricating system.

2-30. Torquemeter.

A torquemeter indicator is located on the instrument panel and is connected to a transmitter which is part of the engine oil system. The torque indicating system converts the pressure sensed at the torquemeter pressure sensing port, on the front side of the accessory gearbox, into an indication, in psi, of torque output.

2-31. Turbine Outlet Temperature Gage.

An equal resistance branch thermocouple harness assembly with four integral probes is used to sense the temperature of the gases on the outlet side of the gas producer turbine rotor. Each thermocouple probe consists of a single element, chromel-alumel assembly with a bare wire junction. A DC voltage which is directly proportional to the gas temperature it senses, is generated by each thermocouple. The thermocouple and thermocouple harness provide an average of the four voltages representative of the turbine outlet temperature (T.O.T.) and this is the temperature indication on the TOT gage on the instrument panel.

2-32. Gas Producer Tachometer.

The gas producer tachometer generator generates an AC voltage with a frequency that is a function of gas producer turbine rotor N1 RPM. The output of this tachometer generator is delivered to the gas producer tachometer indicator which indicates the frequency in terms of percent RPM of gas producer turbine speed. The power for the gas producer tachometer is engine generated and does not depend on the helicopter electrical system.

2-33. Oil Pressure Gage.

The oil pressure indicator is a direct-reading, wet-line system. Pressure from the pressure side of the oil pump is indicated in psi.

2-34. Oil Temperature Gage.

The engine oil temperature gage is connected to an electrical resistance type thermocouple and indicates the temperature of the oil at the oil tank outlet.

2-35. Engine Oil Bypass Caution Light.

Oil at a low level will cause the ENG OIL BYPASS caution light to illuminate.

2-36. Helicopter Fuel Supply System.

The helicopter fuel system incorporates a single bladder type, self-sealing cell with a total capacity of 73 U.S. gallons. The cell is located below and aft of the passenger seat. In addition, the fuel lines are self-sealing. Mounted in the bottom of the cell is one boost pump, one fuel quantity transmitter, one low fuel transmitter, and one fuel sump drain and defuel valve. Installed in top of the cell is, one fuel quantity transmitter, a vent line, boost pump pressure switch, and governor return line fitting. A fuel filler cap is located on the right side just aft of the passenger door. The fuel shut-off valve is mounted on the right side of aircraft above the fuel cell cavity and is manually operated by the fuel valve handle on the overhead console. A connector for an auxiliary fuel cell is located on the forward side of the fuel cell beneath the seat. See figure 2-7.

2-37. Fuel Quantity Gage.

The fuel quantity gage is a transistorized electrical receiver which indicates the quantity of fuel in pounds from 0 to 600.

NOTE

Erratic readings on fuel quantity indicator may occur when keying VHF radio or operating force trim interrupter switch.

2-38. Fuel Boost Caution Light.

The FUEL BOOST caution light is located on the caution panel and illuminates if the fuel boost pump is inoperative.

NOTE

When the helicopter fuel boost pump is inoperative, unfiltered fuel will enter the engine through the fuel return line. Prolonged operation should be avoided, land as soon as practical.

2-39. Transmission System.

Lubrication is provided by a system which includes pump, relief valves, filter, spray jets, temperature bulb, and an oil cooler. The pump is a constant volume type driven by the accessory gear. An oil level sight gage is located on the right side of the transmission. A breather type filler cap and a magnetic drain plug are incorporated. The transmission also furnishes lubrication for the freewheeling unit. A pressure line and a return oil line pass through the forward bulkhead to connect the transmission and freewheeling unit. A pressure switch and oil pressure transducer are provided on the oil pressure line. The switch is connected to the warning panel light on the instrument panels which illuminates to indicate a condition of pressure below 30 psi or above 80 psi.

2-40. Transmission Chip Detector.

There are three chip detectors located within the transmission lubricating system. Two electrical chip detectors are located on the base of the transmission and are wired to the XMSN CHIP DET caution light and the MASTER CAUTION light. One magnetic chip detector is located on the freewheeling unit and is not connected to the caution lighting system. All three are provided to give evidence of ferrous metal particles in the transmission lubrication system.

2-41. Tail Rotor Gearbox Chip Detector.

A magnetic chip detector is located in the lower section of the tail rotor gearbox and gives evidence of ferrous metal particles in the tail rotor gearbox. The chip detector is wired to the T/R CHIP DET caution light and the MASTER CAUTION light. The caution lights are activated when a sufficient amount of metal particles has been collected on the chip detector to close the circuit.

2-42. Electrical Supply Systems.

a. Direct Current Primary Power. The OH-58A helicopter is equipped with a 28-volt direct current dual bus (essential and non-essential) system supplied by a starter-generator and battery. Major components of the direct current power system include battery, starter generator, voltage regulator, relays, switches and circuit breakers. All circuits in the electrical system are single wire with common ground return. The negative terminals of the starter-generator and the battery are grounded to the helicopter structure. In the event of GEN failure, the non-essential bus is automatically deactivated. The BAT then supplies power to the essential bus load. The non-essential bus may be manually reactivated. In the event of engine failure, generator power will be lost.

(1) DC power control. The DC power is controlled by the BAT switch, GEN switch, non-essential bus switch and circuit breakers.

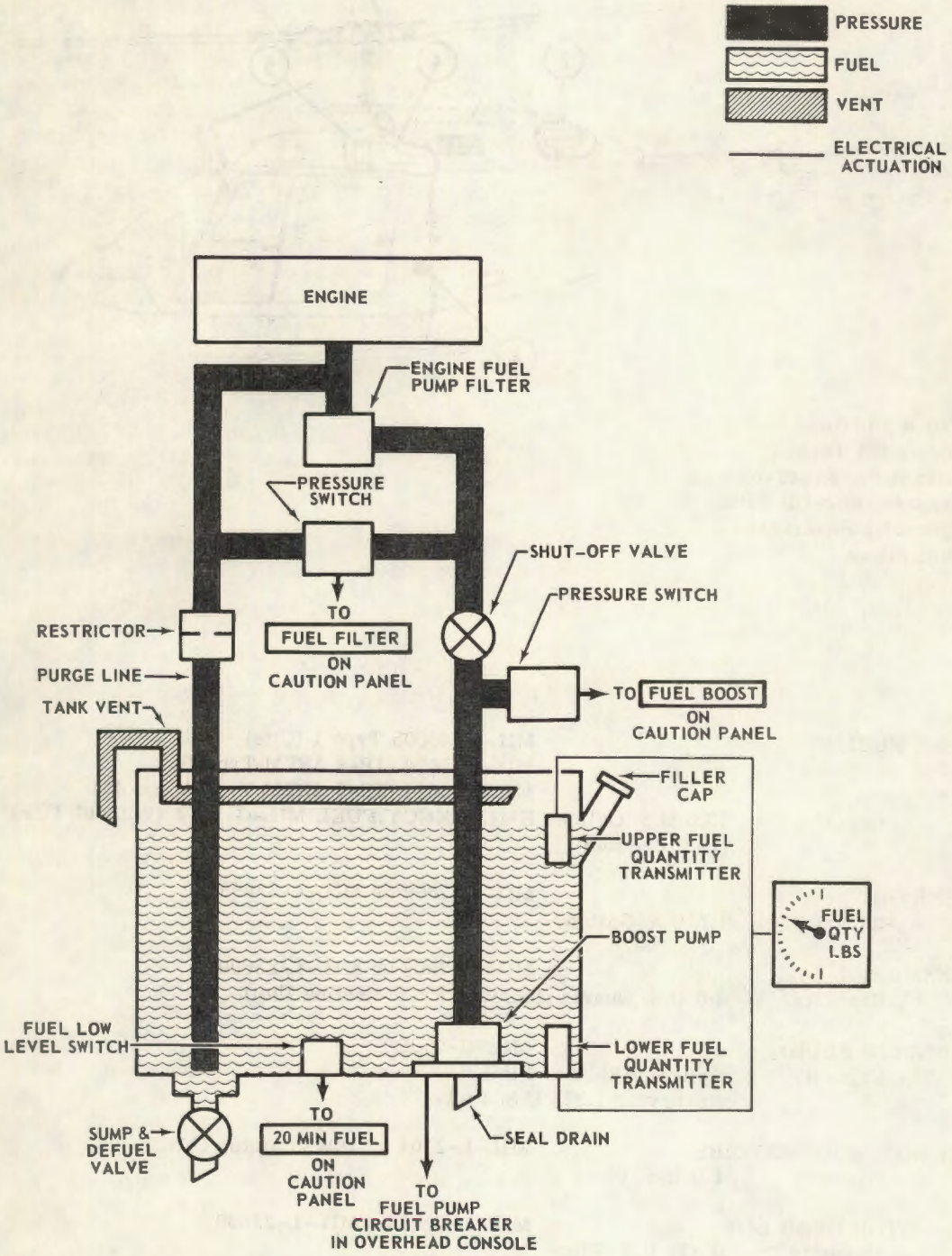


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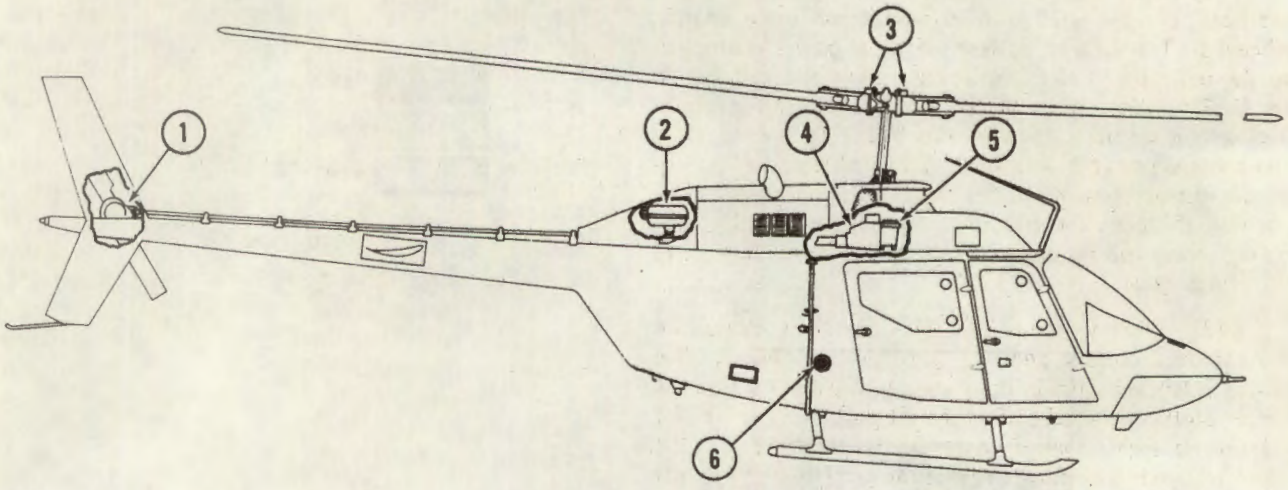
Figure 2-7. Fuel system schematic



1. Tail Rotor Gear Box
2. Engine Oil Tank
3. Main Rotor Reservoirs (4)
4. Transmission Oil Filler
5. Hydraulic Reservoir
6. Fuel Filler

ENGINE FUEL		MIL-F-46005 Type 1 (Cite) MIL-T-5624 (JP-4 ASTM Type B) MIL-T-5624 (JP-5 ASTM Type A and A1)
Capacity	73.0 U.S. Gallons (71.5 Useable)	EMERGENCY FUEL MIL-G-5572 (Without TCP)
ENGINE OIL		MIL-L-7808 or MIL-L-23699 *
Capacity	1.5 U.S. Gallons	
TRANSMISSION OIL		MIL-L-7808 or MIL-L-23699
Capacity	4.0 U.S. Quarts (Includes Freewheeling Unit)	
HYDRAULIC FLUID		MIL-H-5606
Capacity	System 2.25 U.S. Pints Reservoir 1.375 U.S. Pints	
MAIN ROTOR RESERVOIRS		MIL-L-2104 10W30 Motor Oil
Capacity	1.0 U.S. Pints	
TAIL ROTOR GEAR BOX		MIL-L-7808 or MIL-L-23699
Capacity	0.375 U.S. Pints	

*** Note**

When oil is mixed or changed from one type to other enter on DA Form 2408-13.

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Figure 2-8. Servicing diagram

(2) BAT switch. The BAT switch is located in the overhead console and is a two-position toggle switch, labeled BAT and OFF. Battery electrical power is supplied to the helicopter's electrical system when the switch is in the BAT position. When the switch is in the BAT position, it closes the circuit to the actuating coil of the battery relay and battery power is then being delivered from the battery to the primary bus. When the switch is placed in the OFF position it opens the circuit to the actuating coil of the battery relay and no power is delivered from the battery to the primary bus.

(3) GEN switch. The GEN switch is located on the overhead console and is a three position switch. This switch is labeled GEN in the forward position, OFF in the center position and RESET in the aft position. The RESET position is spring loaded to return to the OFF position when released; therefore, to reset the generator the switch must be held in the RESET position momentarily and then moved to the forward position.

(4) Inverter switch. The inverter switch is located in the overhead console and is a two-position toggle switch labeled INV and OFF. AC electrical power is provided to the electrical system when the switch is in the forward position. DC power to the inverter is supplied by the non-essential bus, therefore, to have AC power, electrical power must be available at the non-essential bus. When the switch is in the OFF position it opens the circuit to the inverter.

(5) Non-essential bus switch. The non-essential bus switch is located in the overhead console and is a two-position switch labeled NORM NON-ESS BUSS and MAN. When the switch is in the NORM position, power is supplied to the non-essential bus provided the generator is operating and charging. When the switch is in the MAN position, power is supplied to the non-essential bus regardless of generator operation. In all normal flight operations the switch should be in the NORM position.

NOTE

If any item on the non-essential bus is essential to the mission, the pilot may operate in MAN position.

(6) DC circuit breaker panel. The DC circuit breaker panel is located in the overhead console. Each individual circuit 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. The circuit is reactivated by pushing the circuit breaker button.

(7) DC system indicator. The ammeter is mounted in the instrument cluster on the instrument panel and indicates the ampere load being used. The circuit is protected by two circuit breakers in the aft electrical compartment.

b. Alternating Current Power. The OH-58A helicopter is equipped with a 65 volt-ampere solid state inverter powered from the non-essential 28-volt DC bus through a 5 ampere INV PWR circuit breaker and is manually controlled by an INV switch. The inverter delivers 115 volt AC 400 Hz to the 115 volt AC bus. A caution panel segment INST INVERTER will illuminate when AC power is lost.

(1) AC power control. The AC power is controlled by the INV switch and AC circuit breakers.

(2) AC circuit breakers. The AC circuit breakers are on the aft end of the overhead console. In the event of a circuit overload, the circuit breaker protecting that circuit will pop out. The circuit is reactivated by pushing in the circuit breaker button.

c. External power receptacle. During ground operations, external power may be connected to the electrical system through an external power receptacle located on the lower right side of the helicopter just aft of the rear landing gear cross tube. The GEN and BAT switches should be in the OFF position when external power is connected. The external power relay closes automatically and connects the ground unit to the main power direct current bus.

2-43. Hydraulic Power System.

The hydraulic system consists of a variable delivery pump and reservoir, servo actuators with irreversible valve circuits for cyclic and collective controls, a pressure line filter, a return line filter, and a solenoid shutoff valve. The pump is on the forward face of the transmission. The hydraulic system provides for fully powered flight controls being available during autorotative flight.

2-44. Hydraulic System Control.

A Hydraulic System ON-OFF switch (HYD BOOST) located on the lower right portion of the instrument panel and controls the activation and deactivation of the hydraulic system.

2-45. Rotor System.

The rotor system consists of the main rotor and anti-torque tail rotor system.

a. Main Rotor. The main rotor assembly is a two blade, semi-rigid, see-saw type rotor called an Underslung Feathering Axis hub. The blades are mounted in the hub assembly grips with blade retaining bolts which have hollow shanks for installation of weights to balance the hub and blade assembly. After balancing, the bolts must be kept with their respective rotor hub grips. Blade alignment is

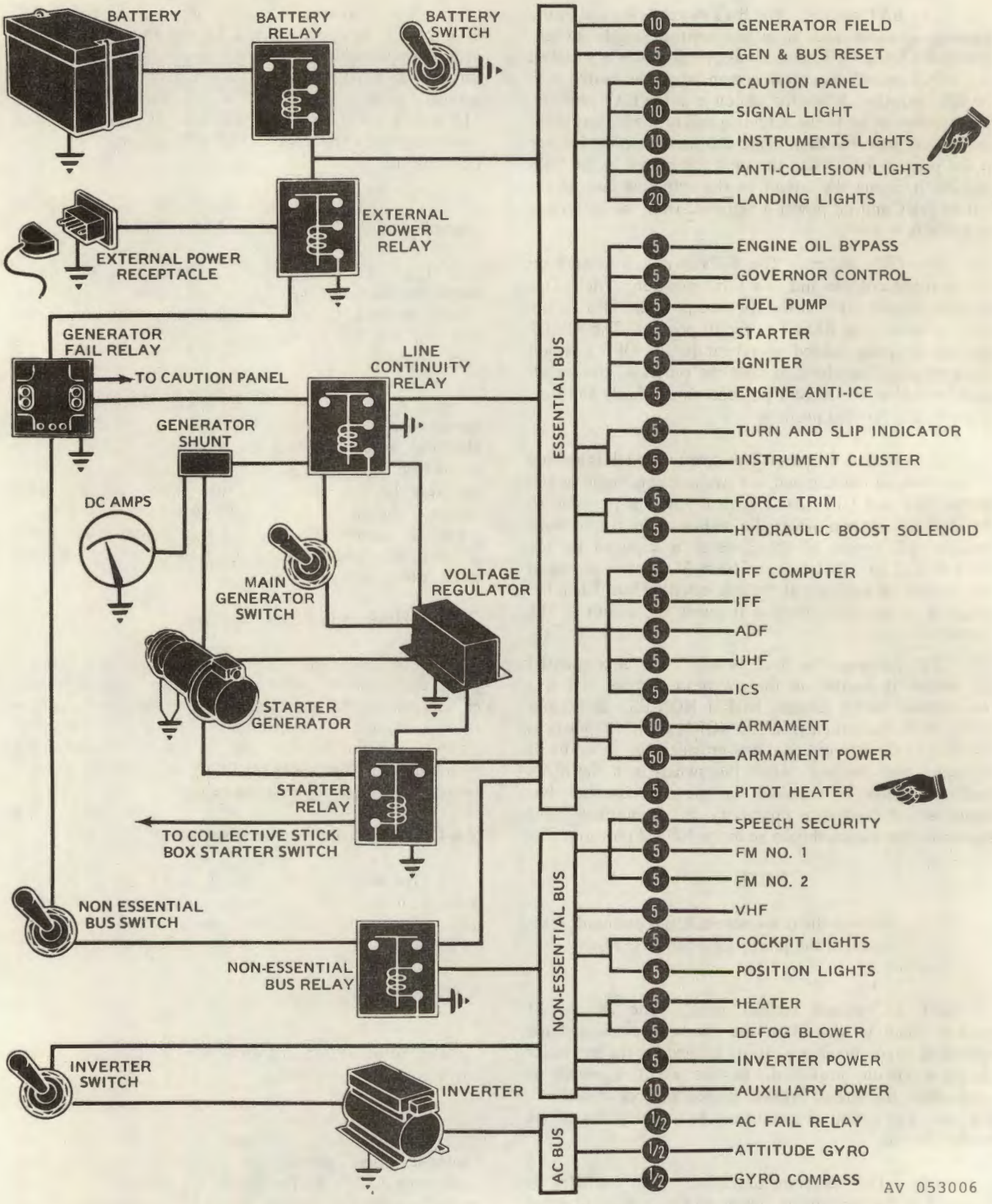

Figure 2-9. Electrical system schematic

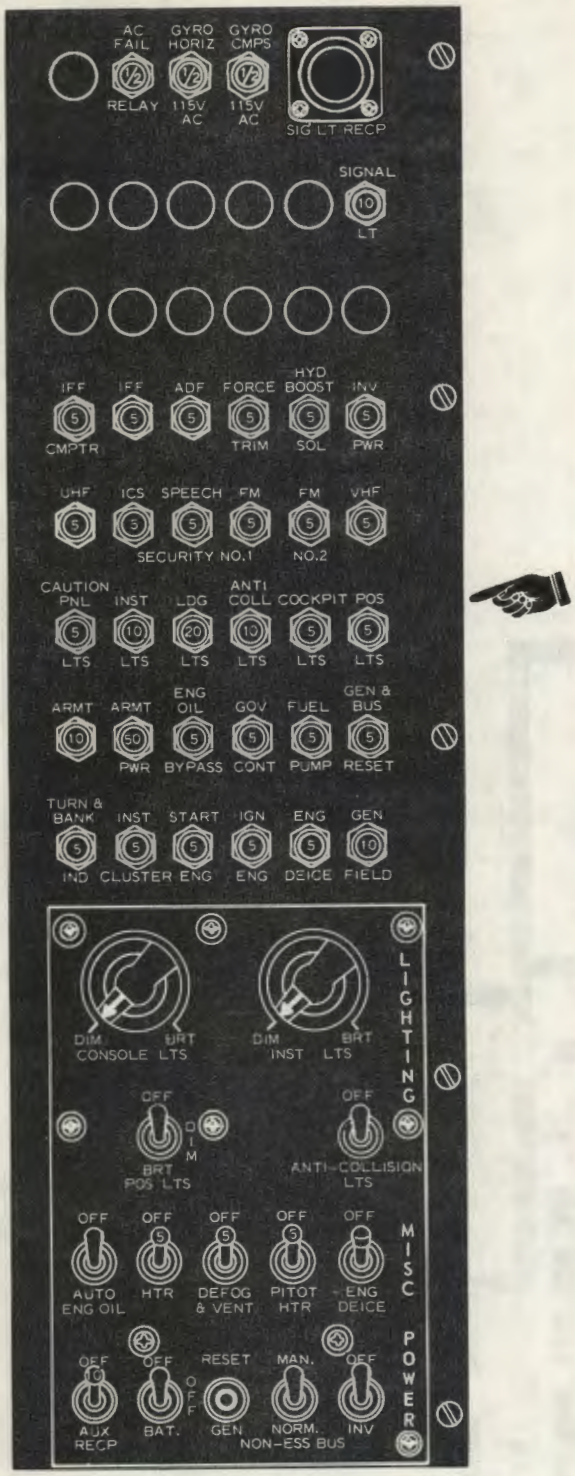

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Figure 2-10. Overhead console

accomplished by adjustment of blade latches which engage the root end of the blade. The blade grips are retained on the hub yoke by means of tension-torsion strap assemblies. Changes in blade pitch angle are made by turning the grips on the yoke journal; each grip has two pitch change alignment bearings. Oil reservoirs, with sight gages, are provided for pitch change bearings in the two grips and for the two pillow block bearings utilized with the flapping axis trunnion. The rotor blades are all metal, consisting of an extruded aluminum alloy nose block, aluminum alloy trailing edge and an aluminum honeycomb filler.

b. Rotor RPM Indicator. The rotor RPM indicator is part of the dual tachometer and is located on the instrument panel. The rotor RPM reading is indicated on the inner scale and the pointer needle is marked with an R. The indicator is powered by a tachometer generator mounted on and driven by the transmission and is independent of the helicopter electrical system.

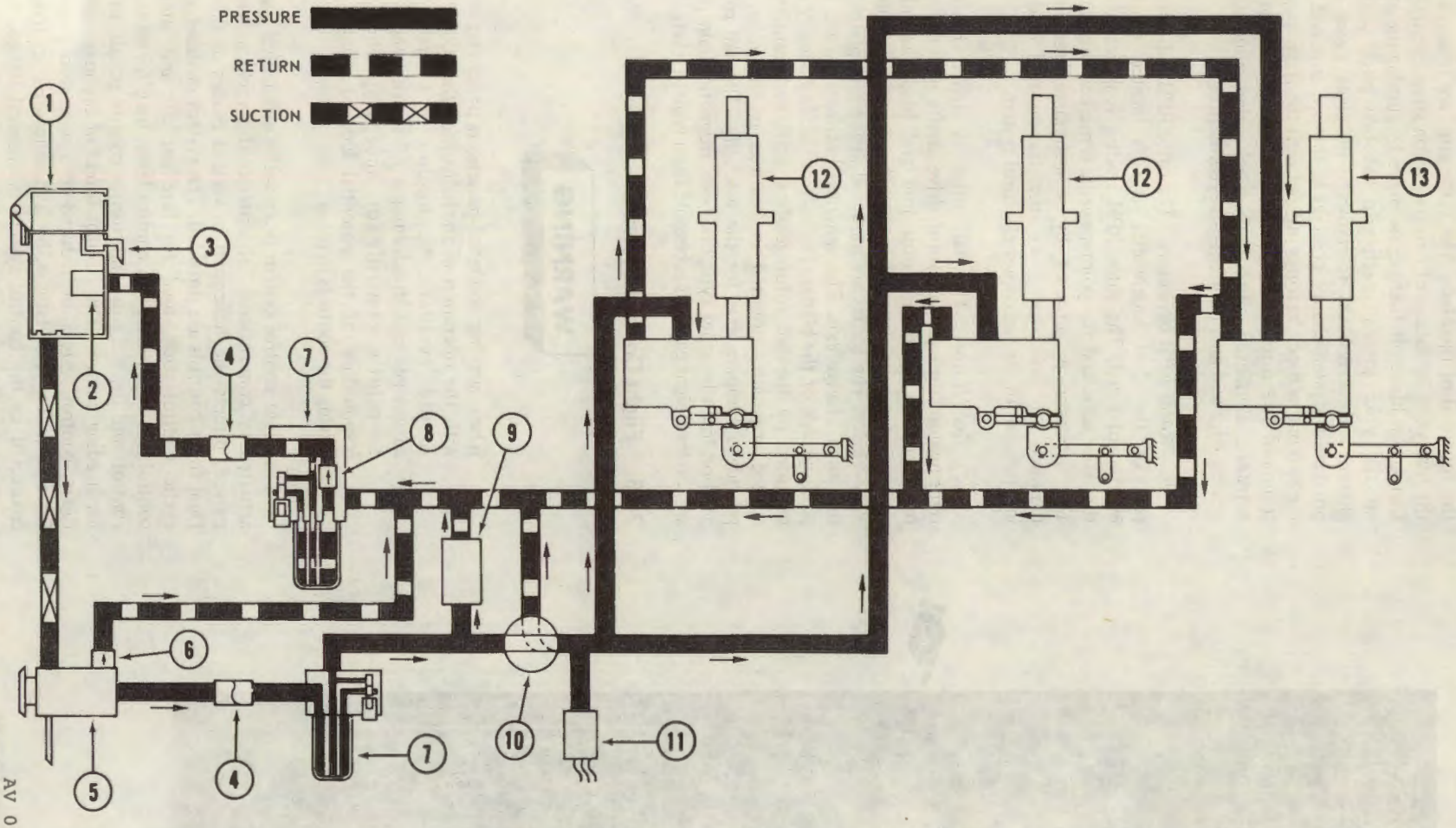
c. Tail Rotor. The tail rotor is driven by the transmission through tail rotor drive shafts and the tail rotor gearbox. The tail rotor hub and blade assembly consists of an aluminum alloy forged yoke and aluminum alloy blades. The blades are mounted in the grip plates on the pitch change axis. The spherical bearings provide for pitch change of the blades. The hub and blade assembly are mounted on the tail rotor gearbox shaft by means of a splined trunnion, mounted in bearings in the yoke, to provide a flapping axis for the assembly. The tail rotor gearbox has a breather type filler cap, magnetic drain plug and oil level sight gage, all accessible from ground level.

2-46. Flight Control System.

WARNING

When carrying non-rated passengers unfamiliar with the operation of the helicopter, the pilot should evaluate the mission as to the advantages and disadvantages of stowing the co-pilot's controls or accepting the responsiility of the potential hazzard when leaving the controls in place.

The flight control system is a positive mechanical type, actuated by conventional helicopter controls which, when moved, directs the helicopter in various modes of flight. Dual flight controls are provided. The system includes; the cyclic control stick, used for fore and aft and lateral control; the collective pitch control lever, used for vertical control; and the tail rotor anti-torque control pedals, used for heading control. The control forces of the main rotor flight, control system are reduced to a near zero pounds force to lessen pilot fatigue, by hydraulic servo cylinders connected to the control system mechanical linkage and powered by the transmission driven pump. Force trims



1. Reservoir
2. Baffle
3. Scupper Drain
4. Quick Disconnects
5. Pump
6. Check Valve
7. Filter
8. Filter By-Pass Valve
9. Relief Valve
10. Solenoid Valve
11. Pressure Switch
12. Servo Actuator, Cyclic
13. Servo Actuator, Collective

Figure 2-11. Hydraulic system schematic

(force gradients) connected to the cyclic controls are electrically operated mechanical units used to induce artificial control feeling into the cyclic controls and to prevent the cyclic stick moving from a pre-set position.

a. Force Trims (Force Gradient). Force gradient devices are incorporated in the controls. These devices are installed in the flight control system between the cyclic stick and the hydraulic power cylinder (servos). The devices act to furnish a force gradient or feel to the cyclic control stick, however, these forces can be reduced to zero by depressing the force trim button on the cyclic stick. The

gradient is accomplished by means of springs and magnetic brake release assemblies which enable the pilot to trim the controls, as desired, for any condition of flight. A FORCE TRIM toggle switch is installed in the control panel on the lower right section of the instrument panel to activate the force trim system.

b. Cyclic Control. The pilot's cyclic stick grip contains the FORCE TRIM release switch, RADIO/ICS, armament firing switch and gun elevate depress switch. The cyclic control system controls the fore and aft and lateral movement of the helicopter. Control feel is provided by the force trim units.

c. Co-Pilot's Cyclic Stick Stowage.

CAUTION

Do not disconnect electrical connector when stowing co-pilot's cyclic stick or pilot's force trim will be lost.

(1) Unscrew retaining nut on cyclic stick.

(2) Secure cyclic stick in stowage clips located on the left outboard side of the center console.

d. Co-Pilot's Cyclic Stick Installation.

(1) Remove cyclic stick from stowage clips.

(2) Insert cyclic stick into pivot assembly on torque tube.

(3) Secure cyclic stick by tightening retaining nut.

e. Collective Pitch Control. The pilot's collective pitch control is located to the left of the pilots position and controls the vertical mode of flight. A rotating grip-type throttle and a switch box assembly are located in the forward end of the pilot's collective pitch lever. The switch box assembly contains the starter, governor, engine idle release and landing lights switch. Friction can be induced into the collective system by rotating a friction device located between the pilot and copilot seats. The copilot's collective lever contains only a twist type throttle at the forward end of the control.

f. CoPilot's Collective Pitch Control Stowage.

(1) Remove boot around copilot's stick shaft.

(2) Loosen knurled screw at base of copilot's stick. Remove stick.

(3) Stow stick in clips located on forward side of copilot's seat.

g. CoPilot's Collective Pitch Control Installation.

(1) Remove stick from stowage clips and insert stick in jackshaft elbow assuring engagement of throttle tube.

(2) Secure stick in elbow with knurled screw.

(3) Secure boot around stick shaft.

h. Anti-Torque Control Pedals. Anti-torque control pedals alter the pitch of the tail rotor blades and thereby provide the means of directional control. Pedal adjustments are located at the base of the pedals at floor level. Adjuster knobs enable adjustment of pedal distance for individual comfort.

2-47. Horizontal Stabilizer.

The horizontal stabilizer is located near the center of the tail boom and is installed in a predetermined fixed position.

2-48. Landing Gear System.

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

2-49. Tail Skid.

A tubular steel tail skid is attached at the lower section of the vertical fin and acts as a warning to the pilot upon an inadvertent tail low landing.

2-50. Flight Instruments.

The flight instruments consist of Airspeed Indicator, Altimeter, Turn And Slip Indicator and Attitude Indicator.

a. Airspeed Indicator. The single scale airspeed indicator is calibrated in knots and indicates airspeed of the helicopter at anytime during forward flight by measuring the difference between impact air pressure from the pitot tube and static air pressure from the static ports.

b. Pressure Altimeter. The pressure altimeter furnishes direct readings of height above mean sea level when properly adjusted.

c. Attitude Indicator. This indicator displays the attitude of the helicopter. The indicator is self contained

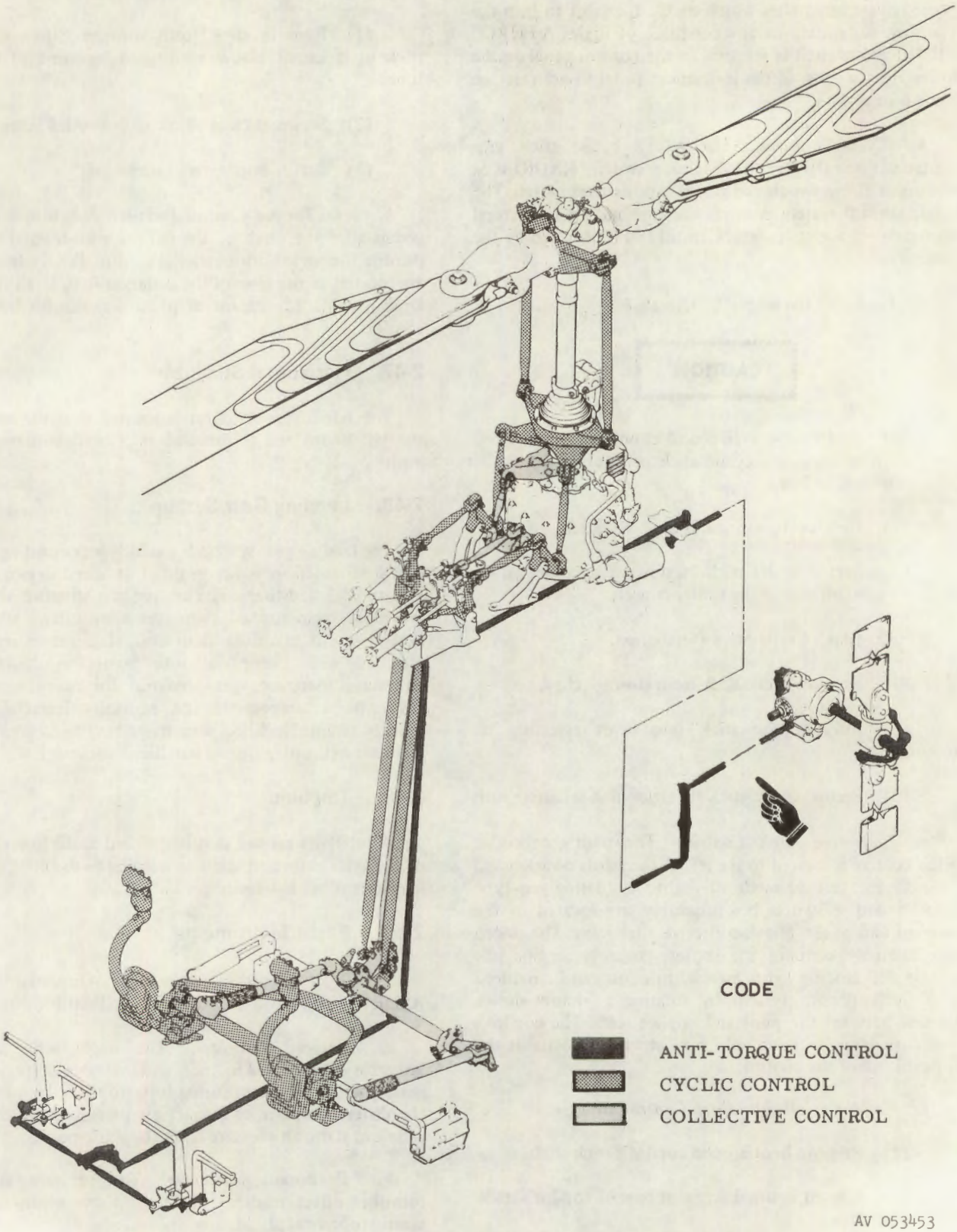


Figure 2-12. Flight controls

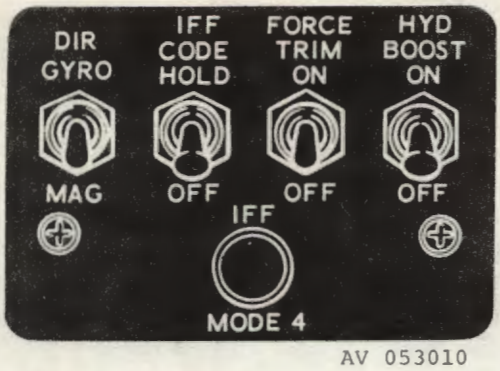


Figure 2-13. Miscellaneous Control Panel

and is connected through circuit breakers on the overhead console to the 115-volt AC bus.

d. Turn And Slip Indicator. The turn and slip indicator is controlled by an electrically actuated gyro. This instrument has a needle (turn indicator) and a ball (slip indicator). Although 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. If the helicopter is yawing or slipping, the ball will be off center. The needle indicates in which direction and at what rate the helicopter is turning.

2-51. Navigation Instruments.

(Refer to Chapter 5.)

2-52. Magnetic Compass.

The magnetic compass is a standard, non-stabilized, magnetic type instrument mounted on a support which is attached to the right of the instrument panel. The compass is used in conjunction with a compass correction card that is located on the left side of the compass.

2-53. Miscellaneous Instruments.

Instruments and indicators that are independent or are linked with more than one system are the Free Air Temperature Indicator, Clock, master caution and warning systems.

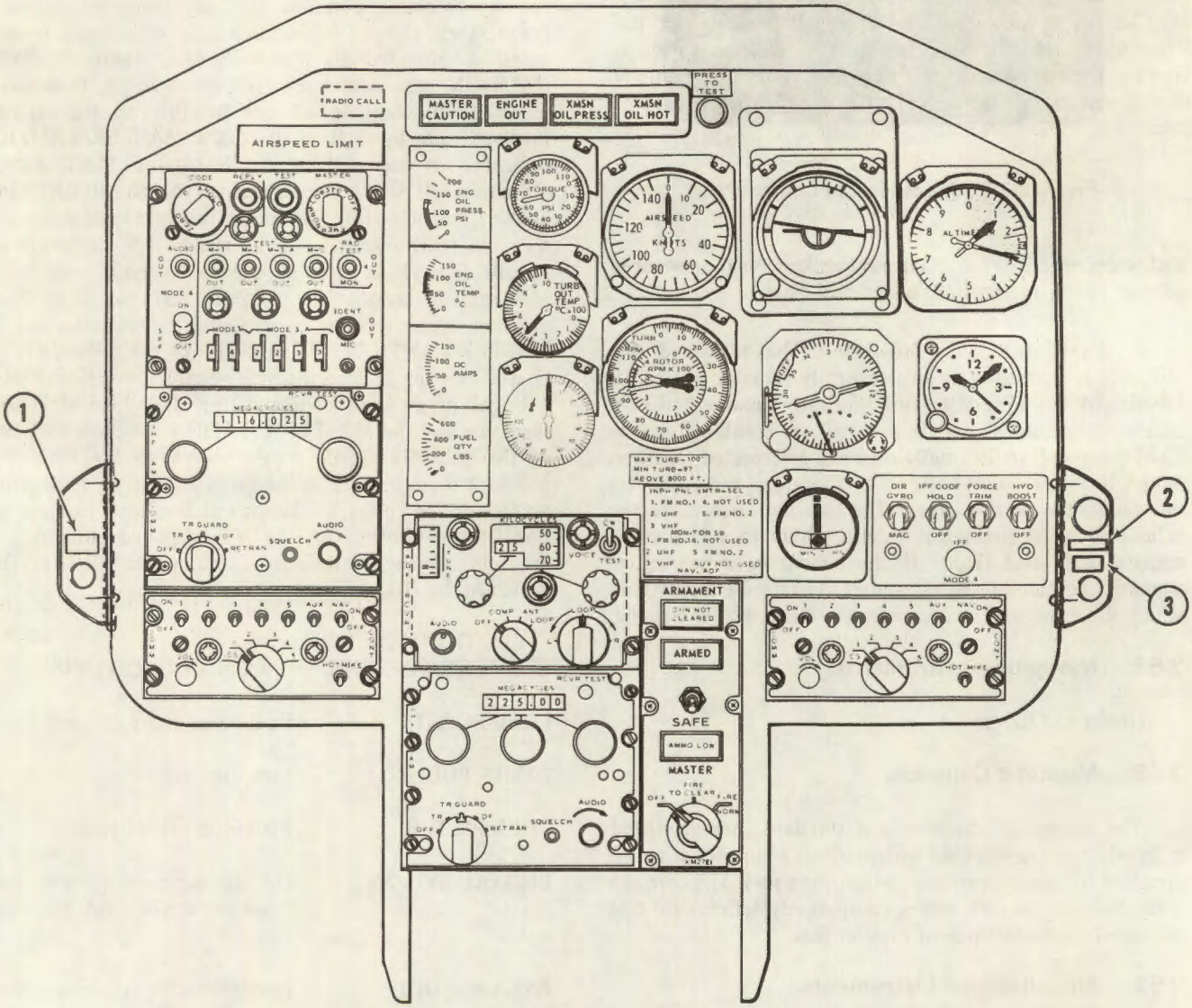
a. Clock. The clock has a sweep-second pointer and a minute totalizer hand to indicate elapsed time. The control knob in the upper right corner of the case starts, stops and returns the pointers to the 12 o'clock position when actuated.

b. Free Air Temperature. The bi-metal free air temperature indicator is in the windshield, and provides a direct reading of the outside air temperature.

2-54. Caution System.

The caution system is a segment wording type, consisting of a segment word warning CAUTION panel on the lower console and a remote MASTER CAUTION, segment on the instrument panel. The purpose of the CAUTION system is to provide visual indication, suitable for day or night operation, that any faulty conditions or combination thereof has occurred. In addition, a positive signal is provided to illuminate the remote MASTER CAUTION indicator. Each fault condition as it occurs is indicated by flashing of the lettering on the segment involved and by a flashing of the MASTER CAUTION indicator. A momentary positioning of TEST RESET switch to RESET extinguishes the MASTER CAUTION light so that it will illuminate for the next fault indication; also the fault segment will be steady ON. Segments will remain lighted as long as the fault condition(s) exist. Momentarily pressing the RESET-TEST switch to TEST position causes flashing of all individual segments and the MASTER CAUTION indicator. Testing the system will not change existing indications. It is possible to manually select a bright or dimmed condition for all individual caution segments and the MASTER CAUTION indicator by means of the BRIGHT - DIM toggle switch on the CAUTION panel. The system is so designed that after each initial application of power, the lamps will illuminate in the bright condition. Selection of the dimmed condition is accomplished by momentarily placing the BRIGHT DIM switch in the DIM position.

CAUTION PANEL SEGMENT WORDING	FAULT CONDITIONS
FUEL BOOST	Fuel boost pump pressure low
20 MIN FUEL	Low fuel quantity
FUEL FILTER	Fuel filter being bypassed
ENG OIL BYPASS	Oil at dangerously low level and/or engine oil bypassing cooler
ENG CHIP DET	Foreign metal particles in engine
XMSN CHIP DET	Foreign metal particles in transmission
T/R CHIP DET	Foreign metal particles in tail rotor gearbox
INST INVERTER	AC inverter has failed
DC GENERATOR DC	Generator has failed
HYD PRESS	Hydraulic pressure low
IFF	IFF system inoperative



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1. Defog Pull
2. Vent Pull
3. Defog Pull

Figure 2-14. Instrument panel

2-55. Warning System.

The warning system consists of individually illuminated warning light segments mounted in the MASTER CAUTION and warning light panel on the instrument panel. The purpose of this system is to provide visual indication for day or night operation that any of the three conditions or combination thereof has occurred. Each fault condition as it occurs is indicated by a steady illumination of the lettering on the particular segment. In addition an audio signal sounds when the ENGINE OUT segment is illuminated and the collective pitch is not in the full down position. The warning indicator segment remains illuminated until the fault condition is corrected.

ENGINE OUT	Engine N1 speed below 55%
XMSN OIL PRESS	Transmission oil pressure dangerously low or high
XMSN OIL HOT	Transmission dangerously hot

2-56. Emergency Equipment.

The emergency equipment consists of a fire extinguisher and first aid kit.

a. Fire Extinguisher. A portable fire extinguisher is carried in a bracket located on the right side of the center support column.

b. First Aid Kit. An aeronautical type first aid kit is located on the right-hand side of the center support column.

2-57. Doors.

Four entrance doors are provided for access to the cabin section. The doors utilize a honeycomb structure and acrylic plastic windows. Each door is jettisonable by means of a release handle, which is spring loaded.

2-58. Seats.

The crew seats are constructed of an aluminum frame with a nylon net cover. The passenger seats are constructed of aluminum honeycomb panels and form an integral part of the airframe. Snap fastener cushions are provided for the back of crew seats and back and bottom of the passenger seat. The crew seats are protected on the back, bottom and outside by ceramic/fiberglass composite armor.

2-59. Seat Belts And Shoulder Harness.

Web type seat belts and shoulder harnesses are provided for four seats. Each of the crew shoulder harnesses is secured to an inertia reel, which incorporates a manual lock control. The shoulder harnesses in the passenger compartment are secured to a support assembly and have no inertia reel.

2-60. Fuel Quantity Caution Light

The 20 MIN FUEL caution light is located on the CAUTION panel and illuminates when there is approximately enough fuel remaining for 20 minutes flight time at cruise power.

WARNING PANEL

CAUTION PANEL

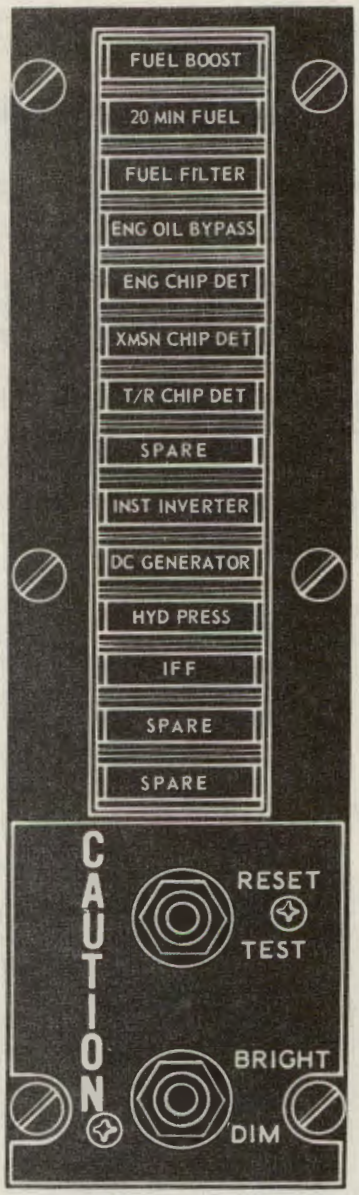

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Figure 2-15. Warning and caution panels

CHAPTER 3

NORMAL PROCEDURES

SECTION I GENERAL

3-1. Scope

Chapter 3, contains instructions and procedures covering flight of the helicopter from the planning stage, through actual flight conditions, to securing the helicopter after landing. Normal and standard conditions are assumed in these procedures. Pertinent data in other chapters is referenced when applicable. Normal procedures are given in checklist form when applicable. A condensed version of these procedures is contained in the condensed checklist, Technical Manual TM 55-1520-228-CL. To provide for easier cross referencing; the procedural steps in this chapter are numbered to coincide with the corresponding numbered steps in the abbreviated pilot's check list (TM 55-1520-228-CL). The instructions and procedures contained herein are written for the purpose of standardization and are not applicable to all field situations.

SECTION II FLIGHT PROCEDURES

3-2. Preparation for Flight.

This period should be devoted to matters of general mission planning and to a study of special problems involved in operating the helicopter for mission completion.

3-3. Flight Restrictions.

The minimum, normal, maximum, and cautionary range 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.

3-4. Flight Planning.

The safe and efficient planning of the mission to be accomplished will provide the pilot with the data to be used during flight. The information to be used can be compiled from the following sources.

1. Check type of mission to be performed and destination.

2. Select performance charts to be used from Chapter 14.

3. Record for in-flight use the information concerning fuel quantity required, airspeed, power settings, take-off, climb, cruise or hovering conditions, landing and fuel consumption for operating gross weight and climatic condition.

3-5. Take-Off and Landing Data.

Consult Chapter 14, Performance Data, for detailed operating information when planning various types of missions that require use of the data.

3-6. Weight And Balance.

WARNING

Operating outside the prescribed CG limits is extremely hazardous due to a reduction in control margins.

1. Consult applicable weight and balance instructions given in Chapter 12, and ascertain that DD Form 365F has been completed properly.

2. Compute take-off and anticipated landing gross weight, checking helicopter CG location and ascertaining weight of fuel, oil, payload, etc.

3. Check that loading limitations, described in Chapter 7, have not been exceeded.

3-7. Pre-Flight - Check

The amplified preflight check includes the exterior and interior checks as outlined. When the aircraft is flown by the same flight crew during tactical or administrative missions requiring intermediate stops, the flight crew need not perform all the preflight checks required by the amplified or condensed checklists for beginning flights.

Under these conditions, only the asterisked (*) items in these lists are required checks to assure safe operation.

NOTE

(I) Indicates check required for Instrument Flight ONLY.

(N) Indicates checks required for Night Flights ONLY.

(O) Indicates checks required if item is installed.

3-8. Before Exterior Check.

1. Publications - Check DA Forms 2408, DD Form 365F, locally required forms and publications and availability of Operators Manual (-10).

2. ARMED - SAFE switch - SAFE.

3. ARMAMENT MASTER switch - OFF.

4. BAT switch - BAT.

(N) 5. LDG LTS and POS LTS - Check. (NON-ESSential BUS switch must be placed in MAN position.)

*6. Fuel Quantity indication - Check.

*7. BAT switch - OFF.

8. First Aid Kit - Check security.

9. Fire Extinguisher - Condition and security.

3-9. Exterior Check.

3-10. Fuselage Right Side Forward - Area 1.

1. Right static port - Unobstructed.

2. Crew door - Condition and security.

3. Landing gear - Condition and security; handling wheels removed.

4. Passenger door - Condition and security. (If doors are removed, seat belts and shoulder harnesses must be secured.)

5. Hydraulic servos and flight controls - Check for security and leaks.

*6. Hydraulic reservoir - Check fluid level.

*7. Hydraulic filters - Buttons down.

3-11. Fuselage - Right Side Aft - Area 2.

*1. Transmission - Condition and oil level.

CAUTION

Whenever the oil level in the transmission is below the required level, it may indicate an oil leak from the transmission system to the engine oil system Maintenance action required before next flight.

2. Transmission cowling - Secure.

3. Engine inlet - Cover removed, inlet clear.

*4. Fuel - Check quantity, secure cap.

5. FM homing antenna - Condition and security.

6. Drain lines and vents - Condition, unobstructed.

7. Engine exhaust - Cover removed.

8. Engine compartment - Condition, fuel and oil leaks, generator air intake - Condition.

NOTE

At temperature of 41°F and above - Fuel Control Heater Valve - Closed
At temperature of 40°F and below - Fuel Control Heater Valve - Open.

9. Engine and aft cowling - Secure.

10. Fuselage - Condition.

11. Lower anti-collision light - Condition.

*12. Oil tank - Check condition and security of cap. cap.

3-12. Tail Boom - Right Side - Area 3.

1. Tail rotor drive shaft, bearings and hangers - condition and security.

2. Tail boom - Condition.

3. Horizontal stabilizer - Condition.

4. Right navigation light - Condition.

*5. Main rotor blade - Condition. Blade tie down removed.

6. Vertical fin - Condition and security.

7. Tail skid - Condition and security.

3-13. Tail Boom - Full Aft - Area 4.

1. Aft navigation light - Condition.

2. Tail rotor gearbox – condition, oil level, chip detector wiring and oil filler cap secure.

3. Boot – condition.

4. Tail rotor – condition and security of blades and controls.

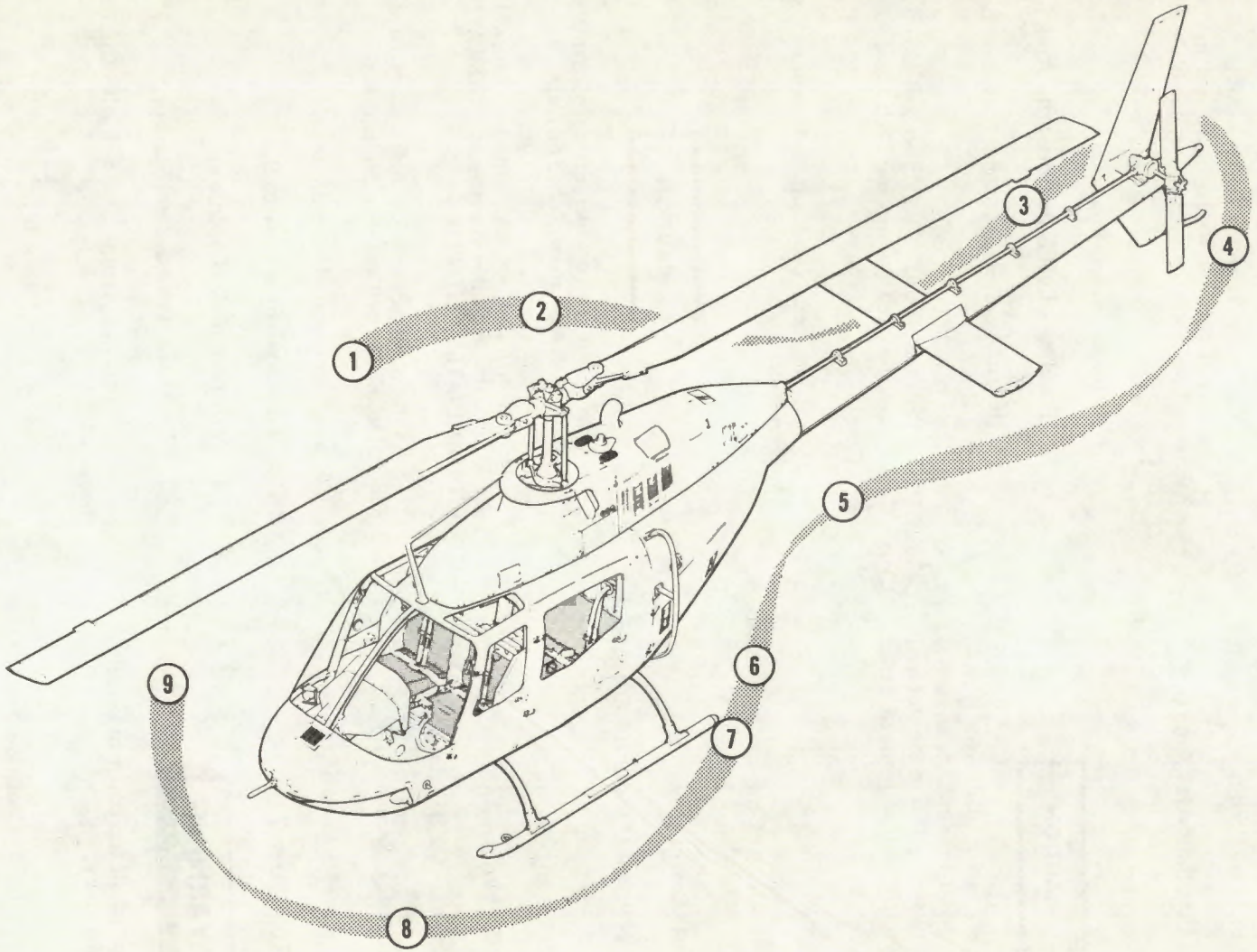

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Figure 3-1. Exterior check diagram

3-14. Tail Boom - Left Side - Area 5.

1. Tail rotor drive shaft, bearing and hangers - condition and security.

2. Horizontal stabilizer - Condition.

3. Left navigation light - Condition.

3-15. Fuselage - Left Side Aft - Area 6.

1. Fuselage - Condition.

CAUTION

Whenever the oil level in the engine is above the required level, it may indicate an oil leak from the transmission system to the engine oil system. Maintenance action required before next flight.

*2. Oil tank sight glass - Oil level.

3. Avionics compartment - Condition and security of components, battery connected, and secure door.

4. Engine exhaust - Cover removed.

5. Engine compartment - Condition, fuel and oil leaks.

6. Engine and aft cowling - Secure.

7. Heater vent - Unobstructed.

8. FM homing antenna - Condition and security.

9. Transmission cowling - Secure.

10. Engine inlet - Cover removed, inlet clear.

3-16. Fuselage - Top - Area 7.

WARNING

FM antenna located on top center of aircraft can cause personal injury.

1. Oil cooler air exhaust - Condition and free of foreign matter.

2. Anti-collision light - Condition.

3. Hydraulic reservoir filler cap - Secure.

4. Transmission filler cap - Secure.

5. Swashplate and flight controls - Condition and security.

6. Mast - Condition and security.

7. Main rotor system - Check condition, cleanliness, and security. Check oil level of grip and pillow block reservoirs. Check security of mast nut and blade retention bolts.

*8. Main rotor blades - Condition.

3-17. Fuselage - Left Side Forward - Area 8.

1. Hydraulic servos and flight controls - Check for security and leaks.

2. Passenger door(s) - Condition and security. (If door(s) are removed secure seat belts and shoulder harnesses.)

3. Landing gear - Condition and security; handling wheels removed.

CAUTION

Insure that proper fuel drain and sample procedures were accomplished on PMD.

4. Fuel sump - Drain fuel sump into sample jar and check for water and other contaminates. NO WATER OR CONTAMINATES ALLOWED.

5. Crew door - Condition and security (If door is removed secure seat belt and shoulder harness.)

6. Left static port - Unobstructed.

3-18. Fuselage - Front - Area 9.

*1. Main rotor blade - Condition.

2. Windshield - Condition and cleanliness.

3. Free-air temperature bulb - Condition unobstructed.

4. Ram air grill - Unobstructed.

5. Pitot tube - Cover removed; unobstructed.

6. LDG LTS - Condition.

7. Fuselage underside - Condition.

3-19. Interior Check.

*1. Doors - Secure.

2. Emergency door releases - Secure.

*3. Pedals - Adjust.

*4. Seat belt and shoulder harness - Secure.

5. Shoulder harness lock - Check operation; leave unlocked.

*6. Flight controls - Friction off - Check freedom of movement.

NOTE

If copilot's cyclic stick is in stowed position assure electrical plug is connected.

*7. Collective pitch - Down, friction as desired.

*8. Throttle - Full increase, close to idle stop, press IDLE REL. button, then throttle closed.

9. LDG LTS switch - OFF.

*10. Radios - OFF; Set to desired frequency.

*11. Engine instruments - Check static indications, slippage marks, and operating range limit markings.

12. Radio Bearing Heading indicator - Check.

13. Turn and slip indicator - Check.

14. DIR GYRO/MAG switch - MAG.

15. IFF CODE switch - OFF.

*16. FORCE TRIM switch - ON.

*17. HYD BOOST switch - ON.

*18. Clock - Set and Running.

*19. Altimeter - Set.

*20. Attitude Indicator - Caged and Locked.

*21. Airspeed Indicator - Check reading.

*22. Magnetic compass - Check fluid, heading and deviation card.

*23. Free air temperature gage - Check reading and secure.

*24. FUEL VALVE handle - Check ON (FWD) and OFF (AFT) then ON.

*25. INV switch - OFF.

*26. NON-ESS BUS switch - NORM.

*27. GEN switch - OFF.

*28. BAT switch - OFF.

*29. AUX receptacle switch - OFF.

*30. ENGINE DEICE switch - OFF.

31. PITOT HTR switch - OFF.

32. DEFOG and VENT switch - OFF.

33. HTR switch - OFF.

*34. ENGINE OIL BYPASS switch - As desired.

NOTE

In a combat situation with the possibility of oil cooler failure, oil cooler bypass switch should be in the AUTO position.

(N) 35. POS LTS switch - OFF (as required).

36. ANTI-COLLISION LTS - OFF.

(N) 37. CONSOLE and INST LTS reostates - As required.

38. Circuit breakers - IN.

39. Heat Control - Minimum.

40. Map Light - OFF.

3-20. Before Starting.

*1. Helmet - ON.

*2. BAT switch - BAT (OFF for APU start).

(N) *3. POS LTS - ON (Night flight only).

*4. ENGINE OUT warning light - Check illumination.

NOTE

If ENGINE OUT warning light is not illuminated, check circuit breaker in. Do not fly aircraft until malfunction is corrected.

*5. CAUTION TEST/RESET - TEST; check illumination of CAUTION lights; RESET.

*6. ENG OUT AUDIO - CHECK.

*7. GOV - RPM switch - DECR 7 seconds.

*8. THROTTLE - Recheck CLOSED.

3-21. Engine Starting And Run-Up.

*1. Rotor blades - Check clear and untied.

*2. Fireguard - Posted.

CAUTION

In case of false start, or a start not completed in a total time of 45 seconds, close throttle and motor engine with throttle closed for at least 10 seconds and until residual TOT indication reads less than 200°C. At O.A.T. of 10°C or below, allowable total starting time is increased to 60 seconds.

*3. ENGINE - START.

NOTE

If starter relay chatters during start cycle it is an indication of low battery power. Abort start and use APU or recharge battery.

a. Starter button - PRESS and hold.

b. Throttle - Open to idle at peak of N1 RPM provided the following N1 RPM limits are maintained and TOT is not above 200°C.

(1) 15% and above at 7°C through 54°C (45°F to 130°F).

(2) 13% and above at -18°C through 7°C (0°F to 44°F).

(3) 12% and above at -54°C through -18°C (-65°F to -1°F).

CAUTION

Avoid prolonged operation between 172 and 206 rotor RPM.

CAUTION

If the main rotor is not moving by 30% gas producer speed N1 abort start and investigate for possible mechanical failure or drive system malfunction.

c. TOT indicator - Monitor for over temperature indication.

(1) During start

(a) 749° is exceeded for more than 10 seconds.	Shutdown. Record peak temperature and duration. Maintenance action required before next flight.
(b) Any time 927°C is exceeded.	Shutdown. Record peak temperature and duration. Maintenance action required before next flight.

(2) During power change and/or transient

(a) 749° is exceeded for more than 6 seconds.	During runup - shutdown. Record peak temperature and duration. Maintenance action required before next flight. During flight - abort mission. Land at nearest suitable site. Record peak temperature and duration. Maintenance action required before next flight.
(b) Any time 843° is exceeded, excluding starts.	During runup - shutdown. Record peak temperature and duration. Maintenance action required before next flight. During flight - abort mission. Land at nearest suitable site. Record peak temperature and duration. Maintenance action required before next flight.
(c) Any time 927° is exceeded.	During runup - shutdown. Record peak temperature and duration. Maintenance action required before next flight. During flight - reduce power. Execute precautionary landing. Be prepared for complete power failure. Record peak temperature and duration. Maintenance action required before next flight.

d. Starter button - Release (58 to 62% N1).

*4. ENG OIL PRESS - Check for indication.

*5. XMSN OIL PRESS Warning light - OUT.

*6. ENG IDLE - Check (62 to 63% N1).

*7. APU - Disconnect (APU start).

*8. BAT switch - BAT (APU start).

*9. GEN switch - GEN.

*10. DC AMPS - Check normal indication.

CAUTION

Do not turn radios on until generator output decreases to 50-60 amperes.

*11. INV switch - INV.

*12. RADIOS - ON.

*13. FORCE TRIM - Check, then OFF.

*14. FLIGHT controls - Freedom of movement.

CAUTION

Before any movement of controls with the hydraulic system off, both hands must be on the controls.

*15. a. Hydraulic boost switch - OFF.

(1) Cyclic - Check freedom of control movement by moving cyclic 45° left forward, back to neutral, then 45° right forward, and back to neutral.

(2) Collective - Check freedom of movement.

b. HYD BOOST switch - ON.

NOTE

Feedback forces will be encountered when moving the cyclic stick. If hydraulic servos are functioning properly, negligible force will be required to maintain a given stick position once stick is stopped by the pilot.

*16. FORCE TRIM switch - ON.

*17. THROTTLE - Full increase, check 97% N2.

*18. GOV RPM switch - INCR, check 104% N2 reset at 103% N2.

NOTE

When anti-ice is on, TOT will be higher for the same power setting as with anti-ice off.

*19. ENG DE-ICE switch - ON, check for rise in TOT, then as required.

*20. PITOT HTR switch - ON, check DC AMPS indication, then as required.

*21. DEFOG and VENT switch - ON check DC AMPS indication and MAG COMPASS swing, then OFF.

*22. HTR switch - (as necessary) ON, check TOT gage for 7-10°C increase, then OFF.

(N) *23. INTERIOR LIGHTS - As desired.

*24. ATTITUDE INDICATOR - UNLOCK.

*25. FLIGHT INSTRUMENTS - Check.

*26. ANTI-COLLISION LTS switch - ON.

*27. COLLECTIVE FRICTION - As desired.

*28. FORCE TRIM - As desired.

3-22. Before Take-Off

*1. Warning lights - Check (Not illuminated).

*2. Engine instruments - Normal operating range.

*3. Fuel - Quantity check.

*4. Engine RPM - 103% N2.

*5. CAUTION lights - Check (Not illuminated).

*6. HTR switch - OFF.

3-23. Take-Off.

1. Collective pitch - Increase to hover.

2. Directional control - As required to maintain desired heading.

3. Cyclic control - Apply as required to accelerate smoothly.

4. Collective - As required to obtain desired speed and rate of climb.

3-24. Normal Cruise.

1. Airspeed - As desired (not to exceed Vne at flight altitudes.

2. ANTI-ICE switch - ON in visible moisture when temperature is below 4°C (40°F).

NOTE

When anti-ice is on, TOT will be higher for the same power setting as with anti-ice off.

3-25. Pre-Landing Check.

*1. Warning lights - Check.

*2. Engine instruments - Check.

*3. Fuel - Check.

*4. RPM - Check.

*5. CAUTION lights - Check.

*6. HTR switch - OFF.

3-26. Descent And Landing.

See figure 3-2.

3-27. Engine Shut Down.

*1. Governor RPM increase - decrease switch - Full decrease (7 sec.)

*2. Throttle - Idle stop (idle for two minutes).

*3. FORCE TRIM switch - ON.

*4. Controls - Cyclic neutral
Collective down
Friction ON.

*5. ANTI-COLLISION LTS switch - OFF.

*6. Radios - OFF.

*7. All electrical switches - OFF.

NOTES

If the ampmeter indicates a charging rate greater than 10 amperes at idle with all electrical load OFF, continue operating the engine until the ampmeter decreases to the range of 5 to 10 amperes. Thus insuring that the battery is approaching a full charged state.

*8. Throttle - CLOSED.

*9. Gen switch - OFF.

*10. BAT switch - OFF.

*11. Main rotor blades - Tie down.

*12. Conduct a thorough walk around inspection of the aircraft. Check oil levels and check for leaks.

*13. Complete DA Forms 2408-12 and -13.

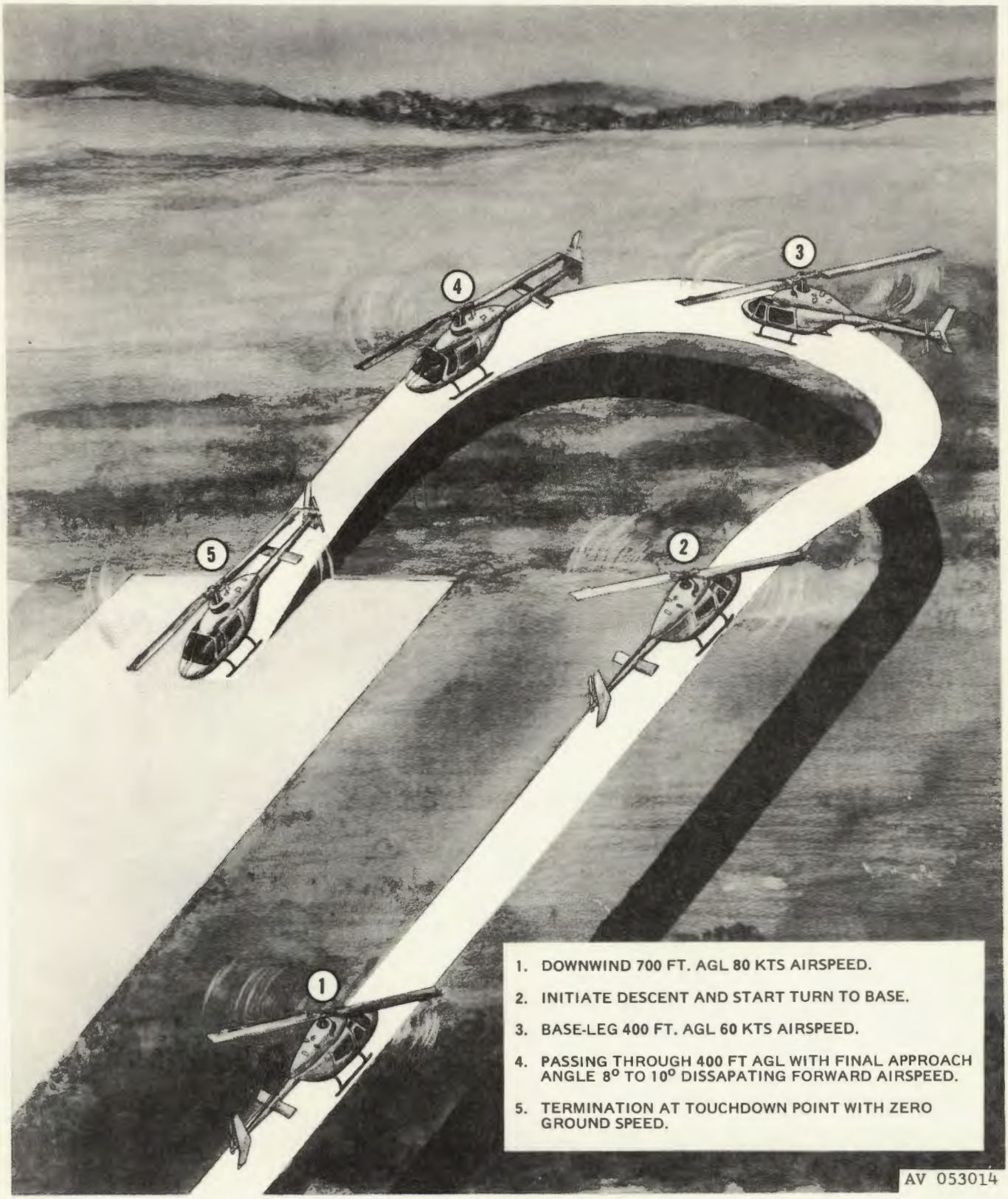


Figure 3-2. Normal approach and landing - power ON

CHAPTER 4

EMERGENCY PROCEDURES

SECTION I GENERAL

4-1. Scope.

NOTE

The urgency of certain emergencies requires immediate and instinctive action by the pilot. The most important single consideration is aircraft control. All procedures are subordinate to this requirement.

Procedures in this chapter describes action to be followed in emergencies that can, within reason, be anticipated. In some cases emergency situations can be avoided by maintaining operation within the limitations described in Chapter 7. Emergency operation of auxiliary equipment is contained in this chapter only insofar as its utility affects safety of flight. Detailed descriptions and operation of this equipment are given in Chapter 6. Emergency procedures are given in checklist form when applicable. A condensed version of these procedures is contained in the condensed checklist TM 55-1520-228-CL.

SECTION II ENGINE

4-2. Engine Failure.

The two conditions most likely to affect successful autorotational landings in the event of power loss or engine failure are the altitude and airspeed at which the helicopter is operating at the time of failure. The main symptoms of either a partial power loss or complete engine failure are a sudden reduction in engine noise, a sudden drop in engine and rotor RPM, left yaw resulting from the reduction in engine torque. Under partial power conditions the engine may operate relatively smoothly at reduced power or it may operate roughly and erratically with intermittent surges of power. In instances where a power loss is experienced without accompanying engine roughness or surging, the helicopter may sometimes be flown in a gradual decent at reduced power to a favorable landing area; however, under these conditions the pilot should always be prepared for a complete power failure and an immediate autorotative landing. In the event that a partial power condition is accompanied by engine roughness, erratic operation or power surging, take immediate action by closing the throttle completely and perform an autorotational landing to the nearest possible landing area.

WARNING

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

WARNING

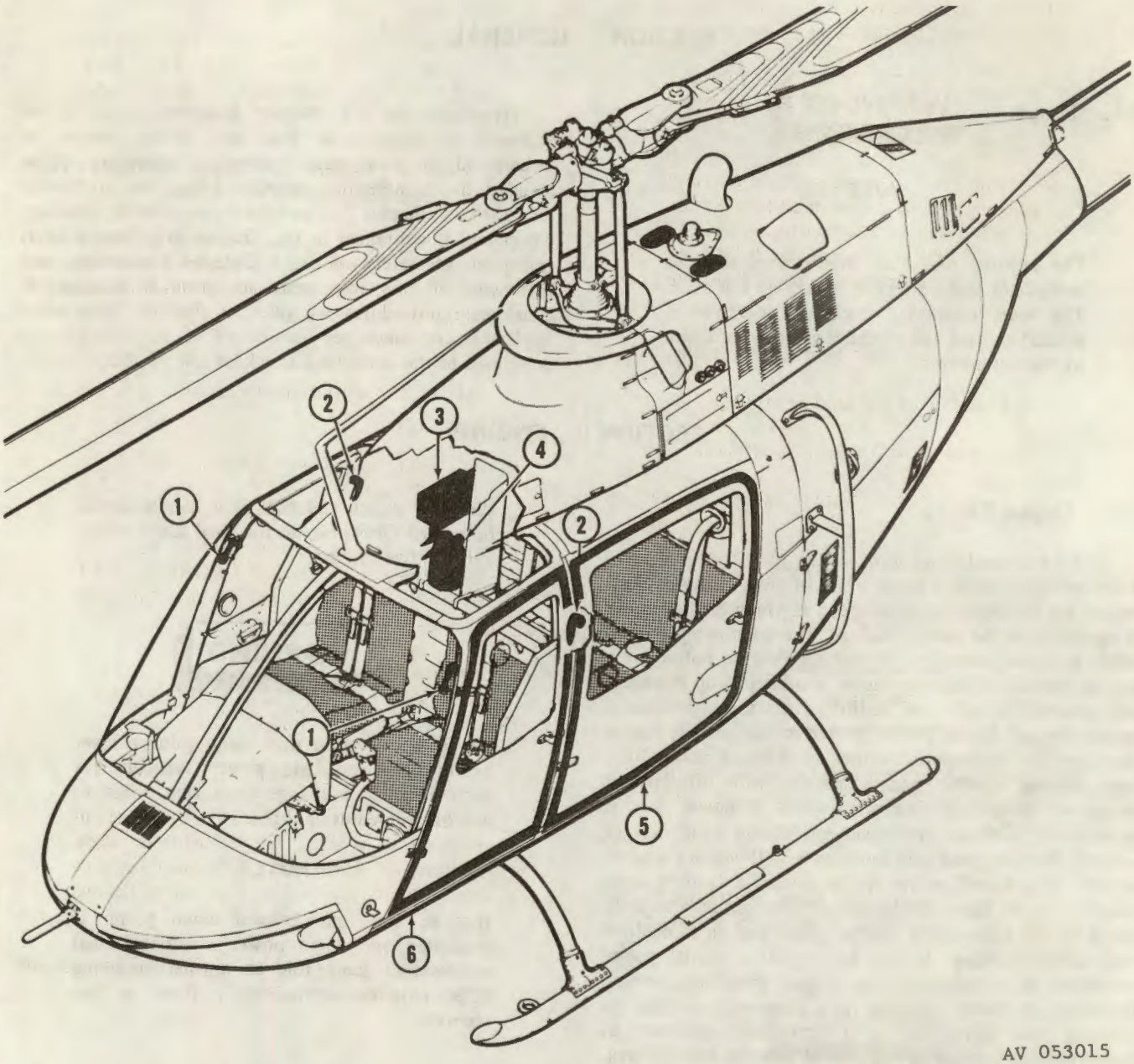
Lag in acceleration may cause pilot to over estimate immediate power available for accomplishing a change from one phase to another phase during flight.

NOTE

Due to the time interval when power is requested and when power is avalable (lag) acceleration from idle to normal operating RPM requires approximately three to five seconds.

NOTE

Whenever engine failure occurs, the following fuel samples should be taken by maintenance personnel as soon as possible in clean sealable containers. Sample should include all the fuel and the filter element in the engine driven fuel pump and a minimum of one pint of fuel from the fuel tank. Seal and mark samples, and hold for disposition instructions.



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1. Crew Jettisonable Door Release (2)
2. Passenger Jettisonable Door Release (2)
3. First Aid Kit
4. Fire Extinguisher
5. Passenger Exit (2)
6. Crew Exit (2)

Figure 4-1. Emergency exits and equipment

4-3. Engine Failure During Take-Off or Hover (Altitude Below 8 Feet Skid Height).

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

WARNING

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

1. Maintain collective pitch as helicopter settles.
2. Adjust cyclic to achieve landing attitude.
3. Maintain heading with anti-torque pedals.
4. Prior to ground contact apply sufficient collective pitch to cushion landing.
5. BAT switch - OFF.
6. Fuel valve handle - OFF (AFT)

CAUTION

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

4-4. Engine Failure at Low Altitude - Low Airspeed (Altitude Above 8 Feet Skid Height).

WARNING

Do not attempt to lower the nose or gain airspeed for reduced rate of descent if failure occurs at low altitude. See figure 7-3.

1. Adjust collective pitch to maintain rotor RPM.
2. Maintain directional control to best available area.
3. Prior to ground contact apply sufficient collective pitch to cushion landing.
4. BAT switch - OFF.
5. Fuel valve handle - OFF (AFT).

NOTE

If time and altitude permits prior to touchdown, Throttle - CLOSED, BAT switch - OFF, Fuel - OFF, and Shoulder harness - LOCK.

4-5. Engine Failure at Low Altitude - High Airspeed (100 Knots or Above).

1. Apply aft cyclic to initiate a speed reduction climb and adjust collective pitch as necessary to maintain rotor RPM within the red lines. Maintain the climb until airspeed is reduced to 60 knots or above.
2. Throttle - CLOSED.
3. Accomplish autorotational landing.
4. BAT switch - OFF.
5. Fuel valve handle - OFF (AFT).

NOTE

If time and altitude permits prior to touchdown, Throttle - CLOSED, BAT switch - OFF, Fuel - OFF and Shoulder harness - LOCK.

4-6. Engine Failure During Flight

(See figure 4-2 and 4-3.)

NOTE

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

1. Collective pitch - Reduce as required to maintain rotor RPM within limits.
2. Throttle - Closed.
3. Establish autorotational glide as required to make forced landing area.

NOTE

Maximum recommended airspeed for steady autorotational is 100 knots. Airspeed above 100 knots results in high rates of descent and low rotor RPM. A blue line is installed on the Airspeed indicator as a reminder of this condition.

4. Make radio call.

5. Landing accomplished.

6. BAT switch - OFF.

7. Fuel valve handle - OFF (AFT).

CAUTION

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

NOTE

If time and altitude permits prior to touchdown, Throttle - CLOSED, BAT switch - OFF, Fuel - OFF, and Shoulder harness - LOCK.

4-7. Minimum Rate Of Descent.

The power-off minimum rate of descent is obtained by maintaining an indicated airspeed of approximately 42 knots IAS, and rotor RPM 330.

4-8. Maximum Glide.

Maximum gliding distance is obtained by an indicated airspeed of 74 knots and rotor RPM 330.

4-9. Emergency Engine Shutdown.

1. Throttle - Closed

2. BAT - OFF

3. Fuel valve handle - OFF (AFT)

4-10. Engine Restart During Flight.

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

CAUTION

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

1. Establish autorotational glide.

2. Select forced landing area.

3. Throttle - CLOSED.

4. Attempt start.

5. Throttle - Open slowly to full open after start.

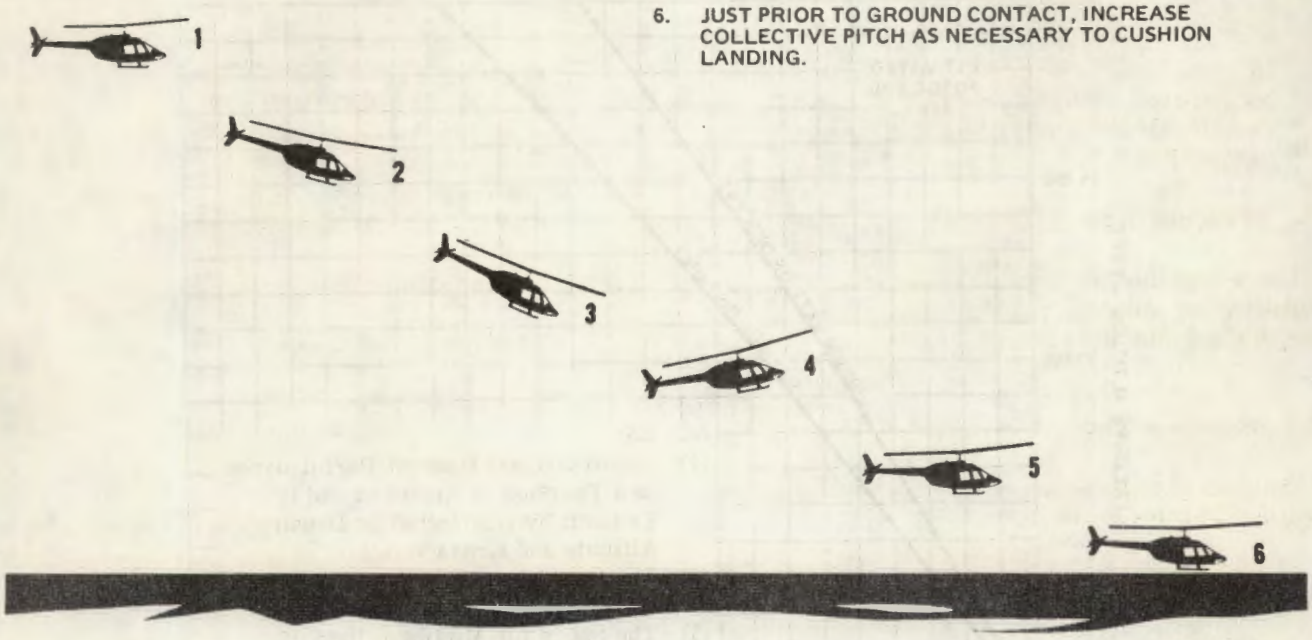
1. COLLECTIVE PITCH CONTROL - ADJUST AS REQUIRED TO MAINTAIN ROTOR RPM WITHIN LIMITS.

2. and 3. AUTOROTATIONAL GLIDE - ESTABLISH AT 60 KNOTS IAS.

4. AT APPROXIMATELY 50 TO 75 FEET ASSUME A DECELERATING ATTITUDE AS NECESSARY TO SLOW RATE OF DESCENT AND FORWARD AIRSPEED.

5. AT APPROXIMATELY 5 TO 10 FEET APPLY SUFFICIENT COLLECTIVE PITCH TO FURTHER SLOW RATE OF DESCENT AND FORWARD SPEED.

6. JUST PRIOR TO GROUND CONTACT, INCREASE COLLECTIVE PITCH AS NECESSARY TO CUSHION LANDING.



CAUTION

In practice autorotation for best engine acceleration do not reduce governor setting during low power operation below 103 percent N_2.

Figure 4-2. Standard autorotation

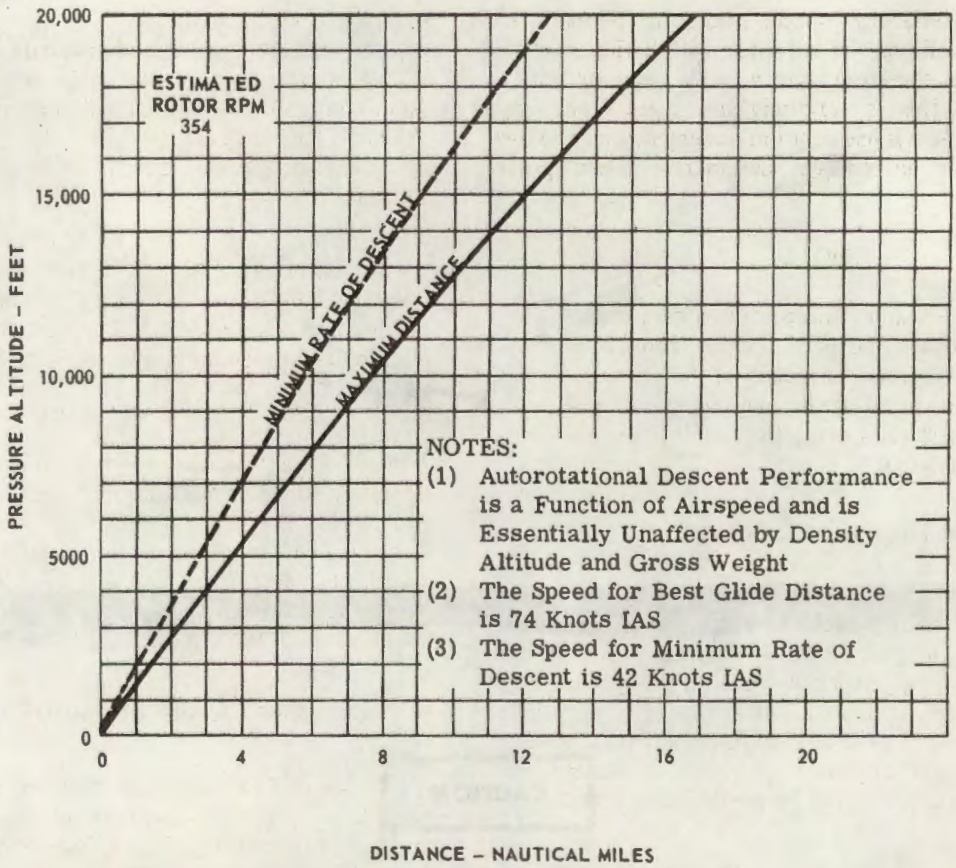


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Figure 4-3. Maximum glide distance - power off

4-11. Tail Rotor Malfunction In Flight.

WARNING

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

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

NOTE

When any apparent anti-torque system failure occurs, at low airspeed, power should be reduced. At cruise airspeeds of 60 knots or greater, controlled flight may be maintained due to the streamlining effect of the fuselage and tail fin design.

4-12. Loss Of Tail Rotor Control.

This type of failure can occur anywhere during operation in the normal flight envelope (hovering, climbs, cruise, descents, etc. (See figure 7-3)), and is caused by loss of control in the pitch-change mechanism that prevents tail rotor pitch change. If control is lost during hover, climb (left pedal forward), cruise (approximately neutral pedals), and descent (pedal displaced to right), a descent and landing can be safely effected by use of power and throttle changes.

4-13. Right Pedal Locked Forward Of Neutral.

1. Throttle should be reduced and engine rpm maintained within the green arc. This will help streamline the helicopter in flight. Normal turns to the right are easier than left turns, but airspeed should be maintained.

2. Establish a 5 to 8° approach maintaining engine RPM and an airspeed of about 60 Knots during the initial part of the approach.

3. At 50 to 75 feet AGL and when the landing area can be made, start a slow deceleration to arrive at the intended landing point at or above translational lift.

4. At 2 - 3 feet skid height, slowly reduce throttle to overcome the yaw effect and allow the helicopter to settle. When the ship is aligned with the landing area, allow it to touch down. After ground contact is established, use collective and throttle as necessary to maintain alignment with the landing strip, and minimize forward speed. If the helicopter starts to turn, move the cyclic as necessary to follow the turn until the ship comes to a completed stop.

4-14. Left Pedal Locked Forward Of Neutral.

1. Reduce throttle and maintain engine RPM within the green arc. Normal turns can be safely made under these conditions, although the ship's nose may be displaced to the left (depending on how far pedal is forward). Maintain about 60 Knots during the initial part of the approach (5 to 8 degrees).

2. On final approach reduce throttle to minimum operating RPM (101% N2) and simultaneously begin a slow deceleration so as to arrive at a point about two feet above the intended touchdown area as effective translational lift is lost.

3. Apply collective pitch (maintaining minimum operating RPM) to stop the rate of descent, forward speed and to align the helicopter with the intended landing path. If the ship is not aligned after pitch application, increase the throttle to further help with the alignment. Allow the ship to touch down at near zero ground speed maintaining alignment with the throttle.

4-15. Pedals Locked In Neutral.

1. Reduce throttle and maintain engine RPM within the green arc. Normal turns can be made safely under these conditions. Establish a 5 to 8 degree approach, holding 60 Knots IAS during the initial part of the approach.

2. At 50 to 75 feet AGL and when the landing area can be made, start a slow deceleration to arrive at the intended landing point at or above translational lift.

3. At 2 - 3 feet skid height use throttle slowly as necessary to maintain alignment with the landing area and overcome yaw; do not allow the helicopter to settle until alignment is assured, then effect a touchdown. After ground contact is established, use collective and throttle as necessary to minimize forward speed and to maintain alignment. Move the cyclic as necessary to follow the turn until the ship has come to a complete stop.

4-16. Loss Of Pitch - Change Control Linkage.

In this type of failure, the pitch-change mechanism is broken at some point and the tail rotor will assume a blade angle determined by the aerodynamic and counter-balance forces. The corrective action procedure is described in paragraphs 4-12, 4-13 and 4-14 above, depending on the yaw change experienced.

CAUTION

Do not reduce power unless a severe right yaw occurs. If pedals lock in any position at a hover, landing from a hover can be accomplished with greater safety under power controlled flight rather than reducing throttle and performing a hovering autorotation. Rotation may be expected during descent and touchdown, depending on pedal position if locking occurs.

4-17. Loss Of Tail Rotor Components.

These failures are the most severe tail rotor failures. Aircraft reactions and procedures to follow a loss of tail rotor blades, gear box, etc., airspeed, cabin-loading, center of gravity, power being used, wind direction and density altitude will all affect the severity of the aircraft's initial reaction when the tail rotor component loss is experienced. The reaction of the ship to these types of failures may be:

1. The nose will pitch down and right due to center of gravity change and torque effect.

2. The vibration level of the ship can change if ejected parts and debris strike the main rotor.

4-18. Loss Of Tail Rotor Components While Hovering.

Reduce power immediately and make a hovering autorotation landing. Rotation can be expected.

4-19. Loss Of Tail Rotor Components While Climbing.

Reduce power and lower collective pitch immediately. Establish a glide speed slightly in excess of normal autorotation approach speed. With the higher power level required in a climb maneuver, the degree of right yaw will be greater. If a turn is required to reach a more desirable place to land or to align into the wind, make it to the right. A turn to the right can be more nearly streamlined by the use of a little power. Once you are aligned for landing, maintain heading in the following manner:

1. If the nose is turning to the right with power off, a pulse of up-collective will produce more friction in the mast thrust bearings creating a left moment. The greater the input of the pulse, the more the response should be.

NOTE

By moving the collective upward abruptly, you create more load on the rotor. Do not hold the collective up, as the RPM will decrease lower than desirable. It is essential that you return the collective to the down position for autorotation. This cycle is one pulse. The pulse should be rapid (up and down) and not used at low altitudes. DO NOT ALLOW ROTOR RPM TO DECAY BELOW MINIMUM LIMITS.

2. Should the nose turn left, with power off a slight addition of power should arrest it. Further increase in power results in more right turn response.

3. It is recommended during the final stages of the approach that a mild flare should be executed making sure that all power to the rotor is OFF. Maintain the helicopter in a slight flare and use the collective smoothly to execute a soft, slightly nose high landing. Landing on the aft portion of the skid will tend to correct side drift. This technique will, in most cases, result in a run-on type landing.

4-20. Loss Of Tail Rotor Components In Level Flight Or Power Dive.

1. Reduce throttle and reduce pitch immediately. Attain an airspeed slightly above the normal autorotative glide speed.

NOTE

If altitude permits with airspeed about 60 knots, gentle throttle and pitch application can be applied to see if some degree of powered flight can be resumed, but if any adverse yawing is experienced, re-enter autorotation and continue descent to a landing.

2. The landing technique is the same as prescribed for the climb condition in paragraph 4-19.

4-21. Loss Of Tail Rotor Components During Descent (Low Power Or Power Off).

1. If the throttle is not off at the time of the failure, roll it off.

2. Proceed as prescribed in the previous condition of level flight paragraph 4-20.

4-22. Loss Of Tail Rotor Components During Zero Ground Speed Landings.

1. If it is essential that the landing be made at zero ground speed, the only change in the technique described previously is that the deceleration will be more abrupt.

CAUTION

The deceleration and the abrupt use of collective will cause the nose to rotate left, but do not correct for it will throttle. Although application of throttle will result in rotation to the right, addition of power is a very strong response measure and is too sensitive for a pilot to manage properly at this time. DO NOT ADD POWER AT THIS TIME. Slight rotation at time of impact at zero ground speed should not cause any real problem.

2. The deceleration should be executed more steeply and will require a more rapid forward cyclic input to land as near level as possible. A more positive and abrupt use of collective also will be necessary. The deceleration should be executed as close to the ground as possible.

4-23. Tail Rotor Failure During Take-Off.

Maintain control of the aircraft and accomplish a landing. Refer to paragraph 4-11.

4-24. Tail Rotor Failure While Hovering Below 10 Feet.

Maintain control of the aircraft and accomplish a landing. Refer to paragraph 4-11.

4-25. Loss Of Engine/Transmission Oil Pressure Or Excessive Engine/Transmission Oil Temperature.

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

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

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

SECTION IV FIRE

4-26. Engine Fire During Starting - Internal.

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

1. Continue to press starter and roll throttle closed.
2. Throttle - closed.
3. Fuel valve handle - OFF (AFT).
4. As TOT decreases to normal, complete shut-down and record limit and duration of hot start on DA Form 2408-13.

4-27. Engine Fire During Starting - External.

External fire can be detected by the fireguard. Proceed as follows:

1. Close throttle.
2. Complete shut-down.
3. Exit the aircraft.
4. Use fire extinguisher.

4-28. Engine Fire During Flight.

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

1. Select forced landing area (time permitting).
2. Autorotational glide - Establish and prepare for power off landing.
3. Throttle - closed.
4. BAT switch - OFF (except when operation lights and avionics is required - leave BAT - ON).
5. Fuel valve handle - OFF (AFT).

6. Shoulder harness - lock.

7. Landing - accomplish.

CAUTION

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

4-29. Fuselage Fire.

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

2. Ventilators and doors - Open, if smoke enters cabin.

3. BAT switch - OFF.

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

WARNING

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

5. Landing - Accomplish at nearest available, SAFE landing area (open field, etc.).

4-30. Electrical Fire.

The electrical system is protected throughout by circuit breakers; therefore, the possibility of electrical fire is remote. Should there be an electrical fire, accomplish the following:

1. BAT and GEN switches - OFF.

2. Land as soon as possible.

NOTE

The helicopter is capable of remaining airborne with BAT and GEN switches OFF.

4-31. Smoke Elimination.

Smoke or toxic fumes entering the cabin can be exhausted by the following procedure:

1. Cabin heat - OFF, if ON.

2. VENT - Pull on

3. DEFOG and VENT switch - ON.

4. Open cabin door vents.

5. Land as soon as possible and investigate.

SECTION V FUEL SYSTEM

4-32. Helicopter Fuel System Failure.

1. FUEL BOOST caution light illumination indicates failure of the fuel boost pump.

2. The engine will operate without boost pump pressure at altitudes below 10,000 feet.

NOTE

When the helicopter fuel boost pump is inoperative, unfiltered fuel will enter the engine through the fuel return line. Prolonged operation should be avoided, land as soon as practical.

4-33. Engine Fuel Pump Failure.

Failure of engine driven fuel pump will result in engine flame out and the ENGINE OUT warning system will be activated. Execute autorotation landing in accordance with paragraph 4-6.

4-34. Engine Fuel Control System Failure.

a. Overspeed Failure. If a system failure results in overspeed and/or an increase in torque, the following procedures shall be followed:

1. Roll throttle to idle stop position.

WARNING

Do not decrease collective pitch until overspeed and/or torque has been decreased after emergency engine shutdown procedures have been completed.

2. Decrease collective pitch to maintain rotor RPM.

3. If above safe landing area, initiate emergency shutdown of engine, observe rotor RPM decrease to safe limits and autorotate to landing site.

4. If above unsafe landing area, gain altitude and change direction, as required, while decreasing throttle and using collective pitch and/or throttle as required to control rotor RPM. The overspeed protection of the compound power turbine governor becomes effective at approximately 108% N2. This governing action will result in a pulsating increase/decrease of engine power. When above safe landing area initiate emergency shut down of engine. Observe rotor RPM decrease to safe limits and autorotate to landing site.

b. Engine Power Surges. If engine power surges, resulting in torque and N1 fluctuations, to eliminate control effect of the power turbine governor, proceed as follows:

1. Increase beep to maximum.
2. Reduce N2 speed to 100% with throttle.
3. Land as soon as possible.

NOTE

If this does not eliminate surges accomplish engine shutdown and autorotational landing.

c. Underspeeding Failure. In the event an underspeeding N2 governor is evident, perform the following:

1. Collective - Down to maintain rotor RPM.
2. Throttle - Return to idle stop.
3. Accomplish autorotational landing.

4-35. Compressor Stall.

Compressor stall may be audibly detected during a rapid engine acceleration from idle speed and the condition will tend to be more severe as altitude is increased. Stall can be reduced by the following procedure:

NOTE

The audible sound of a compressor stall can be described as any of the following, rumble, drone, fog horn sound, pistol shot, cannon fire.

1. Reduce power.
2. Deice switch - OFF.
3. HTR switch - OFF.

NOTE

If above procedure does not eliminate condition land and investigate.

SECTION VI ELECTRICAL SYSTEM

4-36. Electrical Power Failure.

1. GEN switch - CYCLE. If power is not restored - GEN OFF.
2. GEN FIELD circuit breaker - check.
3. Electrical equipment - OFF except as needed.
4. Landing - Accomplish at nearest safe landing area.

SECTION VII HYDRAULIC SYSTEM

4-37. Hydraulic System Failure.

NOTE

Failure of the hydraulic boost system will be indicated by a caution light on the CAUTION panel and an increase in the force required for control movement. Feed-back forces will be noted in the collective and cyclic controls. Control movements will result in normal flight reactions, except for the increased force required for control movement.

If hydraulic boost failure occurs, accomplish the following:

1. Airspeed - Adjust as desired to obtain most comfortable control movement level.
2. Hydraulic control circuit breaker - OUT, check for electrical failure of hydraulic control switch.
3. Hydraulic control circuit breaker - IN, if electrical failure of hydraulic control switch has been eliminated and actual hydraulic control failure has been confirmed.
4. Hydraulic control switch - Recycle, ON (OFF if power is not restored).
5. Reset MASTER CAUTION light.
6. Landing - Accomplish at nearest safe landing area.

NOTE

A shallow to normal approach may be made to the ground with zero ground speed or with 3-5 knots apparent ground speed as desired.

SECTION VIII LANDING AND DITCHING

4-38. Emergency Landing.

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

4-39. 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. Proceed as follows:

1. Enter normal autorotation from altitude or low level.

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

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

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

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

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

4-40. Emergency Entrance.

To gain entrance to the cabin in the event of an emergency, break the pilot's or copilot's windows, reach forward and PULL the jettisonable door release, if door will not jettison break windshield to gain access. To gain entrance to passenger area in an emergency, break door window, reach forward and pull the jettisonable door release.

4-41. Ditching - Power Off.

1. Collective pitch - Adjust as required to maintain rotor RPM within limits.

2. Autorotational glide - Establish an autorotational glide into the wind.

3. Radio helicopter position to aid in search and rescue.

4. Passengers - alerted.

5. BAT and GEN switches - OFF.

6. Fuel valve handle - OFF (AFT).

7. Pilot, copilot's and passenger doors - Jettison, at low altitude.

8. Shoulder harness - Lock.

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

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

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

12. Shoulder harness and safety belt - Release and CLEAR helicopter when main rotor blades have stopped.

4-42. Ditching - Power On.

1. Radio helicopter position to aid in search and rescue.

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

3. Passengers - Alerted.

4. Pilot's, copilot's passenger's door - Jettison while hovering a few feet above the water.

5. Instruct passengers and copilot to exit helicopter.

6. Fly a safe distance - Avoid possible passenger injury.

7. BAT switch - OFF.

8. Throttle - Close. Allow aircraft to descend vertically, as gear contacts the water, apply full collective, when aircraft starts to roll apply full cyclic in the direction of roll.

9. Shoulder harness and safety belt - RELEASE and CLEAR helicopter when main rotor blade has stopped.

SECTION IX FLIGHT CONTROLS

4-43. Flight Control System Failure.

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

4-44. Mast Bumping.

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

SECTION X BAIL OUT

Not Applicable (AR95-1)

CHAPTER 5

AVIONICS

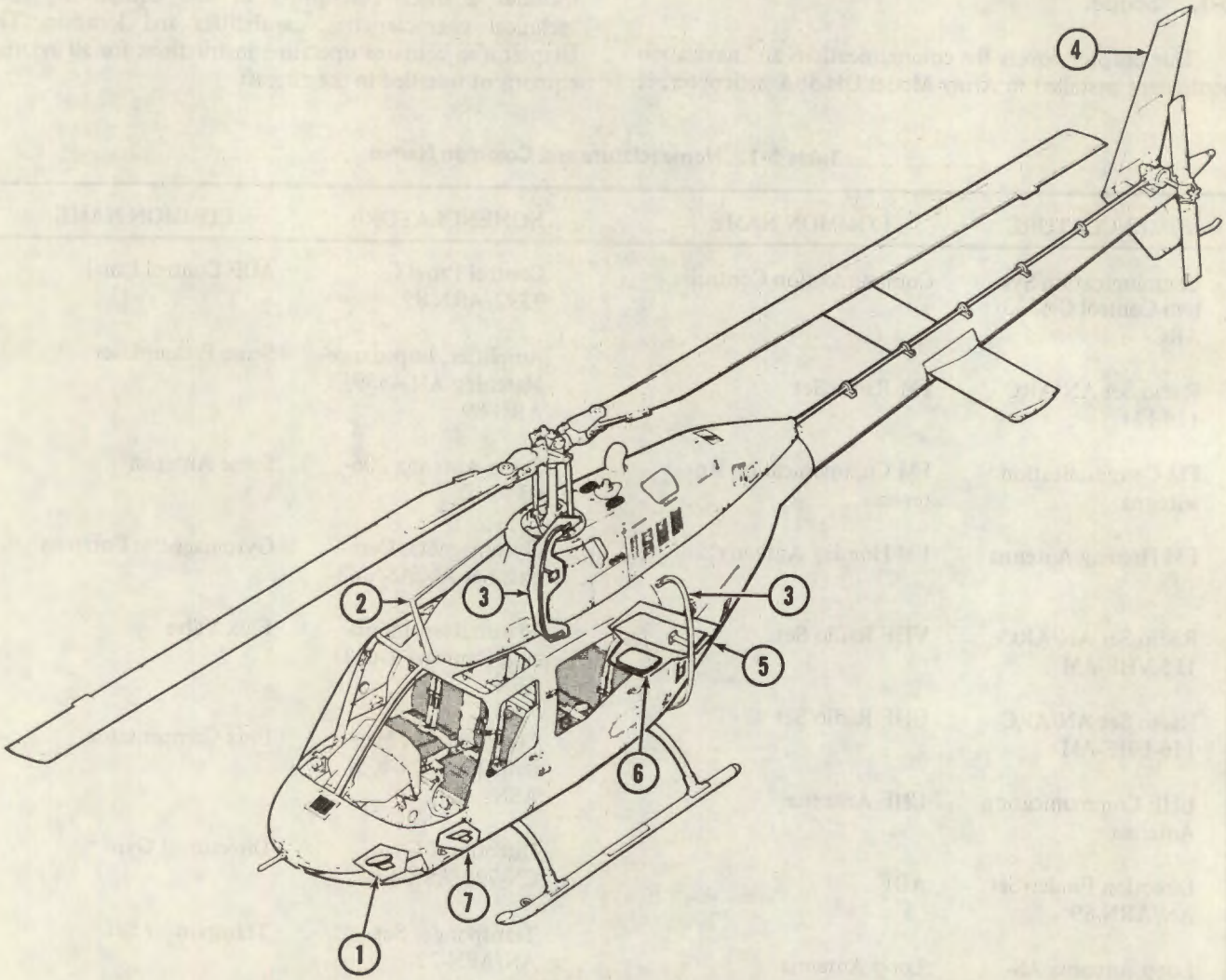
SECTION I GENERAL

5-1. Scope.

This chapter covers the communications and navigation equipment installed in Army Model OH-58A helicopter. It includes a brief description of the equipment, their technical characteristics, capabilities and location. The chapter also contains operating instructions for all avionics equipment installed in the aircraft.

Table 5-1. Nomenclature and Common Names

NOMENCLATURE	COMMON NAME	NOMENCLATURE	COMMON NAME
Communication System Control C-6533/ ARC	Communication Control	Control Panel C-7392/ARN-89	ADF Control Panel
Radio Set AN/ARC 114 FM	FM Radio Set	Amplifier, Impedance Matching AM-4859/ ARN-89	Sense Preamplifier
FM Communication antenna	FM Communication Antenna	Sense Antenna 206-032-310	Sense Antenna
FM Homing Antenna	FM Homing Antenna	Gyromagnetic Compass Set AN/ASN-43	Gyromagnetic Compass
Radio Set AN/ARC-115 VHF-AM	VHF Radio Set	Transmitter, Induction Compass T-611/ ASN	Flux Valve
Radio Set AN/ARC-116 UHF-AM	UHF Radio Set	Compensator, Magnetic Flux CN-405/ ASN	Flux Compensator
UHF Communication Antenna	UHF Antenna	Directional Gyro, CN-998/ASN-43	Directional Gyro
Direction Finder/Set AN/ARN-89	ADF	Transponder Set AN/APX-72	Transponder Set
Loop Antenna AS-2108/ARN-89	Loop Antenna	Receiver-Transmitter Radio RT-859/APX-72	Receiver-Transponder
Radio Set AN/ARC-51BX	UHF Radio Set	Transponder Set Control C-6280(P)A/APX	IFF Control Panel
Receiver-Transmitter RT-742/ARC-51BX	Receiver-Transmitter	Test Set TS-1843A/APX	Test Set
Control Radio Set C-6287/ARC-51BX	Control Panel	Antenna AT-884 ()APX-44	Antenna
Radio Receiver R-1496/ARN-89	ADF Receiver	Computer Kit 1A/TSEC	IFF Computer



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1. UHF Antenna
2. FM Antenna
3. FM Homing Antennas
4. FM-VHF Antennas
5. Sense Antenna
6. Loop Antenna
7. IFF Antenna

Figure 5-1. Antenna installation

SECTION II DESCRIPTION AND OPERATION

5-2. Purpose And Use.

Communications and navigation equipment description and operating procedures in this chapter are oriented toward normal operating procedures in Chapter 3. For more technical information refer to references listed in Appendix A. Avionics equipment may vary among different serial numbered aircraft. Additionally, equipment for which installation provisions are provided may not be installed; therefore, no attempt is made to specify the exact combinations of equipment in a particular aircraft.

Table 5-2. Communications and Associated Electric Equipment

FACILITY	NOMENCLATURE	USE	RANGE	LOCATION OF CONTROLS
Communication Control	C-6533/ARC Control	Interphone for pilot and crew, Integrates all communication equipment		
VHF - FM Communications	Radio Set AN/ARC-114	Two-way Voice Communications in frequency range of 30.00 to 75.95 MHz	Line of sight	Pedestal
VHF - AM Communications	Radio Set AN/ARC-115	Two-way Voice Communication in the frequency range of 116.00 to 149.975 MHz	Line of sight	Instrument Panel
UHF - AM Communications	Radio Set AN/ARC-116	Two-way Voice Communications in the frequency range of 225.00 to 399.96 MHz	Line of Sight	Instrument Panel
Automatic Direction Finding	Direction Finder Set AN/ARN-89	Radio Range Navigation and position fixing Automatic direction finding and homing in the frequency range of 100 to 30000 kHz	150 to 200 miles average depending on terrain interference noise	Instrument Panel
Magnetic Heading Indications	Gyromagnetic Compass AN/ASN-43	Navigational Aid provides accurate heading information		Instrument Panel
Identification	Transponder Set AN/APX-72	Transmits a special coded reply to ground based IFF radar interrogator system	Line of Sight	Instrument Panel
UHF Command Communications	Radio Set AN/ARC-51BX	Two-way Voice Communications in the frequency range of 225 to 399.9 MHz	Line of Sight	Instrument Panel

SECTION III COMMUNICATION AND NAVIGATION SYSTEMS

5-3. Communications System Control, C-6533/ARC.

The communications system control, C-6533/ARC (figure 5-2) provides an intercommunications capability and control of radio communications. Two of the control panels are installed on the aircraft instrument panel, one each for the pilot and another crew member. Another control panel is installed on the right side overhead in the passenger compartment. The control panels may be used in any one of three different modes as determined by the setting of switches and controls on the panel. The three modes of operation are two-way radio communication, radio receiver monitoring, and intercommunications within the aircraft. The aft control panel cannot be used for radio transmission.

5-4. Communications System Control Operation.

a. Receivers switch - As desired.

b. Volume - Adjust.

c. Transmit-Interphone Selector - As required.

d. HOT MIKE - As desired.

5-5. FM Radio Set - AN/ARC-114.

The ARC-114 (figure 5-3) provides two-way frequency modulated (FM) narrow band voice communications and homing capability within the frequency range of 30.00 to 75.95 MHz on 920 channels for a distance range limited to line of sight. A guard receiver is incorporated in the set and is fixed tuned to 40.50 MHz. It has the additional capability for retransmission of voice, CW, or X-mode communications when a second set is installed in the aircraft. The radio set is marked VHF FM COMM and is mounted on the center console. Antenna installations are shown in figure 5-1.

5-6. FM Operation.

a. Transmit/Receive.

(1) Function selector - As desired.

(2) Frequency - Select.

(3) RCVR TEST - Press to test.

(4) AUDIO - Adjust.

(5) Transmit.

(a) Transmit-Interphone selector - Number 1 position (Number 5 position for second FM set).

(b) RADIO transmit switch - Press.

b. Homing.

(1) Function selector - HOMING.

(2) AUDIO - Adjust.

(3) Observe homing indications on the radio bearing heading indicator.

c. Retransmission.

NOTE

Crew transmission may also be made while in RETRAN mode.

(1) Frequencies - Select (Both FM sets).

(2) Communications - Establish with each facility by selecting number 1 position and then number 5 position on the Transmit-Interphone selector.

(3) Function selectors - RETRAN (Both FM sets).

(4) Receivers switches - Number 1 and number 5 positions as desired for monitoring.

d. Stopping Procedure.

Function Selector - OFF.

5-7. VHF Radio Set - AN/ARC-115.

The ARC-115 (figure 5-4) provides two-way VHF amplitude modulated (AM) narrow band voice communications within the frequency range of 116.00 to 149.75 MHz on 1360 channels for a distance range of approximately 50 miles line of sight. A guard receiver is incorporated in the set and is fixed tuned to 121.50 MHz. The radio set is marked VHF AM COMM and is mounted on the left side of the instrument panel. Antenna installation is shown in figure 5-1.

5-8. VHF Operation.

a. Transmit/Receive.

(1) Function selector - As desired.

(2) Frequency - Select.

(3) RCVR TEST - Press to test.

(4) AUDIO - Adjust.

(5) Transmit.

(a) Transmit-interphone selector - Number 3 position.

(b) RADIO transmit switch - PRESS.

b. Stopping Procedure.

Function Selector - OFF.

5-9. UHF Radio Set - AN/ARC-116.

WARNING

UHF (FM) Secure Voice Transmissions. When transmitting and/or receiving on UHF (FM) in Secure mode, do not key or transmit simultaneously on any other transmitter.

The ARC-116 (figure 5-5) provides two-way UHF amplitude modulated (AM) narrow band voice communications within the frequency range of 225.00 to 399.95 MHz on 3500 channels for a distance range of approximately 50 miles line of sight. A guard receiver is

incorporated in the set and is fixed tuned to 243.00 MHz. The radio set is marked UHF AM COMM and is mounted in the bottom center section of the instrument panel. Antenna installation is shown in figure 5-1.

NOTE

Determined by radio set serial number the following channels of the AN/ARC-116 Radio Set are degraded and unuseable as communication frequencies.

AN/ARC-116 Radio Set

Serial number 1 through 136

1. 230.20 MHZ
2. 235.15
3. 243.40
4. 250.00
5. 274.65
6. 286.80
7. 290.00
8. 290.30
9. 300.00
10. 320.00
11. 320.05
12. 335.15
13. 336.80
14. 350.00
15. 360.00
16. 366.20
17. 370.05
18. 385.15
19. 386.80
20. 390.00

AN/ARC-116 Radio Set

Serial number 137 and subsequent

1. 274.65 MHZ
2. 300.00
3. 366.20

5-10. UHF Operation.

a. Transmit/Receive.

(1) Function selector - As desired.

(2) Frequency - Select.

(3) RCVR TEST - Press to test.

(4) AUDIO - Adjust.

(5) Transmit.

(a) Transmit - Interphone selector - Number 2 position.

(b) RADIO transmit switch - PRESS.

b. Stopping Procedure.

Function Selector - OFF.

5-11. ADF Radio Set - AN/ARN-89.

The ARN-89 (figure 5-6) provides a LF/MF amplitude modulated (AM) navigation capability within the frequency range of 100 to 3000 KHz. Reception distance of reliable radio signals depends on the power output of transmitting stations. Navigation information may be presented visually on the radio bearing heading indicator (figure 5-7) located on the instrument panel or received aurally in the headset as a code or tone. The radio set is marked ADF RCVR and is mounted in the center section of the instrument panel. Antenna installations are shown in figure 5-1.

5-12. ADF Operation.

a. Comp.

(1) Function selector - COMP.

(2) Frequency - Select. Tuning may be accomplished with function selector in COMP, ANT, or LOOP positions; however, less noise is encountered in the ANT position.

(3) AUDIO - Adjust.

(4) TUNE meter - Select. Tune for maximum up deflection of needle.

(5) CW VOICE TEST switch - TEST then release.

(6) Observe ADF needle indications.

b. Loop.

(1) Function selector - LOOP.

(2) AUDIO - Adjust.

(3) CW VOICE TEST switch - CW.

(4) LOOP switch - Move left or right as required to obtain aural null.

c. Stopping Procedure.

Function Selector - OFF.

5-13. Radio Bearing Heading Indicator - ID-1351A

The ID-3351/A indicator is mounted on the instrument panel and provides magnetic heading information and radio bearings by displaying information from the gyromagnetic compass set, ADF and FM radios. Additionally, it provides visual indications of gyromagnetic compass failure, compass syncronization and approach to a radio station. Refer to figure 5-7.

a. Gyro-magnetic Heading Display And Synchronization.

(1) Gyro-magnetic heading information is displayed by the heading dial which rotates to indicate the aircraft's magnetic heading under the index.

(2) Heading synchronization is accomplished by twisting the synchronizing knob. The annunciator indicates, by means of a dot (.) or cross (+), the direction that the synchronizing knob should be turned to give immediate and accurate synchronization. If a cross (+) is showing in the annunciator, the synchronizing knob should be turned clockwise, and if a dot (.) is showing, the synchronizing knob should be turned counterclockwise. The system is synchronized when the annunciator indicates neither a dot (.) nor a cross (+). If, shortly after synchronizing the system, the heading dial drifts and a dot (.) or cross (+) appears in the annunciator, then the system was synchronized to a false null located 180 degrees from the correct heading and should be re-synchronized to the correct aircraft heading. The aircrart standby magnetic compass may be check for reference.

b. ADF Pointer. Radio magnetic bearing information is indicated by the ADF Pointer of the indicator. The arrow end of this pointer indicates the bearing of the radio station from the aircraft. The ADF set furnishes the bearing information to the pointer.

c. FM Homing.

(1) The Steering Indicator receives its input from the number 1 FM radio homing system. By moving to the right or left of its center indication, the indicator shows aircraft deviation from a direct approach parth to the FM radio transmitter. The indicator moves to the right when the homing transmitter site is to the right of the aircraft, and to the left when the transmitter is to the left of the aircraft.

(2) An FM signal strength indicator shows red whenever the FM radio receiver signal is absent or is too weak for a reliable indication. When the signal strength is acceptable, the FM Warning Indicator shows black.

(3) The Station Approach Indicator indicates aircraft approach to the FM radio transmitter. The pointer moves down as the transmitter is approached.

d. Power Warning Indicator. The power warning indicator, comes into view whenever electrical AC power to the gyromagnetic compass is off.

5-14. UHF Command Set AN/ARC-51BX.

The ARC-51BX radio set operates within the ultra high frequency (UHF) band of 225.0 to 399.9 megahertz (MHz). The set times in 0.05 MHz increments and provides 3500 channels. This radio also permits selection of 20 preset channels and permits monitoring of the guard channel and provides two-way radio communication. Transmission and reception are conducted on the same frequency with the use of a common antenna.

5-15. UHF Command Set Control.

Control panel C-6287 (figure 5-8) is marked UHF and is mounted in the instrument panel. The control panel is used to control the ARC-51BX Radio Set.

a. ARC-51BX Operation. The operating procedure for the command set is outlined in the following steps:

(1) BAT switch – BAT (OFF for APU).

(2) UHF and INT circuit breakers - IN.

(3) Function select switch - T/R (T/R+G) as desired.

(4) Mode selector switch - PRESET CHAN. allow five minute warmup.

(5) RECEIVERS switch No. 2 - ON.

(6) Channel - Select.

NOTE

An 800 Hz audio tone should be heard during channel changing cycle.

(7) SQ DISABLE switch - ON.

(8) VOLume - Adjust.

(9) Transmit - Interphone No. 2 position selector switch.

(10) Microphone switch - Press.

b. Stopping Procedure. Function select switch - OFF.

c. ARC51-BX Guard Frequency Operation. Operation of the guard frequency may be accomplished by any of the following methods.

(1) Preset guard.

(a) Function select switch - T/R+G.

(b) Mode selector - DF XMIT.

(c) Microphone switch - Press.

(2) Preset.

(a) Mode selector - Preset.

(b) Function select switch - T/R(T/R+G).

(c) Guard Channel - Select.

(d) Microphone switch - Press.

(3) Manual.

(a) Mode selector - Manual.

(b) Function select switch - T/R(T/R+G).

(c) Guard frequency - Select.

(d) Microphone switch - Press.

5-16. Transponder Set AN/APX-72.

WARNING

UHF (FM) Secure Voice Transmissions. When transmitting and/or receiving on UHF (FM) in Secure mode, do not key or transmit simultaneously on any other transmitter.

The APX-72 (figure 5-9) provides a radar identification capability. Five independent coding modes are available to the pilot. The first three modes may be used independently or in combination. Mode 1 provides 32 possible code combinations, any one of which may be selected in flight. Mode 2 provides 4,096 possible code combinations but only one is available since the selection dial is not available in flight and must be preset before flight. Mode 3/A provides 4,096 possible codes, any of which may be selected in flight. Mode C, in this installation is not utilized. Mode 4, which is connected to an external computer, can be programmed prior to flight to display any one of many classified operational codes for security identification. The effective range depends on the capability of interrogating radar and line-of-sight. The transponder set is mounted on the upper left side of the instrument panel. The associated antenna is shown in figure 5-1.

5-17. Transponder Control Panel.

This control panel is located on the instrument panel. It provides remote control of the APX-72 Transponder Set. Mode 2 code select switch is on the front panel of the receiver-transmitter radio.

a. Transponder Operation.

(1) MASTER control - STBY. Allow approximately 2 minutes for warmup.

(2) Mode and code - Select as required.

(3) Test as required.

(4) MASTER control - LOW, NORM, EMER as required.

(5) IDENT - As required.

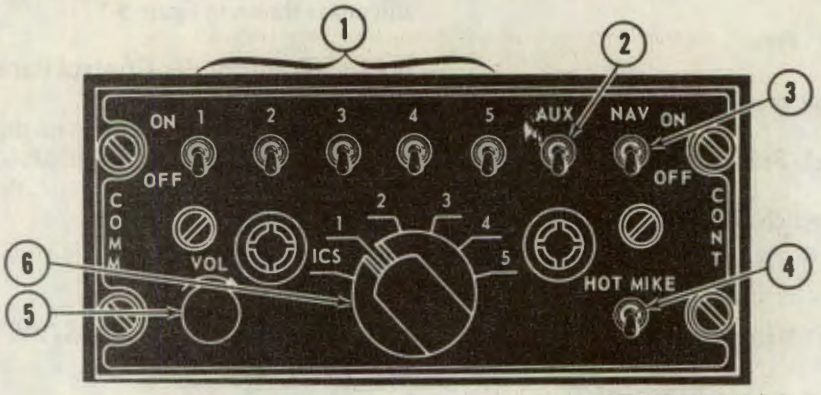
b. Stopping Procedure. Master Control - OFF.

5-18. Gyro Magnetic Compass AN/ASN-43.

The gyro magnetic compass set provides accurate heading information, referenced to a free directional gyro heading when operated in the DIR gyro mode (free gyro), or slaved to the earth's magnetic field when operated in the MAG mode (magnetically slaved). It provides heading information in the form of a synchro output to the radio bearing heading indicator.

5-19. Voice Security Unit, TSEC/KY 28.

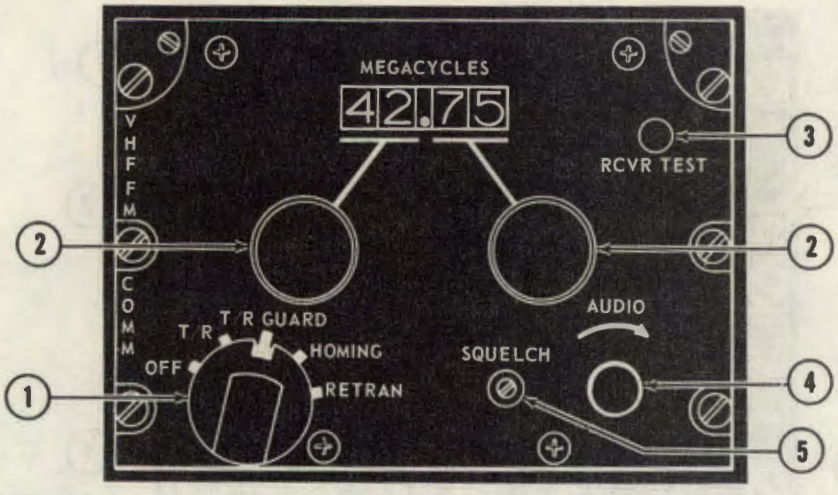
Voice security unit TSEC/KY 28 is a classified audio processing device that accepts voice communications from the aircraft communications system control, encodes the audio, and delivers it to the FM radio set for transmission. It decodes information received by the FM radio set and delivers decoded voice through the communications system control to the headset.



CONTROL	FUNCTION
1. Receiver Switches	Connect (ON) or disconnect (OFF) communications receivers from the headsets.
1 - FM	
2 - UHF	
3 - VHF	
4 - Not used	
5 - FM (When second FM set is installed)	
2. AUX Receiver Switch	Not used.
3. NAV Receiver Switch	Connects (ON) or disconnects (OFF) navigation receiver from the headset.
4. HOT MIKE Switch	Permits hand-free intercommunications with transmit-interphone selector in the ICS position.
5. VOL Control	Adjusts volume from receivers. Adjusts intercommunications volume.
6. Transmit-Interphone Selector	Connects microphone to transmitters.
1 - FM	
2 - UHF	
3 - VHF	
4 - Not used	
5 - FM (When second FM set is installed)	
ICS	Connects the microphone to the intercommunications system only, disconnecting microphone from transmitters.

AV 053443

Figure 5-2. Communication system control panel C-6533/ARC



CONTROL FUNCTION

1. Function Selector

OFF	Power off.
T/R	Receiver - On; Transmitter - Standby
T/R GUARD	Receiver - On; Transmitter - Standby; Guard Receiver - On.

Note

Reception on guard frequency is unaffected by frequencies selected for normal communications.

HOMING	Activates the homing mode and display on the radio bearing heading indicator. May be used also for normal voice communications.
RETRAN	Activates the retransmission mode when second FM set is installed in the aircraft. May be used also for normal voice communications.

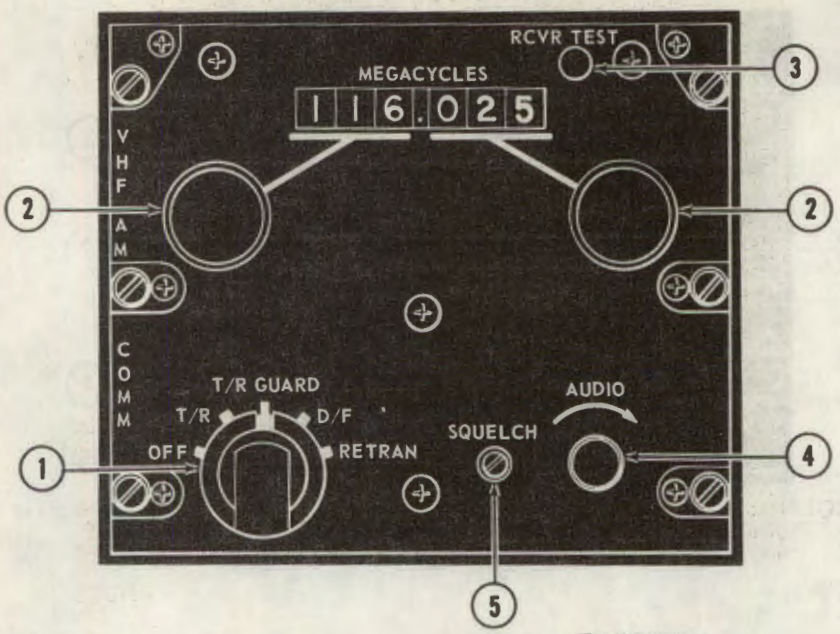
2. Frequency Selectors

Left Selector	Selects first two digits of desired frequency.
Right Selector	Selects third and fourth digits of desired frequency.

3.	RCVR TEST	When pressed, audible signal indicates proper receiver performance.
4.	AUDIO	Adjusts receiver volume.
5.	SQUELCH	Squelch control adjusted by maintenance personnel only.

AV 053444

Figure 5-3. AN/ARC-114 control panel



CONTROL FUNCTION

1. Function Selector

OFF	Power off.
T/R	Receiver - On; Transmitter - Standby.
T/R GUARD	Receiver - On; Transmitter - Standby; Guard Receiver - On.

Note

Reception on guard frequency is unaffected by frequencies selected for normal communications.

D/F	Not used.
RETRAN	Not used.

2. Frequency Selectors

Left Selector	Selects first three digits of desired frequency.
Right Selector	Selects fourth, fifth and sixth digits of desired frequency.

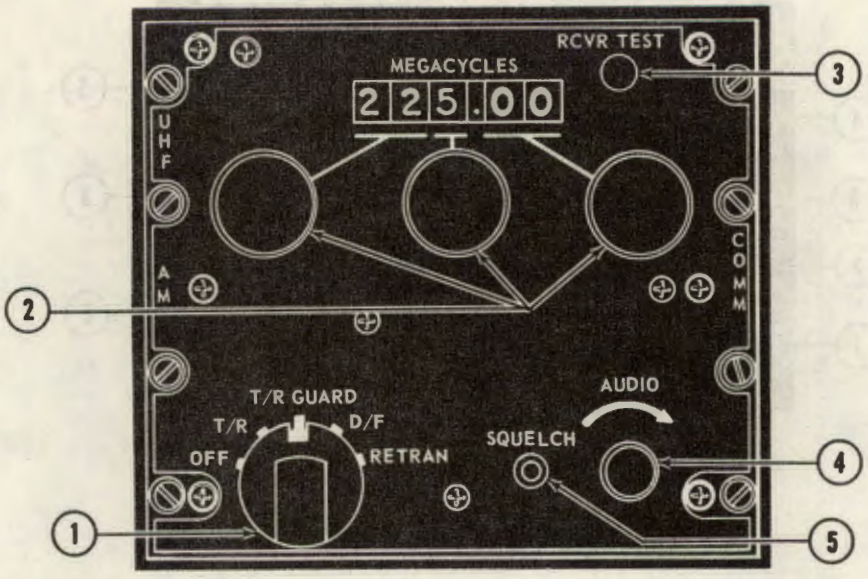
3. RCVR TEST ..... When pressed, audible signal indicates proper receiver performance.

4. AUDIO ..... Adjusts receiver volume.

5. SQUELCH ..... Squelch control adjusted by maintenance personnel only.

AV 053445

Figure 5-4. AN/ARC-115 control panel



CONTROL FUNCTION

1. Function Selector

OFF	Power off.
T/R	Receiver - On; Transmitter - Standby.
T/R GUARD	Receiver - On; Transmitter - Standby; Guard Reciever - On.

Note

Reception on guard frequency is unaffected by frequencies selected for normal communications.

D/F	Not used.
RETRAN	Not used.

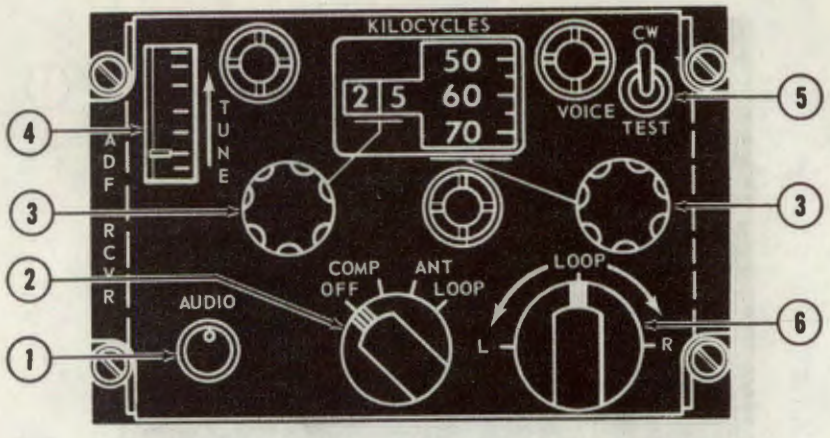
2. Frequency Selectors

Left Selector	Selects first two digits of desired frequency.
Center Selector	Selects third digit (1-mc steps) of desired frequency.
Right Selector	Selects last two digits of desired frequency.

3.	RCVR TEST	When pressed, audible signal indicates proper receiver performance.
4.	AUDIO	Adjusts receiver volume.
5.	SQUELCH	Squelch control adjusted by maintenance personnel only.

AV 053446

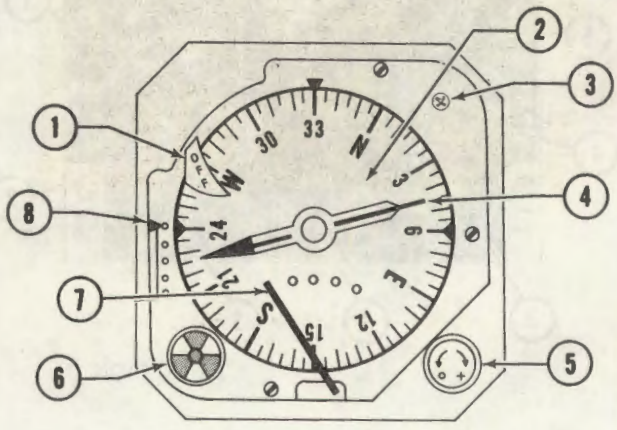
Figure 5-5. AN/ARC-116 control panel



CONTROL	FUNCTION
1. AUDIO	Adjusts receiver volume.
2. Function Selector	
OFF	Power off.
COMP	Activates the ADF pointer on the radio bearing heading indicator.
ANT	Receiver provides aural information only.
LOOP	Receiver operates using only the loop antenna.
3. Frequency Selectors	
Left Selector	Selects first two digits of desired frequency.
Right Selector	Selects third and fourth digits of desired frequency.
4. TUNE Meter	Up deflection of the needle indicates most accurate tuning of the receiver when function selector is in the COMP position.
5. CW VOICE TEST Switch	
CW	Provides tone that may be used for identification, tuning, or for loop operation.
VOICE	Permits normal aural reception.
TEST	Rotates ADF needle to provide a check of needle accuracy with function selector in the COMP position. Inoperative in LOOP and ANT positions. The switch is spring loaded away from TEST position.
6. LOOP Switch	Used to rotate loop antenna by moving switch left or right. Direction and degree of turn are shown on the radio bearing heading indicator. Function selector must be in LOOP position.

AV 053447

Figure 5-6. AN/ARN-89 (ADF) control panel



	CONTROL	FUNCTION
1.	POWER WARNING INDICATOR	Indicates when A/C power is not being supplied to the gyromagnetic compass.
2.	HEADING DIAL	Indicates the aircraft's magnetic heading under the index.
3.	ANNUNICATOR	Indicates by means of a dot (·) or cross (+) the direction the synchronizing knob (item 5) should be turned to give immediate and accurate synchronization.
4.	ADF POINTER	Indicates bearing of radio station from aircraft.
5.	SYNCHRONIZING KNOB	Determines the heading synchronization.
6.	SIGNAL STRENGTH INDICATOR	Indicates the presence or absence of an FM radio signal.
7.	STEERING INDICATOR	Indicates aircraft's deviation from a direct approach to the FM radio transmitter.
8.	STATION APPROACH INDICATOR	Indicates aircraft's approach to an FM radio transmitter.

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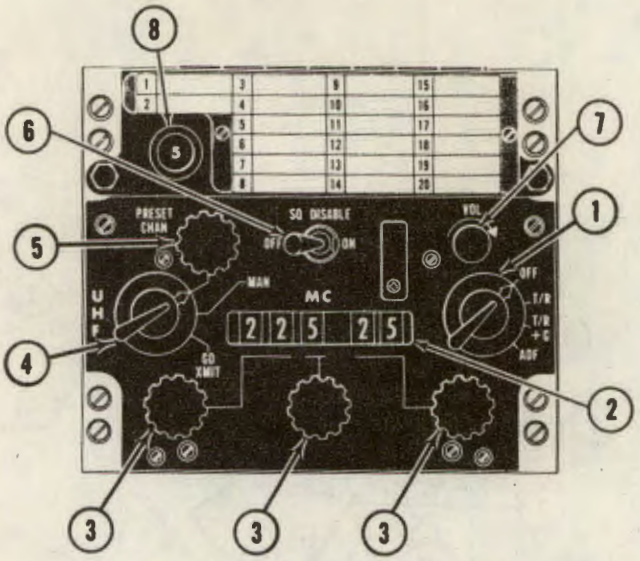
Figure 5-7. Radio bearing heading indicator 1D-1351/A



CONTROL	FUNCTION
1. Function Selector	Applies power to radio and selects type of operation.
OFF position	Removes operating power from the set.
T/R position	Transmitter and main receiver ON.
T/R + G position	Transmitter, main reciever and guard receiver ON.
ADF position	Not used.
2. Channel Indicator	Indicates the frequency selected by the frequency controls.
3. Frequency Controls	
Left-hand control	Selects the first two digits of desired frequency.
Center control	Selects the third digit of desired frequency.
Right-hand control	Selects the fourth and fifth digits of the desired frequency.
4. Mode Selector	Determines the manner in which the frequencies are selected as follows:
PRESET CHAN position . . .	Permits selection of one of 20 preset channels by means of preset channel control.
MAN position	Permits frequency selection by means of frequency controls.
GD XMIT position	Receiver-transmitter automatically tunes to guard channel frequency.
5. PRESET CHAN	Permits selection of any of 20 preset channels.
6. SQ DISABLE Switch	In the ON position squelch is disabled. In the OFF position the squelch is operative.
7. VOL Control	Controls the receiver audio volume.
8. Preset Channel Indicator	Indicates the preset channel selected by preset channel control.

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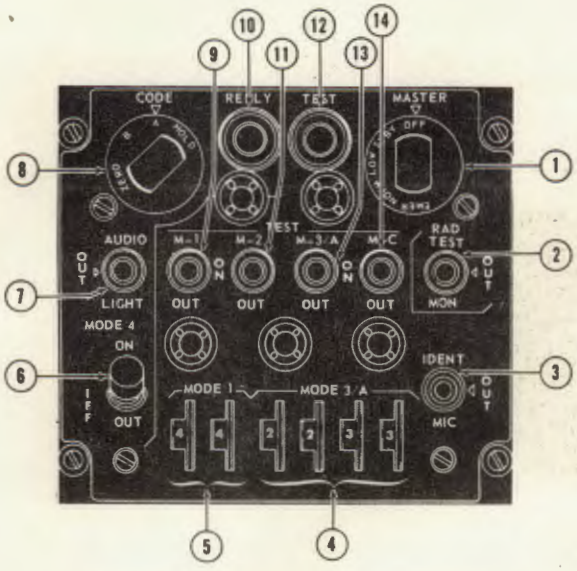
Figure 5-8. AN/ARC-51BX control panel



CONTROL FUNCTION

1. MASTER Control
   - OFF ..... Turns set off.
   - STBY ..... Places in warmup (standby) condition.
   - LOW ..... Set operates at reduced receiver sensitivity.
   - NORM ..... Set operates at normal receiver sensitivity.
   - EMER ..... Transmits emergency reply signals to MODE 1, 2, or 3/A interrogations regardless of mode control settings.
2. RAD TEST - MON Switch
   - RAD TEST ... Enables set to reply to TEST mode interrogations. Other functions of this switch position are classified.
   - MON ..... Enables the monitor test circuits.
   - OUT ..... Disables the RAD TEST and MON features.
3. IDENT-MIC Switch
   - IDENT ..... Initiates identification reply for approximately 25 seconds.
   - OUT ..... Prevents triggering of identification reply. Spring loaded to OUT.
   - MIC ..... Not used.
4. MODE 3/A Code Select Switches .. Selects and indicates the MODE 3/A four-digit reply code number.
5. MODE 1 Code Select Switches ..... Selects and indicates the MODE 1 two-digit reply code number.
6. MODE 4 Switch
   - ON ..... Enables the set to reply to MODE 4 interrogations.
   - OUT ..... Disables the reply to MODE 4 interrogations.
7. AUDIO- LIGHT Switch
   - AUDIO ..... Enables aural and REPLY light monitoring of valid MODE 4 interrogations and replies.
   - LIGHT ..... Enables REPLY light only monitoring of valid MODE 4 interrogations and replies.
   - OUT ..... Disables aural and REPLY light monitoring of valid MODE 4 interrogations and replies.
8. CODE Control .. Functions of this switch are operationally classified.
9. M-1 Switch
   - ON ..... Enables the set to reply to MODE 1 interrogations.
   - OUT ..... Disables the reply to MODE 1 interrogations.
   - TEST..... Provides test of MODE 1 interrogation by indication on TEST light.
10. REPLY Indicator. Lights when valid MODE 4 replies are present, or when pressed.
11. M-2 Switch
    - ON ..... Enables the set to reply to MODE 2 interrogations.
    - OUT ..... Disables the reply to MODE 2 interrogations.
    - TEST ..... Provides test of MODE 2 interrogation by indication on TEST light.
12. TEST Indicator .. Lights when the set responds properly to a M-1, M-2, M-3/A or M-C test, or when pressed.

Note

Computer, transponder must be installed before set will reply to a MODE 4 interrogation.

13. M-3/A Switch
    - ON ..... Enables the set to reply to MODE 3/A interrogations.
    - OUT ..... Disables the reply to MODE 3/A interrogations.
    - TEST ..... Provides test of MODE 3/A interrogation by indication on TEST light.
14. M-C Switch .... Not used.

AV 053450

Figure 5-9. Transponder APX-72 control panel

CHAPTER 6

AUXILIARY EQUIPMENT

SECTION I GENERAL

6-1. Scope.

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. Much of the equipment discussed in this chapter is highly specialized or interchangeably used in many aircraft. Coverage for specialized or interchangeable equipment of this type will be brief, since complete coverage is available in publications devoted entirely to that equipment.

SECTION II HEATING AND VENTILATING SYSTEM

6-2. Heating And Ventilating System.

The bleed air heating system and the ventilating and defogging system are interconnected by ducts. The bleed air heater is installed in the equipment compartment aft of the passenger seat. The system consists of a solenoid controlled bleed air valve, mixing valve, outside air vent, a remote sensor with manual control and connecting ducts and tubing. A circuit breaker switch in the overhead console actuates a solenoid valve. The switch in the ON position permits air from the engine compressor section to pass through the bleed air nozzle. A venturi working in conjunction with the bleed air nozzle draws in outside air through the outside air vent. Bleed air and outside air is fed into the mixing valve where a sensor determines the mixing ratio to produce the desired temperature. Bleed air forces heated air through the duct system to registers under the seat and/or to the defroster nozzles. Temperature is regulated by a manual control knob and flexible cable connected to a variable remote sensor in the heater compartment. The sensor has a bi-metalic element which controls the mixing valve. The ventilating and defogging system is installed in the nose and consists of a ram air intake, two blower fans, defroster nozzles and ducts. The bleed air system is also connected to the ventilating and defogging system. Outside air flow to the cabin and defogging nozzles is controlled by manual push-pull type controls located below the instrument panel. The blowers direct air to the defogging nozzles and are controlled by an ON-OFF switch in the overhead console. (See figure 6-1.)

SECTION III ANTI-ICING, DEICING AND DEFROSTING SYSTEMS

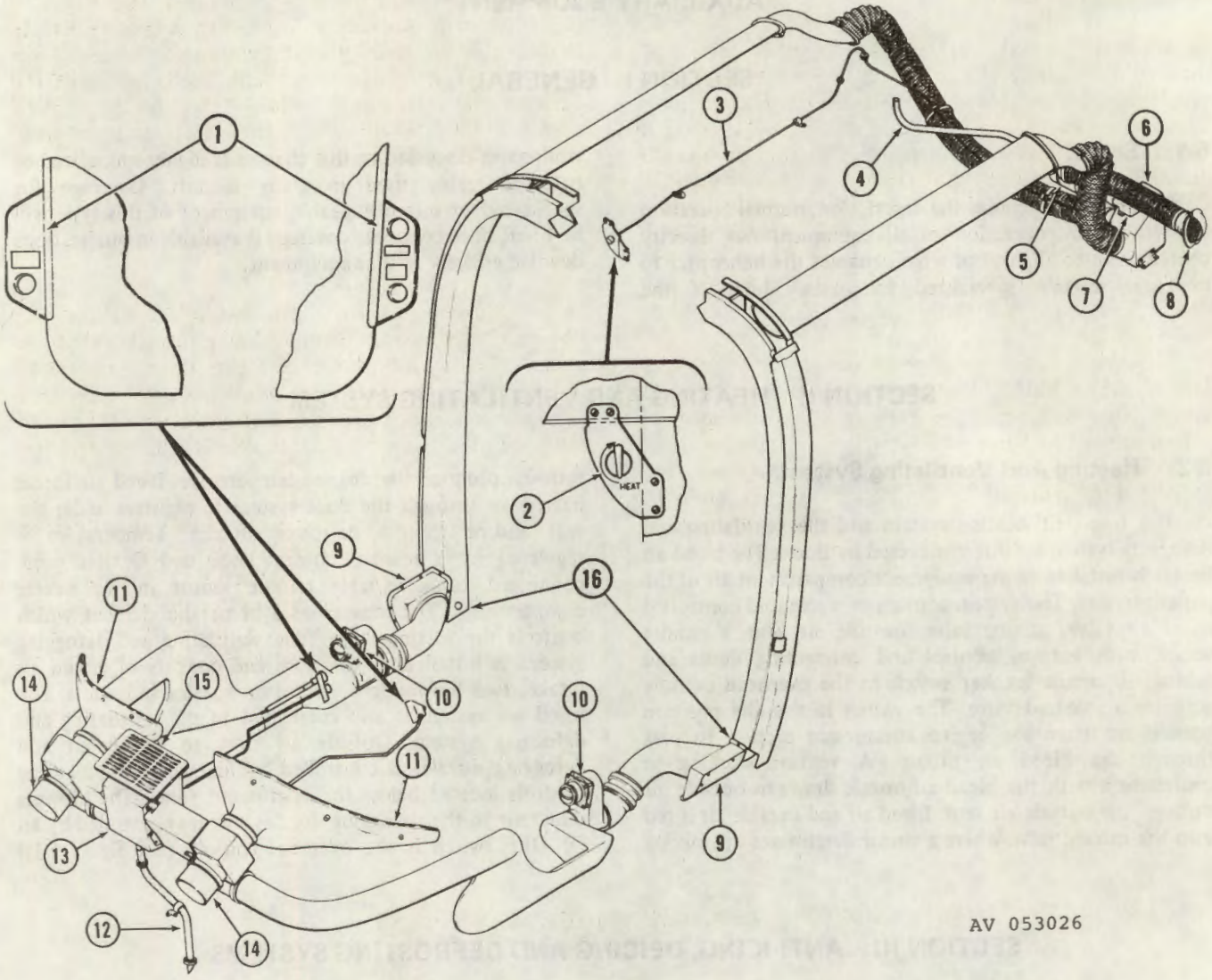
6-3. Principles Of Anti-Ice System.

When the system is in operation, compressor discharge air which has been heated due to compression, will flow through the anti-icing valve and tubes to the compressor front support passages. Hot air flows between the double wall outer shell and into the seven hollow radial struts. The hot air flowing through the radial struts exhausts either out of small slots in the trailing edge of the struts or out of the double wall bullet nose hub of the compressor front support.

a. Engine Anti-Icing System. The engine has an anti-icing system to prevent ice formation on the compressor front support. The anti-icing system includes an anti-icing valve mounted at the 12 o'clock position on the front face of the diffuser scroll, two stainless steel lines between the anti-icing valve and the compressor front support, and passages within the compressor front support. Protection for the anti-icing is provided by a circuit breaker on the overhead console.

b. The pitot heater is installed on the pitot head and functions to prevent ice forming in the pitot tube. Electric power for the pitot heater operation is supplied from the 28-volt helicopter electrical system. Circuit protection is provided by a 5 ampere circuit breaker switch on the overhead console.

c. Operation Pitot Heater System. The pitot heater switch should be in PITOT HTR position to prevent ice forming in pitot tube. To shut off pitot heater, position switch to OFF.



1. Vent and Defog Control
2. Heat Control
3. Heat Control Cable
4. Bleed Air Tube
5. Mixing Valve
6. Plenum
7. Remote Sensor
8. Fresh Air Inlet
9. Post Plenum
10. Air Distribution Valves
11. Windshield Defog Nozzle
12. Plenum Drain
13. Plenum Valve Assembly
14. Ventilating and Defogging Blower
15. Ram Air Intake Grill
16. Air Distribution Vents Cargo/Passenger Area

Figure 6-1. Heating and defrosting system

SECTION IV LIGHTING EQUIPMENT

6-4. Exterior Lights.

a. Position Lights. The position lights consist of three lights. A green light is located on the right horizontal stabilizer tip, and red light on the left horizontal stabilizer tip and a white light is located on the aft end of the tail boom. Electrical power is supplied from the 28-volt DC non-essential bus. Circuit protection is provided by the POS LTS circuit breaker on the overhead console. The position lights are controlled by the POS LTS switch on the overhead console. The switch is a three-position toggle switch with BRT forward DIM center and OFF aft position.

b. Anti-Collision Lights. The anti-collision lights are located one on top of the engine cowling and one centered at the lower section of the fuselage aft of the avionics compartment. Electrical power for the anti-collision lights is provided by the 28-volt DC electrical system. The anti-collision light switch is located on the overhead console. The switch is a two position toggle type labeled ANTI-COLLISION LTS and OFF. The forward position energizes the anti-collision light circuit.

c. Landing Lights. Two fixed landing lights are located in the lower nose section of the helicopter. The lights are controlled by a switch located on the pilot's collective lever switch box. The switch is labeled BOTH, DOWN and OFF. The aft light illuminates forward and the forward light illuminates downward. The switch in BOTH position illuminates both landing lights. In the DOWN position only the forward landing light is illuminated. Electrical power is provided from the 28-volt DC electrical system.

6-5. Interior Lights.

a. Instrument Lights. The instrument lights are all on one circuit and are controlled by a rheostat switch on the overhead console labeled INST LTS. Clockwise rotation of the rheostat knob activates the console panel circuit and increases brilliance. Counterclockwise rotation of the knob dims, with final movement (OFF) deactivating the electrical circuit.

b. Console Lights. The console lights are all on one circuit and are controlled by a rheostat switch on the overhead console labeled CONSOLE LTS. Clockwise rotation of the rheostat knob activates the console panel circuit and increases brilliance. Counterclockwise rotation of the knob dims, with final movement (OFF) deactivating the electrical circuit.

SECTION V OXYGEN SYSTEM

(Not Applicable)

SECTION VI AUXILIARY POWER UNIT

(Not Applicable)

SECTION VII ARMAMENT SYSTEM

6-6. Armament Subsystem XM27E1.

The armament subsystem XM27E1 is used on the left side of OH-58A helicopters. The aircraft is equipped with complete cabling and installation provisions for the XM27E1, making modification of the subsystem unnecessary. The subsystem can be completely removed or installed in a minimum amount of time to allow helicopter to be employed in a different mode of operation. The major components of the subsystem are: the gun assembly containing a 7.62 millimeter machine gun M134, a delinking feeder, and an electric gun drive assembly, a mount assembly containing a motor and sensor assembly, a control rod assembly, an ammunition container, a control box and a sight, reflex XM70E1 (figures 6-2 through 6-5).

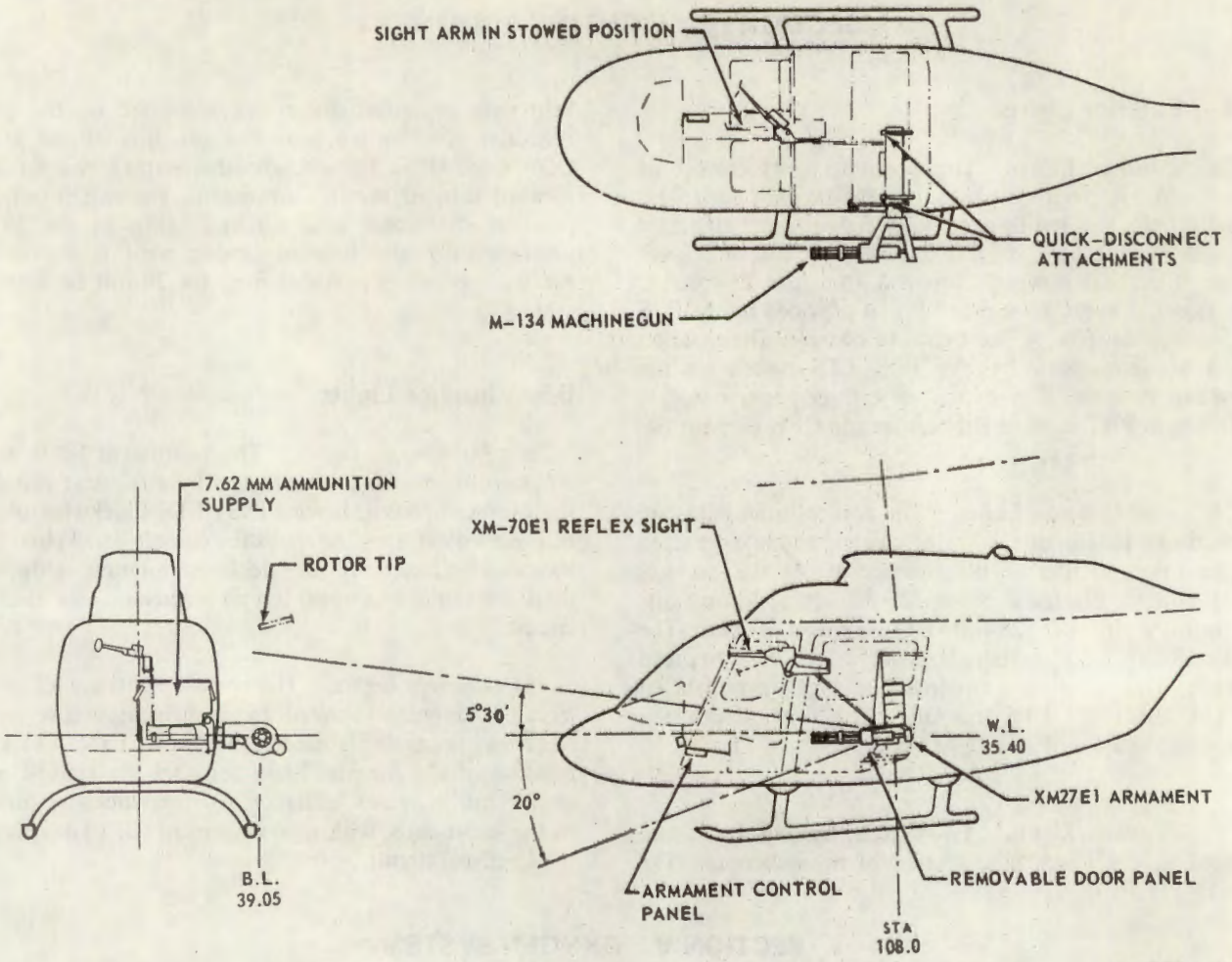


Figure 6-2. Components of armament system

6-7. Tabulated Data – Armament.

a. Armament Subsystem XM27E1.

(1) Weight (Subsystem W/O Ammo) . 117 lb. max.
(2) Weight (Subsystem W/Ammo W/O Spare can) . . . . . 234 lb. max.
(3) Weight (Subsystem W/Ammo W/ Spare Can) . . . . . 245 lb. max.
(4) Ammo Capacity . . . . . 2000 rds.
(5) Elevation Limits:
Elevation . . . . . 97.35 mils (+5 1/2°)
Depression . . . . . 354 mils (-20°)
(6) Azimuth Control . . . . . Maneuver Aircraft

b. Machine Gun M134.

(1) Caliber . . . . . 7.63 millimeter
(2) Cooling . . . . . Air
(3) Rate of fire:
Low . . . . . 2000 spm
High . . . . . 4000 spm
(4) Feed . . . . . M13 type, linked bolt
(5) Muzzle velocity . . . . . 2850 fps
(6) Rotation of barrels . . . . . Counterclockwise (Viewed from breech end)
(7) Weight . . . . . 112 lbs
(8) Barrel life . . . . . 100,000 rds

c. Drive Assembly.

(1) Type . . . . . Electric motor, dual speed
(2) Speed control . . . . . Electronic switch

d. Sight, Reflex XM70E1.

(1) Length (with mount) . . . . . 36 in.
(2) Width (extended) . . . . . 10 in.
(3) Width (stowed) . . . . . 14 in.
(4) Height . . . . . 9 in.
(5) Weight (with mount) . . . . . 4.8 lbs.
(6) Type . . . . . Collimated, Illuminated reticle

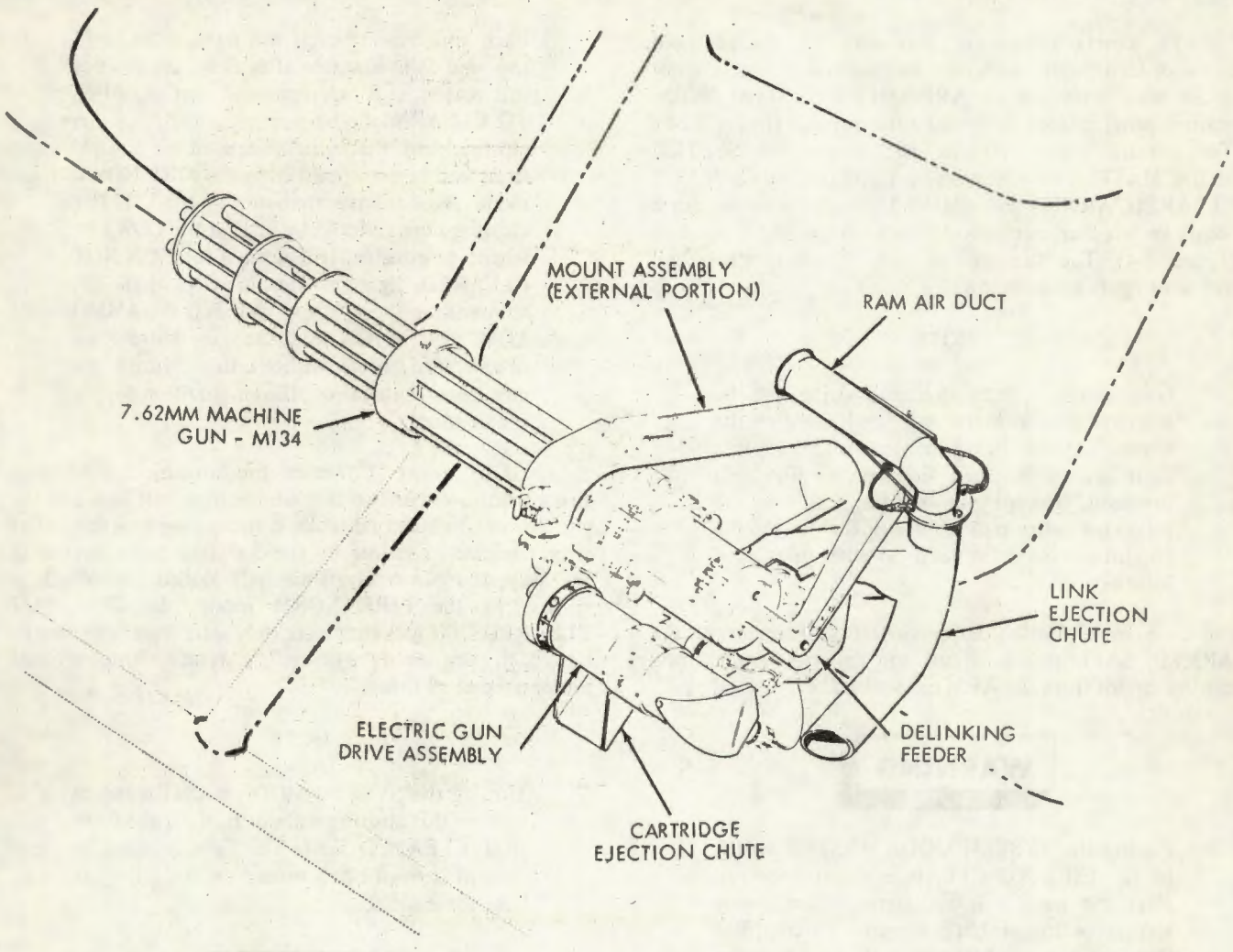


Figure 6-3. Gun assembly mounted

(7) Projection lamp . . . . . Dual filament
Reticle:
Line width . . . . . 1 mil
Outer circle diameter . . . . . 60 mil
Inner circle diameter . . . . . 30 mil
(8) Optical Characteristics:
Clean aperture . 0.94 x 1.4 in. (Beam-splitter)
Objective EFL . . . . . 4.0 in. nominal

e. Armament Subsystem Electrical Characteristics.

(1) Nominal operating voltage 28VDC
(2) Drive motor (steady state)
Slow rate max . . . . . 40 amp
Fast rate max . . . . . 75 amp
(3) Sight lamp . . . . . 0.68 amp (each filament)
(4) Operable temperature
ranged . . . . . -65°F to +165°F

f. Ammunition Authorized

(1) 7.62 Millimeter ball cartridge M59 (NATO)
(2) 7.62 Millimeter ball cartridge M80 (NATO)
(3) 7.62 Millimeter tracer cartridge M62 (NATO)
(4) 7.62 Millimeter armor piercing cartridge M61 (NATO)
(5) 7.62 Millimeter dummy cartridge M172 (inert loaded)

CAUTION

Do not use fluted case dummy cartridges.

6-8. Armament Control System.

The control system consists of trigger and elevation/depression switches on the pilot and copilot cyclic stick grips and an ARMAMENT SYSTEM MODE control panel located in the instrument panel (figure 2-14). The control panel contains a three-position SYSTEM MODE MASTER switch, warning lights marked GUN NOT CLEARED, ARMED and AMMO LOW, and a two-position toggle switch that mechanically locks in the SAFE position (figure 6-4). The function of the various controls and indicator lights are as follows:

NOTE

Gun elevation/depression and firing can be accomplished with the switches located on the copilot's cyclic stick grip. However, the reflex sight cannot be used from the copilot seat position. Except for sighting, all of the following information is applicable to the copilot position as well as the pilot seat location.

a. System Mode Master Switch. Disconnects the ARMED - SAFE switch circuit and gun sub-system firing control circuit from the ARM circuit breaker.

WARNING

Placing the SYSTEM MODE MASTER switch in the FIRE TO CLEAR position does not clear the gun; it is necessary to fire a one second or longer burst in order to complete the gun clearing. Firing is still possible when the GUN NOT CLEARED light is out. It is important to understand the AMMUNITION REMAINS IN THE DELINKING FEEDER after each gun clearing operation. Also the GUN WILL FIRE AGAIN IF THE TRIGGER IS DEPRESSED.

b. Fire To Clear. Connects the armament subsystem firing control circuits so that the gun motor will continue to operate for an additional 0.2 seconds after the trigger is released (gun feed solenoid on feeder disengaged) thereby firing remaining rounds in the gun chambers and ejecting live rounds from the feeder. De-energizing is caused by trigger release or the automatic 3-second burst limits if the trigger is not released with three seconds. The GUN NOT CLEARED light will extinguish after a successful clearing burst has been fired. After the gun has been cleared, firing may be resumed by merely depressing the trigger switch. The reflex sight reticle lamp remains illuminated as long as the SYSTEM MODE MASTER switch is in FIRE TO CLEAR.

NOTE

Each gun clearing burst will jettison 30 to 35 live rounds in low rate after firing ceases. For this reason, it is recommended that the FIRE TO CLEAR mode be used principally for gun clearing and that all anticipated or normal firing will be accomplished in the FIRE NORM mode. To conserve ammunition the XM27E1 clearing bursts should be fired at the LOW rate whenever possible. It is normal for GUN NOT CLEARED light to remain ON when the ammunition supply is exhausted. If the AMMO LOW light is ON and the gun barrels are observed to rotate without firing during the gun clearing operation, the ammunition supply is exhausted.

c. Fire Norm Connects the armament subsystem firing control circuits so that ammunition will be fed to the gun for one-half second while it is coasting to a stop after trigger release or cutoff by the 3-second burst limiter. In this way, the gun receivers are fully loaded for immediate firing. In the FIRE NORM mode, the GUN NOT CLEARED light will illuminate only after the trigger switch has been depressed. The reflex reticle lamp remains illuminated at all times.

NOTE

Turning the SYSTEM MODE MASTER switch to the OFF position will not turn off the GUN NOT CLEARED light. The light is wired to prevent it from being turned off until the gun has been cleared.

WARNING

WHEN THE GUN IS NOT CLEARED ANY ROTATION OF THE GUN BARRELS WILL CAUSE THE GUN TO FIRE.

d. Armed-Safe Switch.

(1) SAFE position disconnects the cyclic grip trigger switch circuits from the SYSTEM MODE MASTER switch and the ARM circuit breaker.

(2) ARMED position connects cyclic trigger circuits to the subsystem when either of the firing modes (FIRE NORM or FIRE TO CLEAR) is selected on the SYSTEM MODE MASTER switch. The ARMED position also illuminated the ARMED light.

NOTE

If the ARMED-SAFE switch is returned to SAFE while the SYSTEM MODE MASTER switch is set to FIRE NORM, the GUN NOT CLEARED light will remain illuminated.

e. Warning Lights. The function of the GUN NOT CLEARED light is described in a. above. The ARMED light illuminates whenever the ARMED-SAFE switch is moved to the ARMED position, above. The AMMO LOW light is illuminated when the ammunition is running low - approximately 400 rounds remaining or 6 seconds of fire at high rate. The AMMO LOW light is actuated by a microswitch in the low ammunition switch assembly located on the gun mount assembly. The switch is operated by a actuator block located in the lower leveler assembly in the ammunition box.

f. Cyclic Grip Trigger Switches.

(1) The switch first step position energizes the low (2000 shots per minute) fire rate circuit of the gun drive motor.

NOTE

At either the high or low firing rate, the gun will stop firing after 3-seconds because of the subsystem burst limiter. The trigger must be released and pulled again for each additional burst.

(2) The switch second step position energizes the high (4000 shots per minute) fire rate circuit of the gun drive motor.

NOTE

Deleted

g. Cyclic Grip Elevation/Depression Switches. With the ARM circuit breaker depressed the elevation/depression switches have a continuous supply of power that is unaffected by the position of any of the other control system switches. Pressing the switch upward depresses the gun 20 degrees from level, pressing the switch downward elevates the gun 5 1/2 degrees above level.

CAUTION

The elevation/depression motor has no limit switches. To prevent elevation drive motor overheating, do not hold the elevation/depression switch on after the system has reached its limit of travel. System's limit can be determined when movement of sight has stopped in either depression or elevation.

6-9. Sight, Reflex XM70E1.

a. Plunger Assembly And Detent. The plunger assembly is located on the end of the sight operating arm. The detent is centrally located on the left side of the reticle housing. When sight is to be used, the operating arm is swung out of its stowed position to the right until the plunger assembly rides over the detent and locks the arm in operating position. Two plate stops, one on the reticle housing and one on the clevis of the pivot arm, assure positive positioning of the sight for operating use.

b. Height Adjustment Knob. This adjustment knob provides a means for locking the sight at a convenient viewing height, depending upon individual pilot's eye level. Counterclockwise rotation of the knob unlocks the sight to be raised or lowered within its adjustment range. Clockwise rotation of the knob locks the sight at the selected position. When extreme gun depression angles are used, a higher than normal sight adjustment level will make sighting easier.

c. Elevation Control Assembly Knob. This adjustment knob is used to set the sight for a preselected (expected) target distance. A white numerical scale on the rotating portion of the knob is graduated in meters, with a range of 0 to 1000. The range is selected by rotating the knob until the expected target range marking is aligned with the white index arrow adjacent to the knob scale. When the expected target range has been set, the sight is adjusted for the gravity drop of the projectiles at that distance. If the target being fired upon is at the expected range, the center of the reticle will coincide with the point of impact. At shorter or longer distances, it will be necessary to maneuver the aircraft to lower or raise the sight reticle a proportionate distance below or above the aiming point.

NOTE

The yellow range markings are intended for use with the XM8 armament subsystem and should be locked out of position when the XM27E1 subsystem is being used.

d. Filament Selector Switch. The filament selector switch receives electrical power from the ARM circuit breaker and SYSTEM MODE MASTER switch. The filament selector switch is a two-position toggle switch located on top of the lamp housing. When moved to either position, one filament of the reticle lamp on the reticle pattern is illuminated. The forward switch position is the normally used position. The rear position (spare filament) should only be used after failure of the normal or primary filament.

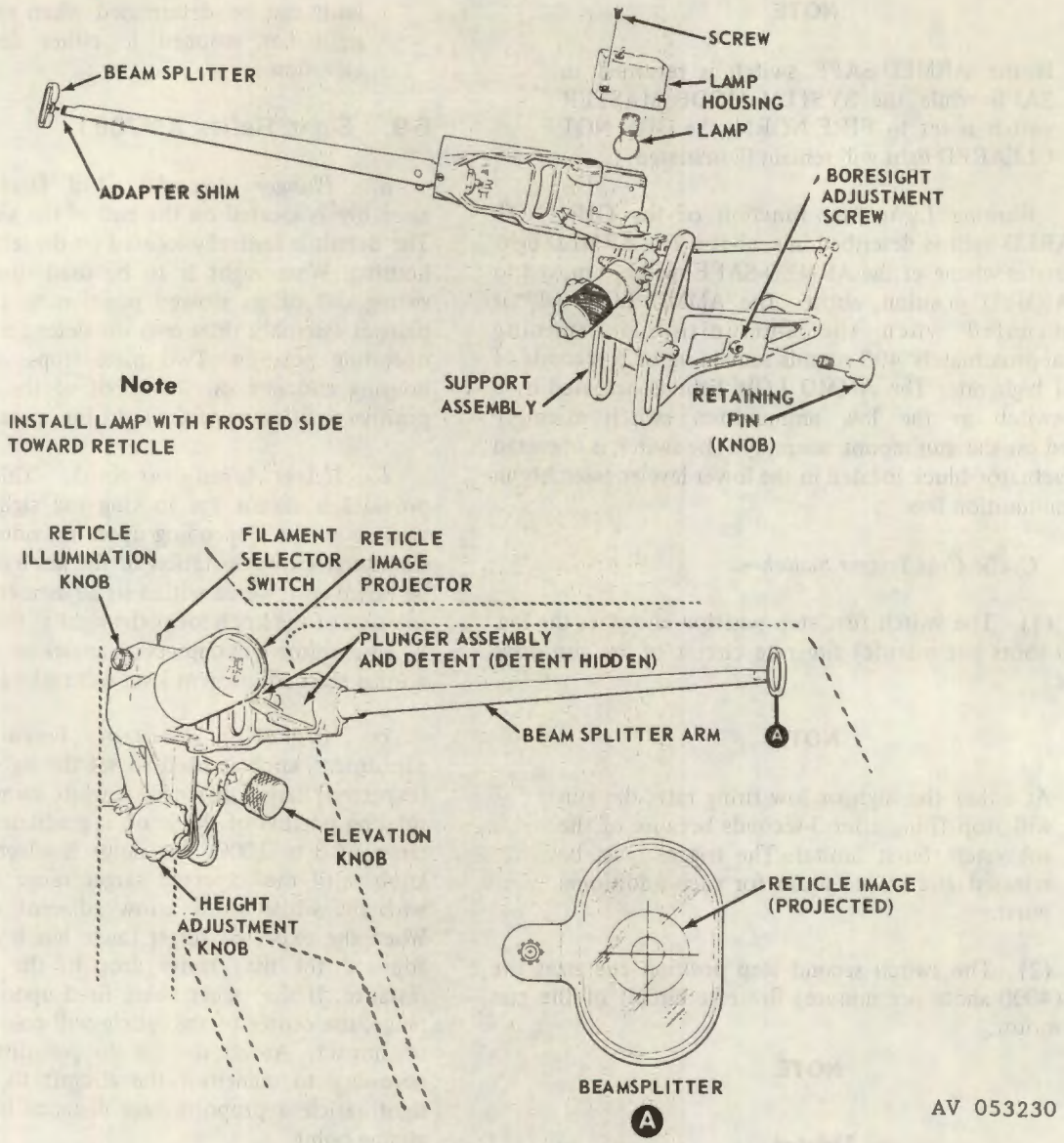


Figure 6-4. Reflex sight XM70E1 control and reticle

e. Reticle Illumination Knob. The reticle illumination knob is located on the upper portion of the lamp housing clockwise rotation of the knob increases reticle illumination intensity; counterclockwise rotation decreases intensity.

6-10. Preflight Checks.

a. Exterior Check.

WARNING

Copilots door must remain on during firing of weapons.

(1) Gun - Installed and secured. Check that front mount lock handle is in LOCKED position and rear mount is secure.

(2) Clear gun - standing behind the gun facing forward.

(a) No personnel in front of gun.

(b) Rotate barrels clockwise one barrel position (or opposite direction of rotation).

(c) Remove safing sector and housing cover.

Figure 6-5. Armament control panel

(d) Rotate barrels counterclockwise to visually check each chamber and remove any cartridges.

(3) Check each bolt for lubrication and freedom of movement.

(4) Electrical connections - check for security and general condition.

(5) Clearing guide - check freedom of movement.

(6) Chuting - check for secure attachment.

(7) Delinking feeder - Check timing by pressing both timing pins.

(8) Ram Air Duct - Check for condition and security of attachment.

(9) Ammunition container - Loaded, ammunition belt engaged in delinking feeder.

(10) Gun elevation - Depressed below door sill.

b. Cabin Check

(1) Ammunition box - Check cover secure, and ammunition container secure.

(2) Sight linkage - Check security and general condition.

(3) Mounting points - Check security.

(4) Downstop - Installed and Secure.

c. Cockpit Check

(1) ARMT PWR and ARMT circuit breakers - Depressed.

(2) System mode master switch - OFF.

(3) Armed - SAFE switch - SAFE.

(4) BAT switch - on.

(5) SIGHT FILAMENT SELECTOR switch - rear (spare filament).

(6) SYSTEM MODE MASTER SWITCH - FIRE/ NORM.

WARNING

Do not turn armed - safe switch away from the safe position during the following checks.

(7) Reflex sight - Adjust height, note reticle and lock.

(8) RETICLE ILLUMINATION KNOB - Desired intensity.

(9) SIGHT FILAMENT SELECTOR SWITCH - Forward (primary filament), check that reticle is still visible.

(10) SYSTEM MODE MASTER switch - OFF.

(11) SIGHT ELEVATION CONTROL KNOB – Set to expected target range.

(12) Elevation/Depression switch - Check full travel of gun.

NOTE

The yellow range markings are intended for use with the XM8 armament subsystem and should be locked out of position when the XM27E1 subsystem is installed.

(13) Reflex sight - Move to stowed position if desired.

(14) OH-58A Adapter shim - Installed.

6-11. In-Flight Operation.

a. Before Firing.

(1) Reflex sight - Position for use.

(2) SIGHT ELEVATION CONTROL KNOB - Reset distance if necessary and if time permits.

(3) SYSTEM MODE MASTER switch - FIRE NORM or FIRE TO CLEAR.

NOTE

If four or more 3-second firing bursts will be fired in extremely rapid succession, it is advisable to use the FIRE TO CLEAR mode rather than the FIRE NORM mode. Repeated firing of full 3-second bursts in the FIRE NORM mode increases possibility of ammunition "cook off" and gun jamming.

(4) RETICLE ILLUMINATION KNOB - Reset intensity if required.

(5) ARMED - SAFE switch - ARMED.

(6) Gun elevation/depression switch - As required.

b. Firing.

(1) Aircraft - Maneuver as required to position reticle pattern on target.

WARNING

Firing should be accomplished in short bursts as controlled by a 3-second burst limiter. If combat emergency requires expending a full complement of ammunition (2,000 rounds) by continued re-cycling of the burst limiter, a minimum of 15 minutes cooling time must be observed before starting to fire the next complement. Failure to comply with the above procedure will result in possible barrel failure and a definite reduction in barrel life.

(2) Trigger switch - Lift guard and depress. Depress to low or high firing rate position as desired.

c. After Firing.

(1) SYSTEM MODE MASTER switch - FIRE TO CLEAR.

WARNING

Do not depress trigger until the clearing burst can be directed into a safe area.

(2) Trigger switch - Lift guard and momentarily depress to low or high firing rate position to complete clearing cycle.

(3) GUN NOT CLEARED light - Out.

NOTE

It is normal for the GUN NOT CLEARED light to remain ON when the ammunition supply is exhausted. If the AMMO LOW light is ON and the gun barrels are observed to rotate without firing during the gun clearing operation, the ammunition supply is exhausted.

(4) ARMED - SAFE switch - SAFE.

(5) SYSTEM MODE MASTER switch - OFF.

(6) Gun elevation/depression switch - Depress gun below door sill level.

(7) Reflex sight - STOWED POSITION.

d. Before leaving Helicopter. Verify that control switch and lights are in the specified positions or conditions.

(1) GUN NOT CLEARED light - OFF.

(2) ARMED - SAFE switch - SAFE.

(3) ARMED light OFF

(4) SYSTEM MODE MASTER switch - OFF.

(5) Helicopter electrical power switch - OFF.

(6) Reflex sight - STOWED position.

6-12. Emergency Procedures.

a. Gun Fails To Fire.

(1) ARMT PWR and ARMT circuit breakers - Depressed.

(2) SYSTEM MODE MASTER switch - FIRE NORM.

(3) ARMED - SAFE switch - ARMED.

(4) Trigger switch - Lift guard and depress. If gun fails to fire, release trigger switch.

(5) SYSTEM MODE MASTER switch - FIRE TO CLEAR.

(6) Trigger switch - Lift guard and depress. Depress trigger to both low and high rate position.

b. Gun Still Fails To Fire.

(1) Trigger switch - Release

(2) ARMED - SAFE switch - SAFE.

(3) SYSTEM MODE MASTER switch - OFF.

(4) ARMT PWR and ARMT circuit breakers - Pulled.

WARNING

Upon landing, immediately alert personnel to probable presence of live rounds in gun. ANY ROTATION OF THE GUN BARRELS WILL CAUSE THE GUN TO FIRE. Summon armament repairman to clear weapon.

c. Runaway Gun.

(1) ARMED-SAFE switch - SAFE.

(2) SYSTEM MODE MASTER switch - OFF.

(3) ARMT PWR and ARMT circuit breakers - Pulled.

WARNING

Upon landing, immediately alert personnel to presence of live round in gun. ANY ROTATION OF GUN BARRELS WILL CAUSE GUN TO FIRE. Summon armament repairman to clear weapons.

d. Sight Reticle Not Illuminated.

(1) Sight filament selector switch. Move switch to spare filament position.

(2) Reticle illumination knob - Rotate Clockwise. Rotate to increase brilliance.

(3) If reticle is still not visible, accomplish the following checks:

(a) SYSTEM MODE MASTER switch - FIRE NORM or FIRE TO CLEAR.

(b) ARMT PWR and ARMT circuit breakers - Depressed.

e. Generator Out, Caution Light On. If helicopter GEN OUT caution light illuminates, any additional firing should be accomplished at the high rate.

NOTE

Firing - Two thousand rounds will consume approximately twelve percent of the energy of a fully charged battery.

6-13. Destruction of Material.

Ordinarily the armament should be destroyed in conjunction with the destruction of the aircraft. Priority should be given to the weapon and sighting equipment.

6-14. Operational Checks.

WARNING

Do not attempt to perform operational checks with ammunition present in gun, delinking feeder, ammunition chutes or container.

a. Place BAT and GEN switch in OFF position and connect 28-volts DC power to the helicopter.

b. Depress ARMT and ARMT PWR circuit breakers.

CAUTION

Gun operation (dry) firing shall be held to a minimum to avoid damaging firing pins. The gun safing sector must be installed to prevent gun jamming and damage to bolt assemblies.

6-15. Loading, Unloading And Clearing Instructions.

a. Loading Instructions.

WARNING

Do not load more than 2000 rounds of ammunition in the container.

(1) Prior to loading the gun check to be sure th following conditions exist.

(a) Helicopter BAT and GEN switches OFF.

(b) Armament SYSTEM MODE switch, OFF and ARMED SAFE switch in SAFE position.

(c) Warning light out.

(2) Fold ammunition belt into ammunition container assembly and work it through ammunition chutes to the delinking feeder.

(3) Remove safing sector and housing cover of gun.

(4) Feed ammunition into delinking feeder by working through open top of ammunition chute.

(5) Rotate gun barrel counterclockwise (as viewed from rear of gun) until a round drops from the delinking feeder.

(6) Install safing sector and housing cover on gun and install gun fairing. Close and latch ammunition container assembly cover.

b. Unloading And Clearing Instructions.

(1) Prior to unloading and clearing the gun, check to be sure the following conditions exist.

(a) Helicopter BAT and GEN switches, OFF.

(b) Armament SYSTEM MODE switch, OFF and ARMED/SAFE switch in SAFE position.

(c) Warning lights out.

WARNING

A firing pin may be cocked and ready to be released. Before removing safing sector and housing cover, rotate barrels clockwise (opposite firing direction) slightly to prevent firing.

(2) Remove safing sector and housing cover.

(3) Release ammunition chute from delinking feeder and remove one cartridge from the linked cartridge.

(4) Manually rotate barrels counterclockwise, viewed from breech end (firing direction), until remaining cartridges are cleared from delinking feeder and the gun.

(5) Open cover on ammunition container assembly and pull linked ammunition from chutes and into ammunition container assembly. Remove ammunition container assembly if required.

SECTION VIII PHOTOGRAPHIC EQUIPMENT

(Not Applicable)

SECTION IX AUTOMATIC STABILIZATION EQUIPMENT

(Not Applicable)

SECTION X MISCELLANEOUS EQUIPMENT

6-16. Data Case.

A data case for maps, flight reports, etc., has been provided. The data case is located on the aft side of the vertical column.

6-17. Mooring Fittings.

One mooring fitting is provided below each crew door and one on aft lower section of the fuselage, forward of the tail boom. All mooring fittings are dual purpose jackpoint and mooring fittings.

6-18. Tow Rings.

To facilitate towing the helicopter, with ground handling wheels lowered, a tow ring has been provided on the inboard side of each skid gear directly beneath the crew doors.

6-19. Rotor Tie-Downs.

A rotor tie down is provided for use in mooring the aft main rotor blade. The tie down prevents the rotor from see-sawing when the helicopter is parked. The tie down can be stowed in the avionics compartment.

6-20. Engine Inlet Shields and Pitot Covers.

A combined engine inlet and pitot cover is provided to prevent entrance of dust etc., into the engine inlet and pitot system when helicopter is parked. The cover can be stowed in the avionics compartment.

6-21. Engine Exhaust Covers.

Individual covers are provided for the exhaust stacks to prevent entrance of foreign objects into the engine exhaust when helicopter is parked. The covers can be stowed in the avionics compartment.

CHAPTER 7

OPERATING LIMITATIONS

SECTION I GENERAL

7-1. Scope.

All important limitations that must be observed during normal operations of the helicopter are provided in this Chapter. Limitations that are characteristic only to a specialized phase of operation are not repeated here.

NOTE

Anytime any limitation defined in this chapter is exceeded, a DA Form 2408-13 entry is required for maintenance action.

SECTION II LIMITATIONS

7-2. 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 purpose. Center of gravity limitations are also covered in the chapter. Close attention must be given to the instrument markings, since they represent limitations that are not necessarily repeated in the text.

7-3. Minimum Crew Requirements.

The minimum crew consists of the pilot only. Additional crewmembers, as required, will be added at the discretion of the Commander, in accordance with appropriate Department of the Army Regulations.

NOTE

Minimum allowable weight for crew compartment with left and right armor side panels installed is 150 lbs.
Minimum allowable weight for crew compartment with left and right armor side panels removed is 170 lbs.
Maximum allowable weight for crew compartment is 440 lbs.

7-4. Instrument Markings.

The operating ranges for both the helicopter and engine are listed below and shown on figure 7-1.

NOTE

Refer to Chapter 10 for exceptions of engine oil pressure and temperature.

a. ENGINE OIL PRESSURE.
50 psi MINIMUM
130 psi MAXIMUM

b. ENGINE OIL TEMPERATURE.
-54°C MINIMUM
107°C MAXIMUM

c. POWER TURBINE TACHOMETER
101% MINIMUM
103% MAXIMUM

NOTE

TRANSIENTS

15 second maximum N2 limit varies linearly from 110% in autorotation (0 torque) to 105% at take-off power (92 PSI torque). See figure 7-4.

d. GAS PRODUCER
104% RPM MAXIMUM

NOTE

TRANSIENTS

105% (Maximum of 15 seconds).

FUEL GRADE JP-4 OR JP-5

POWER TURBINE TACHOMETER

- 101% Minimum
- 101% to 103% Continuous Operation
- 103% Maximum

ROTOR TACHOMETER

- 330 RPM Minimum
- 330 to 390 Continuous Operation
- 390 RPM Maximum
- 172 to 206 RPM Avoid Prolonged Operation

TORQUEMETER

- 0 to 79 PSI Continuous Operation
- 79 to 92 PSI 5 Minute Operation
- 92 PSI Maximum

GAS PRODUCER TACHOMETER

- 62 to 104%
- 104% Maximum

AIRSPEED

- 120 Knots Maximum
- 100 Knots Recommended Maximum IAS for Autorotation.

ENGINE OIL PRESSURE

- 50 to 110 PSI Avoid Continuous Operation
- 110 to 130 PSI Continuous Operation
- 130 PSI Maximum

ENGINE OIL TEMPERATURE

- 60°C to 107°C Continuous Operation
- 107°C Maximum

TURBINE OUTLET TEMPERATURE

- 927° Maximum for Starting
- 330° to 693°C Continuous Operation
- 693° to 749°C Starting and Transient
- 749°C Maximum (30 Minute Limit Below 40°C O.A.T. (5 Minute Limit Above 40°C O.A.T.)

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Figure 7-1. Instrument markings

e. TURBINE OUTLET TEMPERATURE
749°C TAKE-OFF (30 minute limit below 40°C O.A.T.)
(5 minute limit above 40°C O.A.T.)

f. 693°C MAXIMUM Continuous
749°C to 843°C During power transient (6 seconds maximum)
Intentional use of these Limitations in excess of 749°C is not authorized

g. TORQUE PRESSURE
0 to 79 PSI - Continuous operation
79 to 92 PSI - 5 minute operation
92 PSI - Maximum (See figure 7-4)

7-5. Main Rotor Limitations

a. Power OFF - 330 RPM to 390 RPM

b. Power ON - 347 RPM = 101% N2
354 RPM - 103% N2

c. TRANSIENT - - 361 - 105% N2 (15 seconds maximum)

7-6. Engine Limitations During Start.

Overtemperature Limitations:

a. To 749°C No Limit

b. 749°C to 927°C Maximum (10 seconds)

c. Never exceed 927°C.

7-7. Center Of Gravity Limitations.

The maximum center of gravity limitations are shown in figure 7-2.

7-8. Transmission Oil Temperature Limits.

Warning Light ON above 110°C.

7-9. Transmission Oil Pressure.

Warning light ON below 30 psi and above 80 psi.

7-10. Firing Limitations.

WARNING

Copilot's door must remain on during firing of weapons.

Barrel life is limited to 40,000 rounds when the 15 minute cooling period between 2000 round loads is not observed.

7-11. Towing Limitations.

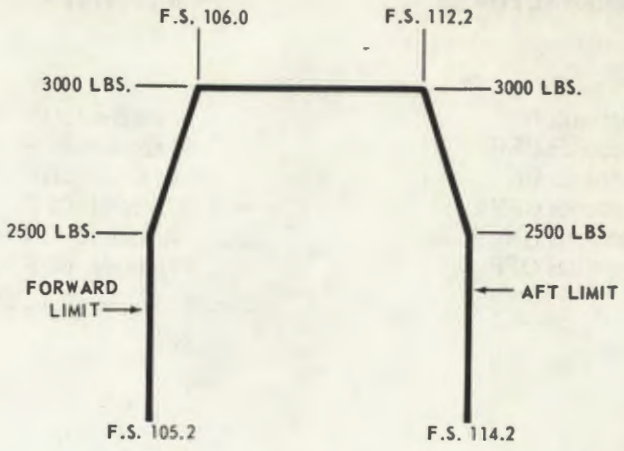
The maximum gross weight for towing the helicopter is 3000 pounds on prepared or unprepared surfaces.

7-12. Weight Limitations.

3000 Pounds Maximum Gross Weight.

7-13. Minimum Height For Safe Landing After Engine Failure.

The mininmum height required for a safe autorotational landing (without aircraft damage) after engine failure is a conservative estimate of the relative importance of various parameters. See figure 7-3. The chart shows the critical areas of operation for gross weights of 2400 to 3000 pounds. The co-ordinates of density altitude (feet) vs gross weight (pounds) indicates the range of various parameters from which a landing may be considered safe.



CENTER OF GRAVITY LIMITS DIAGRAM

AV 053029

LATERAL GRAVITY LIMITS

LEFT LIMIT	2.4 Inch.
RIGHT LIMIT	2.6 Inch.

Figure 7-2. Center of gravity diagram

7-14. Wind Limitations.

a. Maximum Starting and Stopping - Up to 45 knots.

b. Maximum Gust Spread - 15 knots.

7-15. Airspeed Limit.

a. 120 knots maximum, (armed, unarmed, or any combination of doors on or off) sea level to 3000 feet.

b. Decrease Vne 3 knots per 1000 feet above 3000 feet.

c. 30 knots rearward, 35 knots sideward.

7-16. Power Turbine (N2 Limits) See figure 7-4.

7-17. Emergency Fuel Operation Limit.

MIL-G-5572 (without TCP)
6 hours maximum between overhauls

7-18. Starter Limits.

a. Starter Engage Time - Before light-off. Limited to the following:

EXTERNAL POWER	BAT POWER
25 seconds ON	40 seconds ON
30 seconds OFF	60 seconds OFF
25 seconds ON	40 seconds ON
30 seconds OFF	60 seconds OFF
25 seconds ON	40 seconds ON
30 minutes OFF	30 minutes OFF

b. Starter Engage Time - If light occurs during first 20 seconds. Limited to the following:

EXTERNAL/BAT POWER
1 minute ON
1 minute OFF
1 minute ON
1 minute OFF
1 minute ON
30 minutes OFF

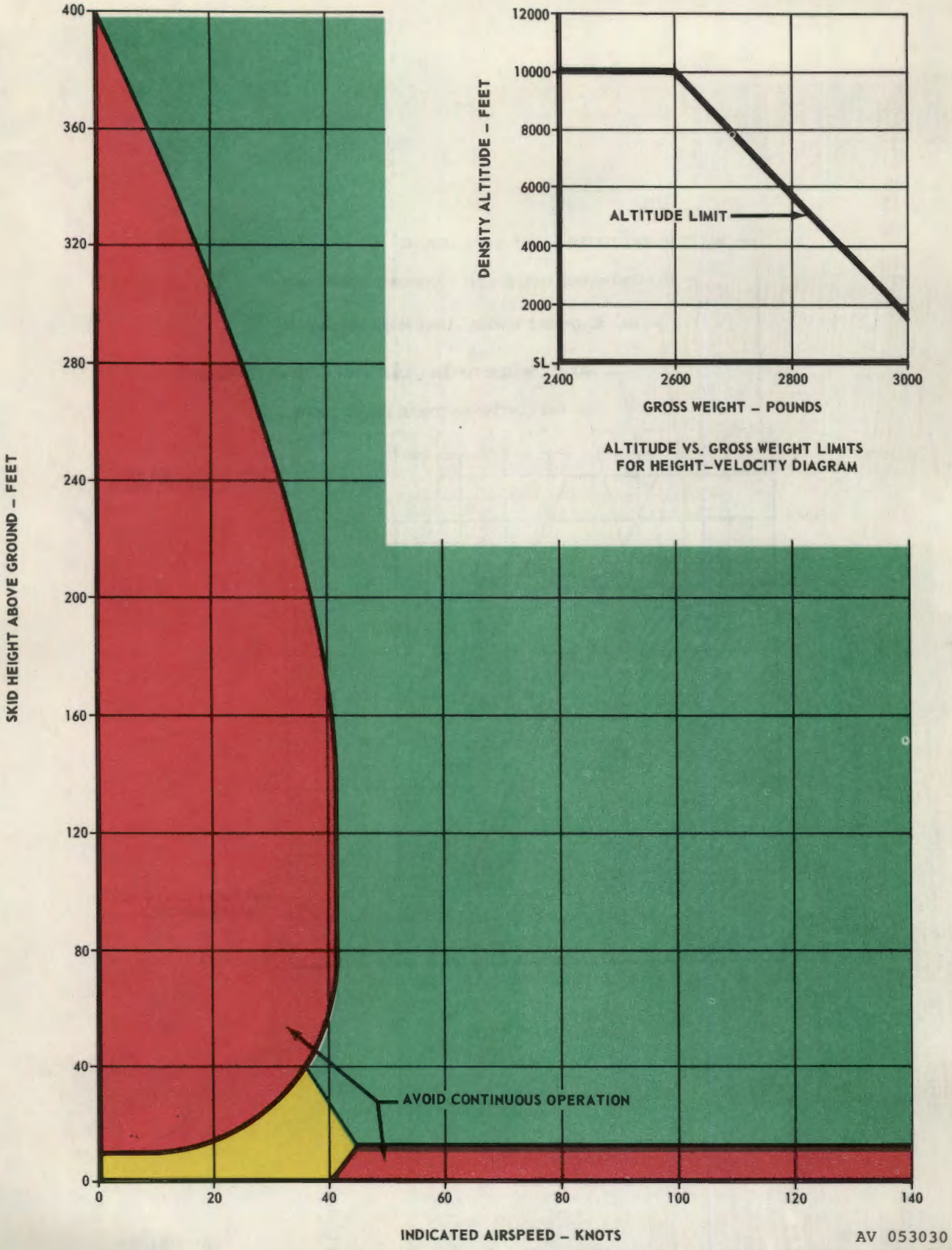


Figure 7-3. Height velocity diagram

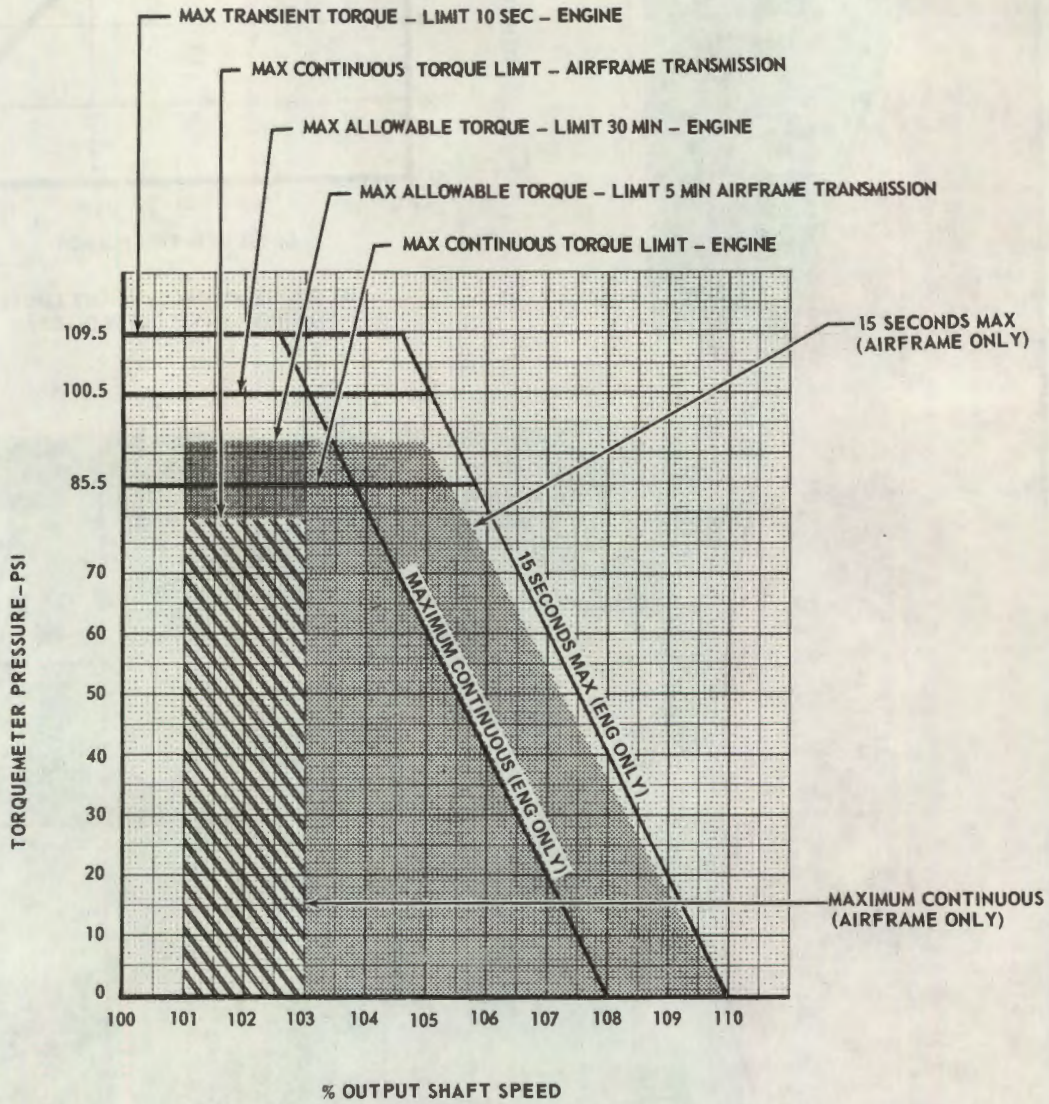


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Figure 7-4. Maximum allowable N2 speed

CHAPTER 8

FLIGHT CHARACTERISTICS

SECTION I GENERAL

8-1. Scope.

The purpose of this chapter is to describe the flight characteristics of the aircraft.

SECTION II GENERAL FLIGHT CHARACTERISTICS

8-2. Operating Characteristics.

The flight characteristics of this helicopter in general, are similar to other single rotor helicopters.

8-3. Rotor Blade Stall.

Rotor blade stall is not a characteristic of the aircraft. The power limits and V_{NE} limits will be reached prior to a blade stall.

8-4. Spins.

The loss of the tail boom or anti torque rotor will create an spinning attitude. Refer to chapter four EMERGENCY PROCEDURES for recovery action.

SECTION III FLIGHT CONTROLS

8-5. Flight Controls.

Refer to Flight Control System, Chapter 2.

8-6. Flight With External And Asymmetrical Loads.

Refer to Weigh and Balance, CHAPTER 12, SECTION III.

CHAPTER 9

SYSTEMS OPERATION

(Not Applicable)

CHAPTER 10

WEATHER OPERATIONS

SECTION I GENERAL

10-1. Scope.

The purpose of this Chapter is to provide information relative to operation under extreme weather conditions. This includes, turbulent air flight, extreme cold and hot weather operations, and night flying. Description of the equipment is not covered, since that information is appropriately covered in other chapters. Except for some repetition which is necessary for continuity of thought, the flight procedures in this chapter contain only procedures that differ from, or are in addition to normal procedures covered in Chapter 3. The checklists presented in Chapter 3, and the operating procedures or the navigation equipment in Chapter 5, are to be used in conjunction with the information presented in this Chapter.

SECTION II INSTRUMENT FLIGHT PROCEDURES

Instrument Flight Prohibited (Not Applicable)

SECTION III COLD WEATHER OPERATION

10-2. Cold Weather Operation.

a. Preparation For Flight.

(1) Remove ice and snow from the engine air inlet.

(2) Insure all engine controls are operable through the full range of travel without any binding or excessive stiffness.

(3) Insure the Fuel Control Heating Valve is in the open position and properly saftied.

b. Engine Starting. The nickel-cadmium battery will provide low temperature starting power. Placing a large load on the battery will cause the electrolyte to boil from the heat generated by the chemical action produced within the cells. By properly utilizing this heat, the battery can be made self-warming to the point where it can be used to start the engine as described in (1) below.

NOTE

Careful attention should be given the DC AMP indicator during cold weather operation. To insure a fully charged battery the engine should be run long enough for the amperage to reach a stablilzed value (approximately 25 amperes, depending on electrical load). Because the charge rate for a nickel-cadmium battery is very high, stabilization requires only about 15-20 minutes; however, if the engine is shut down before the battery is fully charged, cold restarting without external power may be impossible.

(1) Starting at −18°C to −32°C (0°F to −25°F). Starting a cold-soaked engine with a cold-soaked battery is accomplished by initiating the normal starting procedure described in Chapter 3, with the following one exception: Circuit breakers for all unnecessary electrical equipment should be pulled to OFF. Engaging the starter throws a large load on the battery since the oil is thickened and the engine is stiff. Keep the starter engaged for a maximum of 30 seconds or until the engine reaches 12 percent N1 which is minimum light-off RPM at temperatures below −18°C (0°F). If 12 percent N1 is reached before 30 seconds have elapsed, normal starting procedure is followed until the engine reaches idle. If 30 seconds elapse before the engine reaches 12 percent N1, release the starter and allow the engine to coast to a stop. Place the electrical power BAT switch to OFF and allow the engine to stand for 3 minutes. During this time the heat generated in the electrolyte soaks into the battery plates and warms the battery. At the expiration of 3 minutes, engage the starter again and execute a normal start, bearing in mind that light-off at 12 percent N1 is permissible. If 12 percent N1 speed cannot be obtained on the second start attempt, external power should be used to start the engine.

(2) Starting at −32°C to −54°C (−25°F to −65°F). Starting in this temperature range is accomplished in the same manner as at temperatures from −18°C to −32°C (o°F to −25°F), except that external power (APU) must be provided for starting power. The minimum permissible light-off RPM remains 12 percent N1.

(3) Engine ice after starting (during idle). Should ambient conditions cause engine compressor icing to occur, the first engine reaction will be one of air starvation indicated by a gradual but constant increase in TOT. with corresponding decreases in N1 RPM. The immediate application of engine anti-ice air will eliminate any ice accumulations and restore normal engine operation.

c. Engine Oil Pressure and Temperature. During cold weather operations 150 psig engine oil pressure is allowed following an engine start. When the 130 psig limit is exceeded, operate engine at idle RPM until normal engine oil pressure limits are obtained. When the engine oil pressure is within normal limits engine may be operated within full range of temperature limits, (-54°C to 107°C) without regard to engine oil temperature markings.

CAUTION

To prevent the possibility of auto acceleration engines which have not been modified by the addition of fuel control heat valve shall be operated with the following engine warm-up.

d. Engine Warm Up. The purpose of the warm-up is to improve engine reliability by precluding the possibility of auto-acceleration from idle which can occur during unique metrological conditions of low temperature and unusually high humidity.

Ambient temperature	Warm-up time
-30°C	10 min
-20°C	7 min
-10°C	8 min
0°C	3 min
+10°C	1 min

NOTE

For intermediate temperature use next lower temperature specified.

e. Take Off And Flight. Engine anti-ice should be used when flying in visible moisture at OAT 4°C (40°F) or below.

f. Fuel Management. During cold weather always top off tank each night and after every flight if possible. Carefully check for presence of water each Daily Inspection and before each flight.

SECTION IV DESERT AND HOT WEATHER OPERATION

10-3 Hot Weather Operation.

Hot weather operations are the same as normal operations. Hot weather operation requires constant monitoring of the TOT indicator. The initial start is not as critical as subsequent starts; however, during each start in hot weather the starts should be allowed to reach maximum RPM (peak out) before igniting (turning twist grip throttle to idle stop), and the minimum light off speed of 15 percent N1 should be rigidly observed. In restarting a hot engine, the TOT indicator should be checked after the starter has peaked out, and ignition should be delayed until the temperature has dropped to 200°C (392°F) or below.

NOTE

During hot weather operation, engine performance can be temperature-limited rather than torque-limited; therefore, the TOT indicator must be monitored as well as the torquemeter to insure that neither limit is exceeded.

SECTION V TURBULENCE AND THUNDERSTORM OPERATION

10-4. Thunderstorms.

Intentional flight into thunderstorms is prohibited.

10-5. Turbulence.

Information pertaining to OH-58A flight characteristics in turbulence will be furnished at a later date.

CHAPTER 11

CREW DUTIES

NOTE

Crew duties are listed in Chapter 3, and Chapter 6.

CHAPTER 12

WEIGHT AND BALANCE COMPUTATION

SECTION I GENERAL

12-1. Scope Of Weight And Balance Data.

This chapter contains sufficient instructions and data so that the pilot, knowing the basic weight and moment of the helicopter, can compute any combinations of weight and balance. No computers are provided for the helicopter; hence no computer instruction is included.

SECTION II INTRODUCTION

12-2. Introduction.

NOTE

For the purpose of clarity, Model OH-58A helicopters are in Class I Category.

The purpose of this chapter is to provide appropriate information required for the computation of weight and balance for loading an individual helicopter. The data inserted on charts and forms are applicable only to the individual helicopter, the serial number of which appears on the title page of various forms and charts. The charts and forms may change from time to time, but the principle on which they are based will not change. The forms currently in use are the DD 363 series.

The aircraft manufacturer will insert all identifying data, and complete one Weight and Balance Form F, if applicable, at time of delivery, (Refer to TM 55-405-9 and AR 95-16.) The helicopter must be weighed periodically as required by pertinent directives, when major modification or repairs are made, when pilot reports unsatisfactory flight characteristics, and when the basic weight data contained in the records are suspected to be in error.

SECTION III CHART EXPLANATIONS

12-3. 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. At all times, the last weight and moment/constant entry is considered current weight and balance status of the basic helicopter.

12-4. Chart C Use.

At time of delivery of a new helicopter, the manufacturer entered the basic weight and moment/constant of the individual helicopter. This chart becomes a part of the "G" file of the helicopter. Subsequent additions or subtractions to the basic weight and moment/constant on Chart C are made by the weight and balance technician. (Refer to figure 12-1 for a sample of DD Form 365C.)

12-5. Chart E - Loading Data.

The loading data on Chart E are intended to provide information necessary to work a loading problem for the helicopters to which this manual is applicable.

12-6. Chart E - Use.

From the loading table contained in Chart E (see figure 12-2) weight and moment/constant are obtained for all variable load items and are added arithmetically to the currect basic weight and moment/constant (from Chart C) to obtain the gross weight and moment.

a. The cg of the loaded helicopter is represented by a moment figure opposing the gross weight of the table.

b. If the helicopter is loaded within the forward and aft cg limits, the moment figure will fall numerically between the limiting moments.

c. The effect on cg by the expenditure in flight of such items as fuel, ammunition, etc., may be checked by subtracting the weights and moments of such items from the take-off weight and moment and checking the new moment with the cg table.

NOTE

This check should be made to determine whether or not the cg will remain within limits during the entire flight.

12-7. Ballast Weight.

Two ballast weights are provided. The forward ballast weight is located on the APX-72 mounting shelf. The aft ballast weight is located outboard of the tail boom, on the aft side of the attaching mount for the vertical stabilizer.

a. The forward ballast weight is attached to the helicopter by the mounting hardware for the APX-72.

b. The aft ballast weight is attached to the helicopter with four bolts, 12 washers, and four nuts.

NOTE

The maximum ballast weight is as follows:
FORWARD - 15 lbs
AFT - 5 lbs.

SECTION IV WEIGHT AND BALANCE CLEARANCE FORM F - DD FORM 365F

12-8. General.

This form is a summary of actual disposition of the load in the helicopter. It records the balance status of the helicopter, step-by-step. It serves as work sheet on which the record weight and balance calculations, and any corrections that must be made to ensure that the helicopter will be within weight and cg limits. A Form F is required only when the loading is such as to seriously effect the flying characteristics and safety of the helicopter and in all cases where alternate loading is employed.

12-9. DD Form 365F - Use.

Form F is furnished in expendable pads, or as separate sheets, which can be replenished when exhausted. An original 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 should 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. These two versions were designed to provide for the respective loading arrangements of two types of helicopters. However, the general use and fullfillment of either version is the same. Specific instructions for filling out the TACTICAL form is given in the following paragraph 12-10.

12-10. DD FORM 365F - TACTICAL HELICOPTERS.

Insert the necessary identifying information at the top of the form. In the blank spaces of the Limitation table, enter the gross weight and cg restrictions obtained from Chapter 7.

NOTE

Enter moment/constant values from Chart E throughout the form.

a. Reference 1 - Enter the helicopter basic weight and moment/constant (see figure 12-3). Obtain these figures from the last entry on Chart C - Basic Weight and Balance Record.

b. Reference 2 - Enter the amount and weight of oil.

c. Reference 3 - Using the compartment letter designations as shown on Chart E (helicopter diagram) enter the number and weight of the crew at their take-off stations. Use actual crew weight if available.

d. Reference 4 - Enter the sum of the weight for reference 1 through reference 3 to obtain Operating Weight.

e. Reference 5 - Enter by compartment the number of rounds, caliber and weight of all ammunition.

f. Reference 6 - Enter the size, distribution (forward, aft, external, etc.).

g. Reference 7 - Enter the number of gallons and weight of fuel.

h. Reference 8 - Not applicable.

i. Reference 9 - Not applicable.

j. Reference 10 - Enter the sum of the weights for reference 4 through reference 9 opposite Take-Off Condition (uncorrected). At this point, if not already done, calculate and enter the moment/constant for reference 1 through reference 10, inclusive.

k. Check the weight figure opposite reference 10 against the Gross Weight Take-Off in the Limitations table. Check the moment/constant figure opposite reference 10 by means of Chart E to ascertain that the indicated cg is within allowable limits.

l. Reference 11 - If changes in amount of distribution of load are required, indicate necessary adjustments by proper entries in the Corrections table in lower left corner of the form as follows:

(1) Enter a brief description of the adjustment made in the column marked Item.

(2) Add all the weight and moment decreases and insert the totals in the space opposite "Total Weight Removed."

(3) Add all the weight and moment increases and insert the totals in the space opposite Total Weight Added.

(4) Subtract the smaller from the larger of the two totals and enter the difference (with applicable plus or minus sign) opposite Net Difference.

(5) Transfer these net difference figures to the spaces opposite reference 11.

m. Reference 12 - Enter the sum of or the difference between, reference 10 and reference 11. Recheck to ascertain that these figures do not exceed allowable limits.

n. Reference 13 - By referring to the cg table on Chart E determine the take-off cg possible. Enter this figure in the space provided opposite Take-Off CG.

o. Reference 14 - Estimate the weight of ammunition (not including weight of cases and links if retained), fuel and any other items which may be expended before landing. Enter figures together with moment/constant in the spaces provided.

p. Reference 15 - Enter the difference in weights and moment/constant between reference 12 and the total of reference 14.

q. Reference - By again referring to the cg table on Chart E, determine the estimated landing cg position. Enter the figure opposite Estimated Landing CG.

NOTE

Do not consider reserve fuel, as expended when determining Estimated Landing Conditions.

r. Check the landing cg figure with permissible cg figures in limitations block. The landing cg must be within the range of the figures shown.

s. The necessary signatures must appear at the bottom of the form.

NOTE

For charts and forms refer to Weight and Balance Control Data, Miliatry Specification MIL-W-25140.

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	SERIAL NO.	PAGE NO.
OH-58A	SAMPLE ONLY	

DATE	ITEM NO. IN	ITEM NO. OUT	DESCRIPTION OF ARTICLE OR MODIFICATION	WEIGHT CHANGE ADDED (+) WEIGHT	ARM	MOMENT[1]/100	WEIGHT CHANGE REMOVED (−) WEIGHT	ARM	MOMENT[1]/100	RUNNING TOTAL BASIC AIRPLANE WEIGHT	MOMENT[1]/100	~~INDEX[2]~~ C.G.
7-12-69			BASIC - INCLUDING ARMAMENT SUBSYSTEM							1669	1964.3	117.7

EXAMPLE ONLY

[1]Enter constant used below line. [2]Balance computer index.

DD FORM 1 SEPT 54 365C Previous editions of this form may be used until stocks are exhausted.

AV 053031

Figure 12-1. Sample DD Form 365C

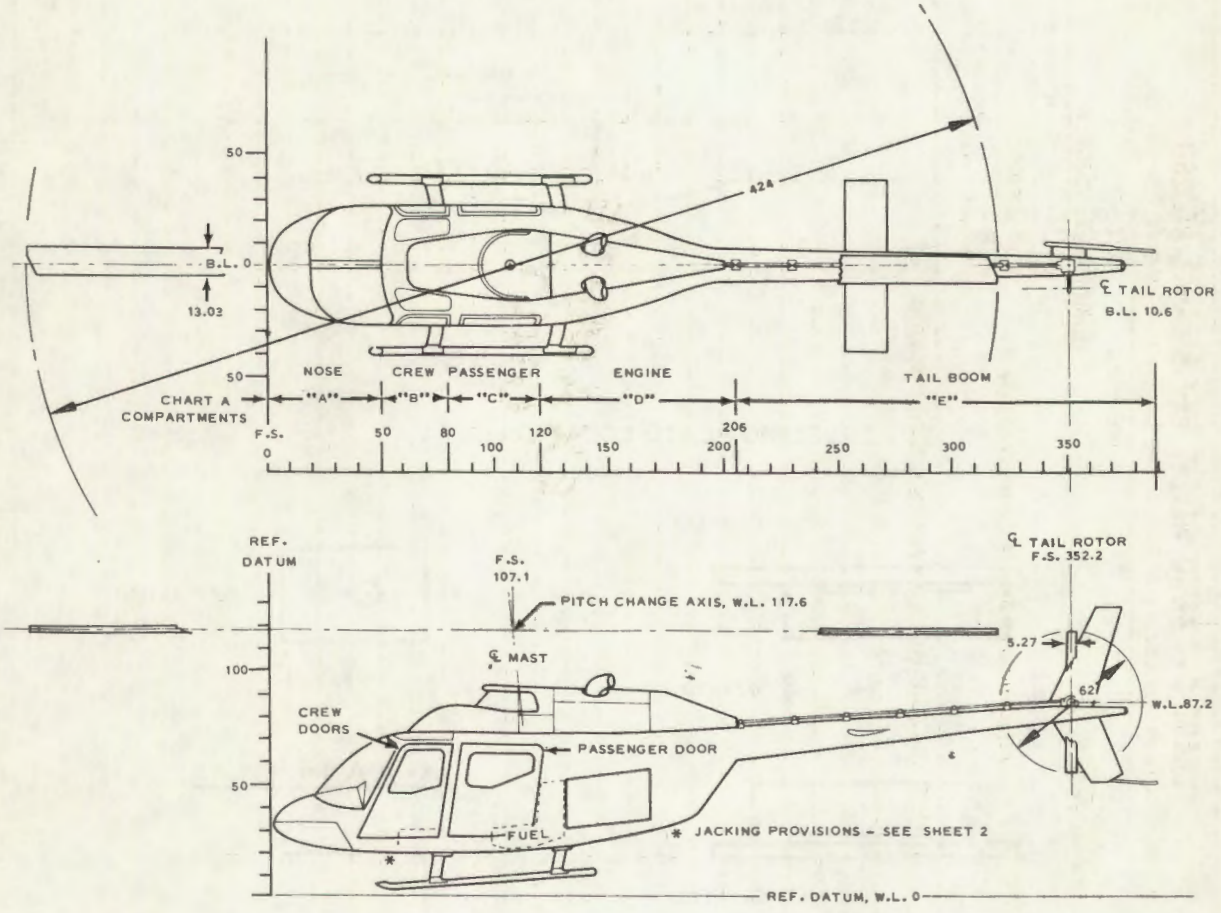
CHART E

SHEET 1 OF 10

MODEL OH-58A

CHART DATE: DECEMBER 2,1968

HELICOPTER DIAGRAM



AV 053032

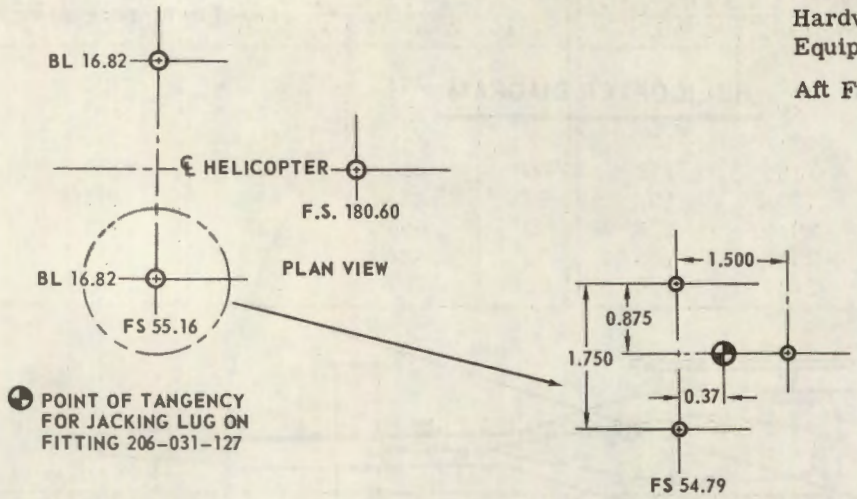
Figure 12-1. Chart E - loading data (Sheet 1 of 10)

Chart: E
Sheet: 2 of 10
Model: OH-58A
Chart Date: See Sheet 1

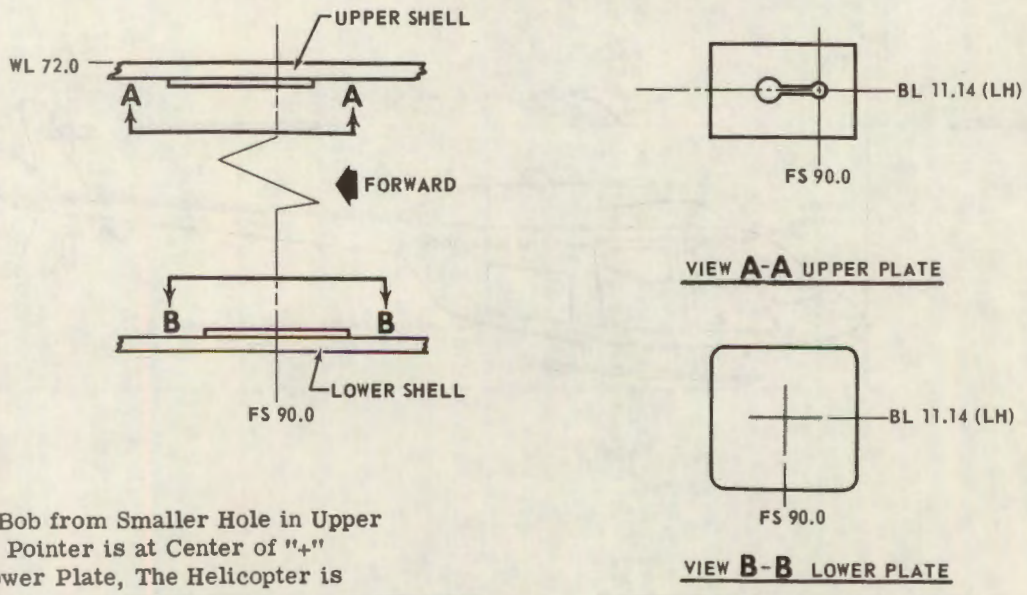
JACK PAD LOCATION DATA

Forward Fittings and Attaching Hardware Included in Loose Equipment Delivered with Helicopter.

Aft Fitting is not Removable.



LEVELING PLATE LOCATION DATA



Drop Plumb Bob from Smaller Hole in Upper Plate. When Pointer is at Center of "+" Target on Lower Plate, The Helicopter is Level.

AV 053033

Figure 12-2. Chart E - loading data (Sheet 2 of 10)

Chart: E
Sheet: 3 of 10
Model: OH-58A
Chart Date: See Sheet 1

FUEL LOADING TABLE
MOMENT/100

GAL.	JP-4 @ 6.5 LBS/GAL WEIGHT	JP-4 @ 6.5 LBS/GAL MOMENT*	JP-5 @ 6.8 LBS/GAL WEIGHT	JP-5 @ 6.8 LBS/GAL MOMENT*	GAL.	JP-4 @ 6.5 LBS/GAL WEIGHT	JP-4 @ 6.5 LBS/GAL MOMENT*	JP-5 @ 6.8 LBS/GAL. WEIGHT	JP-5 @ 6.8 LBS/GAL. MOMENT*
5	33	36	34	37	45	293	331	306	346
10	65	72	68	75	50	325	371	340	388
15	98	109	102	114	55	358	411	374	429
20	130	145	136	152	60	390	450	408	471
25	163	183	170	191	65	423	491	442	513
30	195	219	204	229	70	455	531	476	555
35	228	257	238	268	75	488	571	510	597
40	260	293	272	306	78	507	594	530	621

*Moment Arm Varies

ENGINE OIL LOADING TABLE

GAL.	WEIGHT (LBS)	MOMENT/100 (F.S. 179.9)	GAL.	WEIGHT (LBS)	MOMENT/100 (F.S. 179.9)
0.5	3.8	7	1.5	11.3	20
1.0	7.5	14			

Figure 12-2. Chart E - loading data (Sheet 3 of 10)

Chart: E
Sheet 4 of 10
Model: OH-58A
Chart Date: See Sheet 1

TABLE OF MOMENTS FOR PERSONNEL

FRONT SEAT

Weight (Lbs)	Moment/100 F.S. 65.0	Weight (Lbs)	Moment/100 F.S. 65.0	Weight (Lbs)	Moment/100 F.S. 65.0	Weight (Lbs)	Moment/100 F.S. 65.0
150	98	230	150	310	202	390	254
160	104	240	156	320	208	400	260
170	111	250	163	330	215	410	267
180	117	260	169	340	221	420	273
190	124	270	176	350	228	430	280
200	130	280	182	360	234	440	286
210	137	290	189	370	241		
220	143	300	195	380	247		

BACK SEAT

Weight (Lbs)	Moment/100 F.S. 104.0	Weight (Lbs)	Moment/100 F.S. 104.0	Weight (Lbs)	Moment/100 F.S. 104.0	Weight (Lbs)	Moment/100 F.S. 104.0
150	156	270	281	390	406	510	530
160	166	280	291	400	416	520	541
170	177	290	302	410	426	530	551
180	187	300	312	420	437	540	562
190	198	310	322	430	447	550	572
200	208	320	333	440	458	560	582
210	218	330	343	450	468	570	593
220	229	340	354	460	478	580	603
230	239	350	364	470	489	590	614
240	250	360	374	480	499	600	624
250	260	370	385	490	510		
260	270	380	395	500	520		

Figure 12-2. Chart E - loading data (Sheet 4 of 10)

Chart: E
Sheet 5 of 10
Model: OH-58A
Chart Date: See Sheet 1

7.62MM AMMUNITION LOADING TABLE

FORWARD BOX			AFT BOX		
ROUNDS	WEIGHT (LBS) @ 0.065 LBS/RND	MOMENT/100 F.S. 105.6	ROUNDS	WEIGHT (LBS) @ 0.065 LBS/RND	MOMENT/100 F.S. 108.7
50	3.3	4	50	3.3	4
100	6.5	7	100	6.5	7
150	9.8	10	150	9.8	11
200	13.0	14	200	13.0	14
250	16.3	17	250	16.3	18
300	19.5	21	300	19.5	21
350	22.8	24	350	22.8	25
400	26.0	28	400	26.0	28
450	29.3	31	450	29.3	32
500	32.5	34	500	32.5	35
550	35.8	38	550	35.8	39
600	39.0	41	600	39.0	42
650	42.3	45	650	42.3	46
700	45.5	48	700	45.5	50
750	48.8	52	750	48.8	53
800	52.0	55	800	52.0	57
850	55.3	58	850	55.3	60
900	58.5	62	900	58.5	64
950	61.8	65	950	61.8	67
1000	65.0	69	1000	65.0	71

Figure 12-2. Chart E - loading data (Sheet 5 of 10)

Chart: E
Sheet 6 of 10
Model: OH-58A
Chart Date: See Sheet 1

CENTER OF GRAVITY TABLE

MOMENT/100

GROSS WEIGHT (POUNDS)	← FWD LIMIT		FUSELAGE STATIONS					AFT LIMIT →		
	105.2	106.0	107.0	108.0	109.0	110.0	111.0	112.0	113.0	114.2
1700	1788	1802	1819	1836	1853	1870	1887	1904	1921	1941
1710	1799	1813	1830	1847	1864	1881	1898	1915	1932	1953
1720	1809	1823	1840	1858	1875	1892	1909	1926	1944	1964
1730	1820	1834	1851	1868	1886	1903	1920	1938	1955	1976
1740	1830	1844	1862	1879	1897	1914	1931	1949	1966	1987
1750	1841	1855	1873	1890	1908	1925	1943	1960	1978	1999
1760	1852	1866	1883	1901	1918	1936	1954	1971	1989	2010
1770	1862	1876	1894	1912	1929	1947	1965	1982	2000	2021
1780	1873	1887	1905	1922	1940	1958	1976	1994	2011	2033
1790	1883	1897	1915	1933	1951	1969	1987	2005	2023	2044
1800	1894	1908	1926	1944	1962	1980	1998	2016	2034	2056
1810	1904	1919	1937	1955	1973	1991	2009	2027	2045	2067
1820	1915	1929	1947	1966	1984	2002	2020	2038	2057	2078
1830	1925	1940	1958	1976	1995	2013	2031	2050	2068	2090
1840	1936	1950	1969	1987	2006	2024	2042	2061	2079	2101
1850	1946	1961	1980	1998	2017	2035	2054	2072	2091	2113
1860	1957	1972	1990	2009	2027	2046	2065	2083	2102	2124
1870	1967	1982	2001	2020	2038	2057	2076	2094	2113	2136
1880	1978	1993	2012	2030	2049	2068	2087	2106	2124	2147
1890	1988	2003	2022	2041	2060	2079	2098	2117	2136	2158
1900	1999	2014	2033	2052	2071	2090	2109	2128	2147	2170
1910	2009	2025	2044	2063	2082	2101	2120	2139	2158	2181
1920	2020	2035	2054	2074	2093	2112	2131	2150	2170	2193
1930	2030	2046	2065	2084	2104	2123	2142	2162	2181	2204
1940	2041	2056	2076	2095	2115	2134	2153	2173	2192	2215
1950	2051	2067	2087	2106	2126	2145	2165	2184	2204	2227
1960	2062	2078	2097	2117	2136	2156	2176	2195	2215	2238
1970	2072	2088	2108	2128	2147	2167	2187	2206	2226	2250
1980	2083	2099	2119	2138	2158	2178	2198	2218	2237	2261
1990	2093	2109	2129	2149	2169	2189	2209	2229	2249	2273
2000	2104	2120	2140	2160	2180	2200	2220	2240	2260	2284
2010	2115	2131	2151	2171	2191	2211	2231	2251	2271	2295
2020	2125	2141	2161	2182	2201	2222	2242	2262	2283	2307
2030	2136	2152	2172	2192	2213	2233	2253	2274	2294	2318
2040	2146	2162	2183	2203	2224	2244	2264	2285	2305	2330
2050	2157	2173	2194	2214	2235	2255	2276	2296	2317	2341
2060	2167	2184	2204	2225	2245	2266	2287	2307	2328	2353
2070	2178	2194	2215	2236	2256	2277	2298	2318	2339	2364
2080	2188	2205	2226	2246	2267	2288	2309	2330	2350	2375
2090	2199	2215	2236	2257	2278	2299	2320	2341	2362	2387

Figure 12-2. Chart E - loading data (Sheet 6 of 10)

Chart: E
Sheet 7 of 10
Model: OH-58A
Chart Date: See Sheet 1

CENTER OF GRAVITY TABLE

MOMENT/100

GROSS WEIGHT (POUNDS)	Approximate flight limits shown by heavy vertical line. Numbers in BOLD FACE are actual moment limits for weights indicated but not for Fuselage Stations shown in column head. FUSELAGE STATIONS									
	105.2	106.0	107.0	108.0	109.0	110.0	111.0	112.0	113.0	114.2
2100	2209	2226	2247	2268	2289	2310	2331	2352	2373	2398
2110	2220	2237	2258	2279	2300	2321	2342	2363	2384	2410
2120	2230	2247	2268	2290	2311	2332	2353	2374	2396	2421
2130	2241	2258	2279	2300	2322	2343	2364	2386	2407	2432
2140	2251	2268	2290	2311	2333	2354	2375	2397	2418	2444
2150	2262	2279	2301	2322	2344	2365	2387	2408	2430	2455
2160	2272	2290	2311	2333	2354	2376	2398	2419	2441	2467
2170	2283	2300	2322	2344	2365	2387	2409	2430	2452	2478
2180	2293	2311	2333	2354	2376	2398	2420	2442	2463	2490
2190	2304	2321	2343	2365	2387	2409	2431	2453	2475	2501
2200	2314	2332	2354	2376	2398	2420	2442	2464	2486	2512
2210	2325	2343	2365	2387	2409	2431	2453	2475	2497	2524
2020	2335	2353	2375	2398	2420	2442	2464	2486	2509	2535
2230	2346	2364	2386	2408	2431	2453	2475	2498	2520	2547
2240	2356	2374	2397	2419	2442	2464	2486	2509	2531	2558
2250	2367	2385	2408	2430	2453	2475	2498	2520	2543	2570
2260	2378	2396	2418	2441	2463	2486	2509	2531	2554	2581
2270	2388	2406	2429	2452	2474	2497	2520	2542	2565	2592
2280	2399	2417	2440	2462	2485	2508	2531	2554	2576	2604
2290	2409	2427	2450	2473	2496	2519	2542	2565	2588	2615
2300	2420	2438	2461	2484	2507	2530	2553	2576	2599	2627
2310	2430	2449	2472	2495	2518	2541	2564	2587	2610	2638
2320	2441	2459	2482	2506	2529	2552	2575	2598	2622	2649
2330	2451	2470	2493	2516	2540	2563	2586	2610	2633	2661
2340	2462	2480	2504	2527	2551	2574	2597	2621	2644	2672
2350	2472	2491	2515	2538	2562	2585	2609	2632	2656	2684
2360	2483	2502	2525	2549	2572	2596	2620	2643	2667	2695
2370	2493	2512	2536	2560	2583	2607	2631	2654	2678	2707
2380	2504	2523	2547	2570	2594	2618	2642	2666	2689	2718
2390	2514	2533	2557	2581	2605	2629	2653	2677	2701	2729
2400	2525	2544	2568	2592	2616	2640	2664	2688	2712	2741
2410	2535	2555	2579	2603	2627	2651	2675	2699	2723	2752
2420	2546	2565	2589	2614	2638	2662	2686	2710	2735	2764
2430	2556	2576	2600	2624	2649	2673	2697	2722	2746	2775
2440	2567	2586	2611	2635	2660	2684	2708	2733	2757	2786
2450	2577	2597	2622	2646	2671	2695	2720	2744	2769	2798
2460	2588	2608	2632	2657	2681	2706	2731	2755	2780	2809
2470	2598	2618	2643	2668	2692	2717	2742	2766	2791	2821
2480	2609	2629	2654	2678	2703	2728	2753	2778	2802	2832
2490	2619	2639	2664	2689	2714	2739	2764	2789	2814	2844

Figure 12-2. Chart E - loading data (Sheet 7 of 10)

Chart: E
Sheet 8 of 10
Model: OH-58A
Chart Date: See Sheet 1

CENTER OF GRAVITY TABLE

MOMENT/100

Approximate flight limits shown by heavy vertical line. Numbers in BOLD FACE are actual moment limits for weights indicated but not for Fuselage Stations shown in column head.

GROSS WEIGHT (POUNDS)	FUSELAGE STATIONS									
	105.2	106.0	107.0	108.0	109.0	110.0	111.0	112.0	113.0	114.2
2500	2630	2650	2675	2700	2725	2750	2775	2800	2825	2855
2510	**2641**	2661	2686	2711	2736	2761	2786	2811	2836	**2865**
2520	**2652**	2671	2696	2722	2747	2772	2797	2822	2848	**2876**
2530	**2663**	2682	2707	2732	2758	2783	2808	2834	2859	**2886**
2540	**2674**	2692	2718	2743	2769	2794	2819	2845	2870	**2897**
2550	**2685**	2703	2729	2754	2780	2805	2831	2856	2882	**2907**
2560	**2696**	2714	2739	2765	2790	2816	2842	2867	2893	**2917**
2570	**2706**	2724	2750	2776	2801	2827	2853	2878	2904	**2928**
2580	**2718**	2735	2761	2786	2812	2838	2864	2890	2915	**2938**
2590	**2728**	2745	2771	2797	2823	2849	2875	2901	2927	**2948**
2600	**2739**	2756	2782	2808	2834	2860	2886	2912	2938	**2959**
2610	**2750**	2767	2793	2819	2845	2871	2897	2923	2949	**2969**
2620	**2761**	2777	2803	2930	2856	2882	2908	2934	2961	**2979**
2630	**2772**	2788	2814	2840	2867	2893	2919	2946	2972	**2990**
2640	**2783**	2798	2825	2851	2878	2904	2930	2957	2983	**3000**
2650	**2794**	2809	2836	2862	2889	2915	2942	2968	2995	**3010**
2660	**2805**	2820	2846	2873	2899	2926	2953	2979	3006	**3021**
2670	**2816**	2830	2857	2884	2910	2937	2964	2990	3017	**3031**
2680	**2827**	2841	2868	2894	2921	2948	2975	3002	3028	**3041**
2690	**2838**	2851	2878	2905	2932	2959	2986	3013	3040	**3052**
2700	**2849**	2862	2889	2916	2943	2970	2997	3024	3051	**3062**
2710	**2860**	2860	2900	2927	2954	2981	3008	3035	3062	**3072**
2720	**2871**	2883	2910	2938	2965	2992	3019	3046	3074	**3082**
2730	**2882**	2894	2921	2948	2976	3003	3030	3058	3085	**3093**
2740	**2893**	2904	2932	2959	2987	3014	3041	3069	3096	**3103**
2750	**2904**	2915	2943	2970	2998	3025	3053	3080	3108	**3113**
2760	**2915**	2926	2953	2981	3008	3036	3064	3091	3119	**3123**
2770	**2926**	2936	2964	2992	3019	3047	3075	3102	3130	**3133**
2780	**2937**	2947	2975	3002	3030	3058	3086	3114	3141	**3144**
2790	**2948**	2957	2985	3013	3041	3069	3097	3125	3153	**3154**
2800	**2959**	2968	2996	3024	3052	3080	3108	3136	3164	
2810	**2970**	2979	3007	3035	3063	3091	3119	3147	**3174**	
2820	**2981**	2989	3017	3046	3074	3102	3130	3158	**3184**	
2830	**2992**	3000	3028	2056	3085	3113	3141	3170	**3195**	
2840	**3003**	3010	3039	3067	3096	3124	3152	3181	**3205**	
2850	**3014**	3021	3050	3078	3107	3135	3164	3192	**3215**	
2860	**3025**	3032	3060	3089	3117	3146	3175	3203	**3225**	
2870	**3036**	3042	3071	3100	3128	3157	3186	3214	**3235**	
2880	**3047**	3053	3082	3110	3139	3168	3197	3226	**3245**	
2890	**3058**	3063	3092	3121	3150	3179	3208	3237	**3255**	

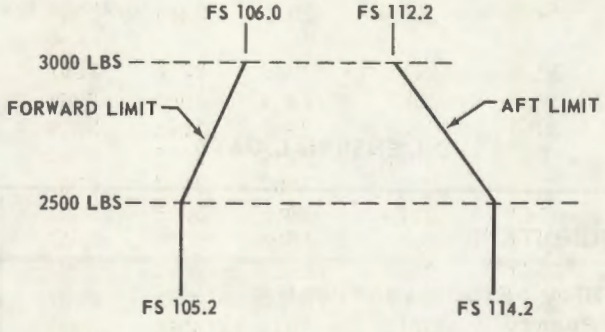
Figure 12-2. Chart E - loading data (Sheet 8 of 10)

Chart: E
Sheet 9 of 10
Model OH-58A
Chart Date: See Sheet 1

CENTER OF GRAVITY TABLE

MOMENT/100

GROSS WEIGHT (POUNDS)	Approximate flight limits shown by heavy vertical line. Numbers in BOLD FACE are actual moment limits for weights indicated but not for Fuselage Stations shown in column head.									
	FUSELAGE STATIONS									
	105.2	106.0	107.0	108.0	109.0	110.0	111.0	112.0	113.0	114.2
2900	**3069**	3074	3103	3132	3161	3190	3219	3248	**3265**	
2910	**3081**	3085	3114	3143	3172	3201	3230	3259	**3275**	
2920	**3091**	3095	3124	3154	3183	3212	3241	3270	**3286**	
2930	**3103**	3106	3135	3164	3194	3223	3252	3282	**3296**	
2940	**3113**	3116	3146	3175	3205	3234	3263	3293	**3306**	
2950	**3125**	3127	3157	3186	3216	3245	3275	3304	**3316**	
2960	**3136**	3138	3167	3197	3226	3256	3286	3315	**3326**	
2970	**3147**	3148	3178	3208	3237	3267	3297	3326	**3336**	
2980	**3158**	3159	3189	3218	3248	3278	3308	3338	**3346**	
2990	**3169**	3169	3199	3229	3259	3289	3319	3349	**3356**	
3000		3180	3210	3240	3270	3300	3330	3360	**3366**	



FLIGHT LIMITS

Gross Weight Limitations:

Takeoff _____ * Pounds; Landing _____ * Pounds

*Service Activities shall insert, or substitute, current figures from latest applicable Technical Manual covering operating restrictions.

Figure 12-2. Chart E - loading data (Sheet 9 of 10)

Chart: E
Sheet: 10 of 10
Model: OH-58A
Chart Date: See Sheet 1

TYPICAL SERVICE LOAD CONDITIONS

The items listed below are typical for the mission indicated. These load items are added to the Basic Weight to determine Operating Weight for the particular mission.

ITEM	ARM	OBSERVATION MISSION		SCOUT MISSION	
		WEIGHT	MOMENT/100	WEIGHT	MOMENT/100
Crew	65.0	400	260	400	260
Fuel	-	455	531	423	491
Oil, Engine	179.9	11	20	11	20
Armor (Removable)	74.9	109	82	109	82
Armor Chest Protectors	65.0	30	20	30	20
Armament Subsystem	107.8			106	114
Ammunition, 2000 Rounds	-			130	140
TOTAL		1005	913	1209	1127

DIMENSIONAL DATA

CONDITION	DIMENSION (INCHES)
Overall Length - Blades Extended and Rotating	488.0
Length - Blades Removed	392.8
Maximum Height	118.0
Span - Blades Rotating	424.0
Span - Blades Fore and Aft or Removed	77.4
Tread	77.4

Figure 12-2. Chart E - loading data (Sheet 10 of 10)

WEIGHT AND BALANCE CLEARANCE FORM F
TACTICAL
(USE REVERSE FOR TRANSPORT MISSIONS)

FOR USE IN T. O. 1-1B-40 & AN 01-1B-40

DATE	AIRPLANE TYPE	FROM	HOME STATION
10-7-69	OH-58A		
MISSION/TRIP/FLIGHT/NO.	**SERIAL NO.**	**TO**	**PILOT**
OBSERVATION	SAMPLE ONLY		

REMARKS

THIS FLIGHT TO HAVE JP-4 FUEL

PILOT AND COPILOT ARMORED VEST ARE INCLUDED IN BASIC WEIGHT.

REF	ITEM	WEIGHT	[1] INDEX OR MOM/100
1	BASIC AIRPLANE (*From Chart C*)	1669	1964
2	OIL (1.5 Gal.)	11	20
3	DISTRIBUTION OF LOAD		

COMPT.	CREW NO.	CREW WEIGHT	BAGGAGE	CARGO AND MISC.	WEIGHT	INDEX OR MOM/100
B	2	380			380	247

EXAMPLE ONLY

COMPUTER PLATE NO. (*If used*)

Pertinent instructions to the pilot for shifting load and crew during takeoff and landing should be noted above.

CORRECTIONS (*Ref. 11*)

COMPT.	ITEM	CHANGES (+ or −) WEIGHT	CHANGES (+ or −) [1] INDEX OR MOM/
TOTAL WEIGHT REMOVED		−	−
TOTAL WEIGHT ADDED		+	+
NET DIFFERENCE (*Ref. 11*)			

LIMITATIONS

[2] GROSS WT. TAKEOFF (lb.)	[2] GROSS WT. LANDING (lb.)
3000	3000

	FROM	TO (~~% M. A. C.~~ IN.)
[3] PERMISSIBLE C. G. TAKEOFF	106	113
[4] PERMISSIBLE C. G. LANDING	105.2	114.2

[1] *Enter constant used.*
[2] *Enter values from current applicable T. O.*
[3] *Applicable to gross weight (Ref. 12).*
[4] *Applicable to gross weight (Ref. 15).*

				WEIGHT	INDEX OR MOM/100
4	OPERATING WEIGHT			2060	2231
5	AMMUNITION	COMPT.	ROUNDS / CALIBER		
		C	1000 7.62MM	65	69
		C	1000 7.62MM	65	71
6	BOMBS, ROCKETS, ETC.	FORWARD			
		AFT			
		EXTERNAL			
		ROCKETS			
7	FUEL	BUILT IN (70 Gal.)		455	531
		BOMB BAY (Gal.)			
		EXTERNAL (Gal.)			
8	WATER INJ. FLUID (Gal.)				
9	JATO OR RATO				
10	TAKEOFF CONDITION (*Uncorrected*)			2645	2902
11	CORRECTIONS (*If required*)				
12	TAKEOFF CONDITION (*Corrected*)			2645	2902
13	TAKEOFF C. G. IN ~~% M. A. C. OR~~ IN.			109.7	
14	LESS EXPENDABLES	JATO OR RATO			
		BOMBS			
		AMMUNITION		130	140
		FUEL		325	386
15	ESTIMATED LANDING CONDITION			2190	2376
16	ESTIMATED LANDING C. G. IN ~~% M. A. C. OR~~ IN.			108.5	

COMPUTED BY (*Signature*)

WEIGHT AND BALANCE AUTHORITY (*Signature*)

PILOT (*Signature*)

DD FORM SEPT 54 365F

AV 053034

Figure 12-3. Sample DD Form 365F

CHAPTER 13

AIRCRAFT LOADING

SECTION I GENERAL

13-1. Scope.

All essential information for aircraft loading is contained in this chapter. The purpose of this chapter is to provide information to accomplish safe loading of the helicopter.

13-2. Seating Arrangement.

Figure 13-1 shows the seating arrangement of the OH-58A.

NOTE

Minimum allowable weight for crew compartment with left and right armor side panels installed is 150 lbs.
Minimum allowable weight for crew compartment with left and right armor side panels removed is 170 lbs.
Maximum allowable weight for crew compartment is 440 lbs.

SECTION II AIRCRAFT CARGO FEATURES

13-3. Cargo Space.

Figure 13-2 shows the cargo loading space available in the armed and unarmed configuration, with the maximum stress of the cargo tie-downs noted.

13-4. Cargo Platform.

The cargo platforms are installed in the cargo/passenger area using existing hardware and attaching pins of the cargo platforms. The strength of the existing cargo tiedowns on the cargo platforms is 2100 lbs.

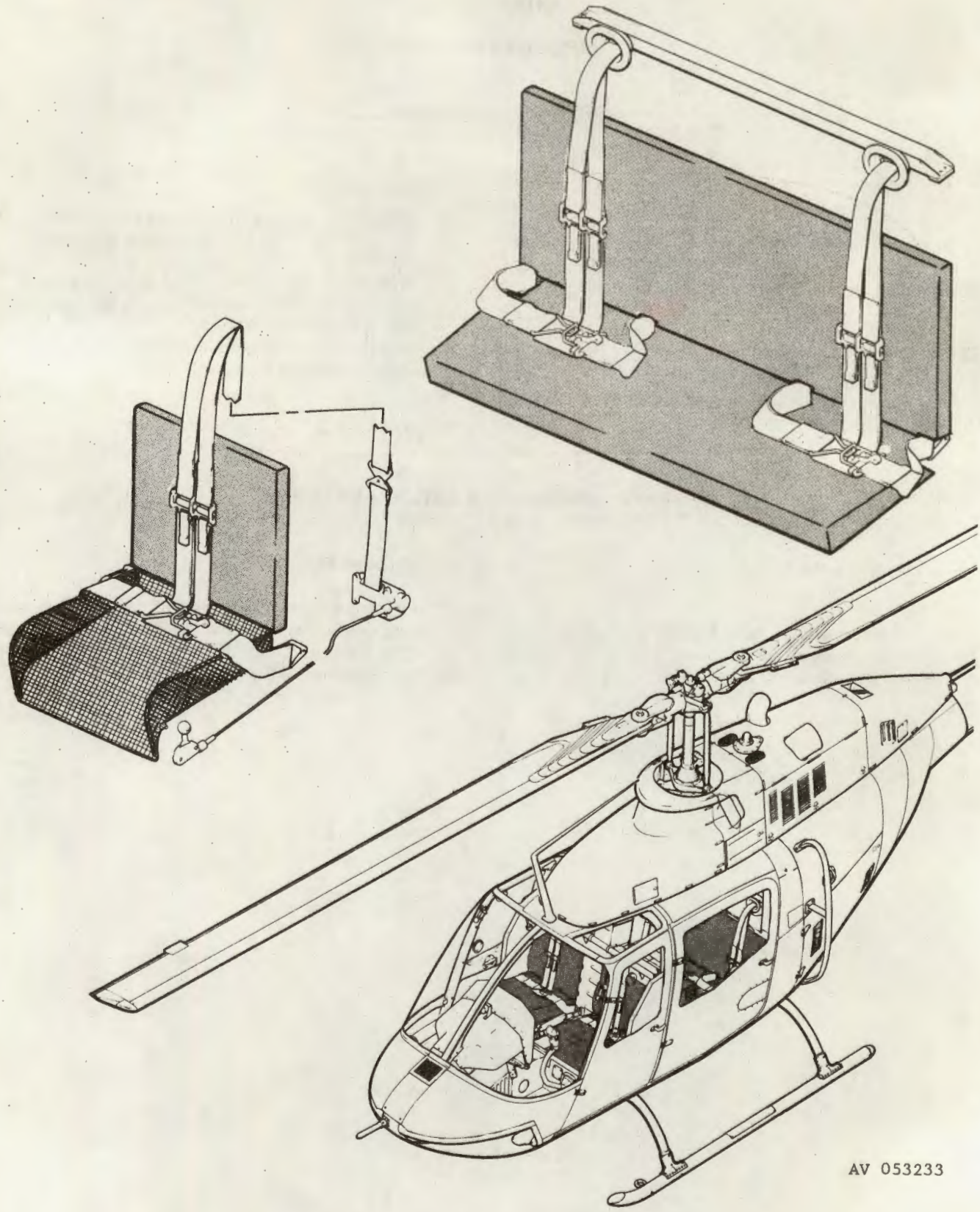
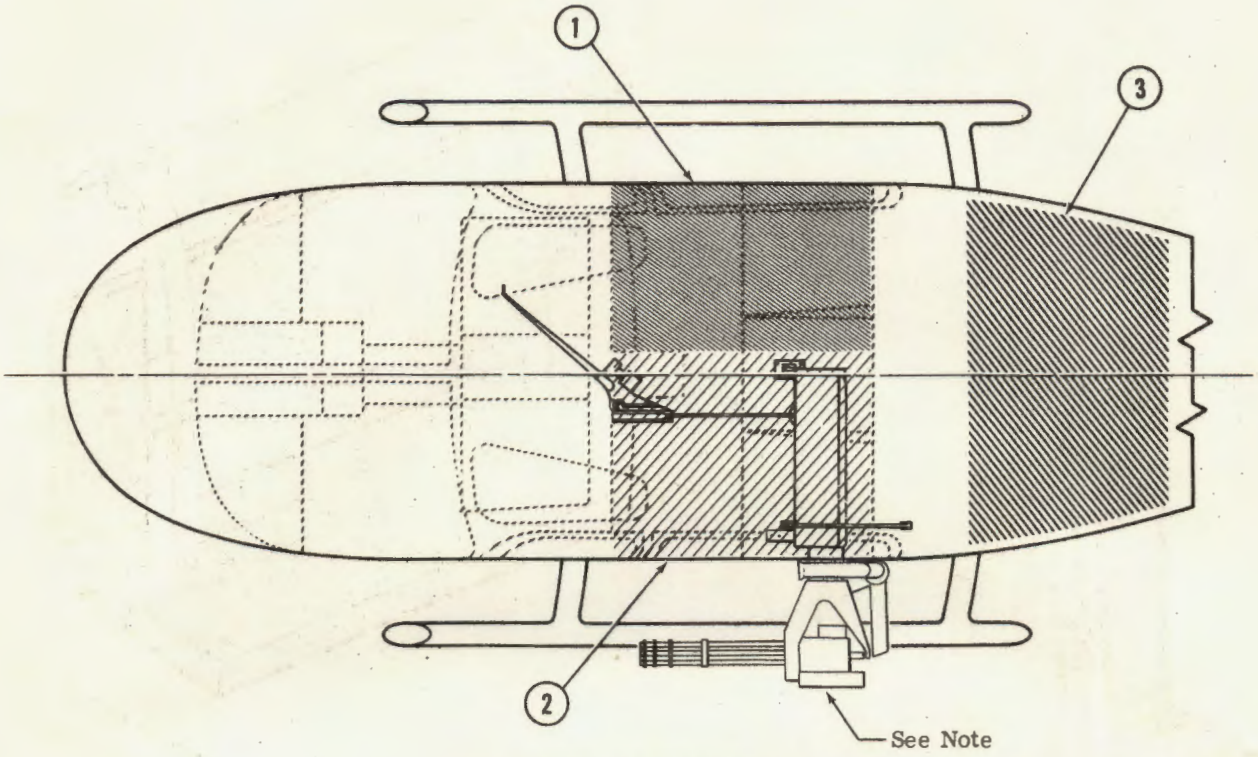


Figure 13-1. Seating arrangement



VIEW LOOKING DOWN

AV 053357

CARGO SPACE AVAILABLE	HELICOPTER CONFIGURATION	
1.	Armed or Unarmed	Maximum cargo weight not to exceed 475 pounds or 100 pounds per square foot.
2.	Unarmed	Maximum cargo weight not to exceed 475 pounds or 100 pounds per square foot.

3. Area number three is the avionics compartment and no cargo tie-downs are installed. No cargo shall be carried in this compartment.

Note

The XM27E1 armament system weight shall be included in the maximum allowable cargo weight when installed.

Figure 13-2. Cargo space

CHAPTER 14

PERFORMANCE DATA

SECTION I GENERAL

14-1. Scope.

The charts contained in this Chapter reflect the necessary data required for pre-flight and in-flight mission planning. The necessary explanatory text for use of the data presented is also contained herein. The performance charts are presented in graphic or profile form. Charts are based on flight test data, calculated data or estimated data as indicated on the chart.

SECTION II INSTRUCTION FOR CHART USE

14-2. Airspeed Calibration Chart.

The airspeed calibration chart (figure 14-1) is used to convert calibrated to indicated airspeed and vice versa. Calibrated airspeed (CAS) is indicated airspeed (IAS) as read from the instrument, corrected for instrument error, plus the installation correction. Enter the IAS scale at 100 knots and move vertically to the cruise curve, then project horizontally to the CAS scale and read 97 knots.

14-3. Density Altitude Chart.

Density altitude is an expression of the density of the air in terms of height above sea level; hence, the less dense the air, the higher the density altitude. For standard conditions of temperature and pressure, density altitude is the same as pressure altitude. As temperature increases above standard for any altitude, the density altitude will also increase to values higher than pressure altitude. Figure 14-2 expresses density altitude as a function of pressure altitude and temperature.

EXAMPLE:

If the ambient temperature is minus 10°C and the pressure altitude is 7000 feet, the density altitude is 5700 feet.

14-4 Component Life Maximum Speed Chart.

Component life maximum speed, Vne, is presented in figure 14-3 in indicated and calibrated airspeed as a function of density altitude at gross weights of 3000 pounds or less. For a given set of atmospheric conditions, the component life maximum speed is the speed beyond which the fatigue life of the aircraft's critical components can be seriously impaired. It should be noted that pressure altitude must be converted to density altitude before the component life maximum speed chart may be properly used.

EXAMPLE:

Pressure altitude	5000 feet
OAT	10°C

a. Enter the density altitude chart (figure 14-2) at 10°C, move vertically to a pressure altitude of 5000 feet, and project horizontally to read a density altitude of 5700 feet.

b. Enter the component life maximum speed chart (figure 14-3) at a density altitude of 5700 feet, move horizontally to the indicated airspeed line, and project vertically to read an indicated airspeed of 115.5 knots. Using the same procedure, the calibrated airspeed is obtained as 112 knots.

14-5. Power Available Chart.

Atmospheric conditions of OAT and pressure altitude have an effect on the capability of the engine to produce power. Data for power available at two power settings is shown: Take-off Power Available (figure 14-4) and Normal Power Available (figure 14-5). OAT and pressure altitude effects on power available are shown on the charts. It should be noted that the power output capability of the engine can exceed the structural limit of the transmission under certain conditions. The limits shown on the charts (317 shp for take-off and 270 shp for normal power) should be observed to prevent exceeding the power limitations imposed by the transmission and engine gearbox.

EXAMPLE:

OAT	-5°C
Pressure Altitude	9000 feet
Power Setting	Take-Off Rated Power

a. Enter the pressure altitude scale of figure 14-4 at 9000 feet.

b. Move horizontally to intersection of minus 5°C temperature line.

c. Project vertically to either the shaft horsepower to torquemeter pressure scale and read 240 shp or 70 psi power available.

14-6. Fuel Flow Chart.

The fuel flow chart (figure 14-6) shows the fuel flow for a given altitude and power setting. Fuel flow for standard day conditions at take-off and normal rated power are shown as dashed lines.

EXAMPLE:

Pressure altitude	9000 feet
Torquemeter pressure	40 psi

a. Move along the 40 psi line to an altitude of 9000 feet.

b. Project back horizontally to the fuel flow scale and read 110 pounds per hour.

14-7. Torque and Power Required to Hover.

The power required to hover out-of-ground effect and in-ground-effect at two- and four-foot skid height is shown in figures 14-7 and 14-8. Power required in shaft horsepower or torque pressure is plotted as a function of density altitude and gross weight.

EXAMPLE:

Pressure altitude	6000 feet
OAT	20°C
Skid height	OGE
Gross weight	2300 pounds

a. Determine density altitude for the given conditions by referring to the density altitude chart (figure 14-2). For a pressure altitude of 6000 feet and OAT of 20°C the density altitude is 8000 feet.

b. Enter the gross weight scale of figure 14-8 at 2300 pounds, and move horizontally to the 8000 feet density altitude line.

c. Move vertically to the appropriate scale to read a shaft horsepower of 193 or a torque pressure of 56.5 psi.

14-8. Hovering Ceiling Charts.

The hovering ceiling charts show maximum pressure altitudes for which hover is possible as a function of gross weight and OAT. Figure 14-9 shows in ground effect hovering ceilings at two-foot and four-foot skid heights. Figure 14-10 shows hovering ceiling out of ground effect with headwind and vertical rate of climb corrections. These charts are used to determine the maximum gross weight at which hovering is possible for the given conditions of pressure altitude and OAT.

EXAMPLE:

Pressure altitude	6000 feet
OAT	20°C
Skid height	OGE
Headwind	5 knots
Vertical rate of climb	100 feet per minute

a. Enter the ceiling grid of figure 14-10 at a pressure altitude of 6000 feet and move horizontally to an OAT of 20°C.

b. The maximum gross weight is then read as 2610 pounds.

c. A headwind correction is applied by entering the headwind grid at 2610 pounds and moving vertically up to the zero baseline. Move down, paralleling the flow lines to the 5 knot line. By projecting vertically to the gross weight scale, the corrected gross weight of 2800 pounds is read.

d. A vertical rate of climb correction is applied by entering the grid at 2610 pounds and moving vertically up to the zero baseline. Move down, paralleling the flow lines to the 100 foot per minute line. By projecting vertically to the gross weight scale, the corrected gross weight of 2550 pounds is read.

14-9. Climb Performance Charts.

The climb performance charts are used to determine, maximum rate of climb, and time, distance, and fuel to climb at take-off rated power (figure 14-11) and normal rated power (figure 14-12). Climb performance is shown as a function of gross weight and altitude for standard day atmospheric conditions. These charts do not include warmup and take-off fuel. This amount of fuel should be added to the climb fuel to determine the total fuel required to reach cruise altiude. Turbine outlet temperature limits are 749°C and 693°C for takeoff and normal power respectively. Climb airspeed is 54 KTAS.

EXAMPLE:

Take-off pressure altitude	2000 feet
Cruise pressure altitude	8000 feet
Gross weight	2400 pounds
Power setting	Normal rated power

a. To determine initial rate of climb after take-off, enter the rate of climb plot along the 2400 pound gross weight line and interpolate between the sea level and 5000 foot altitude lines to 2000 feet and move horizontally to read 1420 feet per minute rate of climb.

b. To determine the time required for the climb, enter the gross weight scale at 2400 pounds and move vertically to an altitude of 2000 feet. Next move horizontally to the time curve and move vertically to read a time of 1.0 minutes. Repeat this procedure for an altitude of 8000 feet and read a time of 6.0 minutes. The time required for the climb from 2000 feet to 8000 feet is therefore (6.0 - 1.0) = 5.0 minutes.

c. Distance and fuel are determined by entering the gross weight scale at 2400 pounds, and following the procedure described above to read a distance of (5.0 - 1.0) = 4.0 nautical miles, and a fuel weight of (18.0 - 4.0) = 14 pounds.

NOTE

Warm-up and take-off fuel of six pounds (two minutes at normal rated power) is to be added for total fuel to climb to cruise altitude.

14-10. Service Ceiling Charts.

Service ceiling is the altitude at which the rate of climb is 100 feet per minute. Two service ceiling charts are included, figure 14-13 for maximum rate of climb speed, VKTAS = 54 knots, and figure 14-14 for a high speed climb, VKTAS = 80 knots. From these charts the service ceiling may be determined for combinations of temperature and gross weight.

EXAMPLE:

Power setting	Normal rated power
Gross weight	2475 pounds
OAT	25°C
Climb airspeed	54 KTAS

a. Using figure 14-13, which corresponds to the desired climb airspeed, enter the gross weight scale at 2475 pounds and move vertically to a temperature of 25°C. This will require interpolating between the 20°C and 30°C temperature lines.

b. Project horizontally to the altitude scale to read a service ceiling of 12,600 feet.

14-11. Autorotational Descent Chart.

The autorational descent chart (figure 14-15) shows the variation of rate of descent with rotor RPM and indicated airspeed. Autorotational descent performance, when expressed as a function of rotor RPM or indicated airspeed is essentially unaffected by density altitude and gross weight. Airspeeds for minimum rate of descent and best glide distance of 42 knots and 74 knots respectively are shown on this chart.

14-12. Specific Range Charts.

The cruise chart (figures 14-16 and 14-17) and maximum permissible speed charts (figure 14-18 and 14-19) are used in conjunction to present specific range and fuel flow information as a function of gross weight, pressure altitude, OAT, and airspeed for the clean and armed configuration. The cruise charts may be used for all temperature conditions, because range for this aircraft is not significantly affected by temperature. Maximum speeds, however, are affected by temperature, and consequently figures 14-18 and 14-19 show maximum speeds for a temperature range from minus 40°C to plus 40°C. Two examples of the use of these charts are shown. The first involves determining specific range at long range cruise (LRC) airspeed and at maximum endurance airspeed at a given cruise altitude. The second example involves long range cruise at an optimum cruise altitude.

EXAMPLE 1: (FIGURE 14-16)

Gross weight at start of cruise	2600 pounds
OAT during cruise	20°C
Cruise pressure altitude	8000 feet
Cruise airspeed condition	LRC and maximum endurance
Configuration	Clean

a. Enter the gross weight scale of the cruise chart (figure 14-16) at 2600 pounds and move horizontally to an altitude of 8000 feet.

b. Project vertically to the nautical miles per pound scale and read 0.707. This is for long range cruise.

NOTE

The long range cruise is 99 percent of the maximum range on the high speed side.

c. The LRC airspeed is determined by projecting vertically along the 0.707 nautical miles per pound line to the LRC line of the airspeed curve and moving horizontally to read 105 knots on the true airspeed scale.

d. To determine if the LRC airspeed exceeds limits, enter the maximum permissible speed curves for 20°C and 2600 pounds gross weight. Move along the gross weight to the given altitude then project vertically to read a maximum speed of 95 KTAS.

e. In this case the LRC speed must be decreased to 95 KTAS to stay within limits. This is accomplished by moving vertically from the 0.707 intersection with the LRC line and paralleling the flow lines until 95 KTAS is reached. The new range is then read as 0.714 nautical miles per pound.

f. Fuel flow is determined by projecting vertically to 95 KTAS on the fuel flow grid and moving horizontally to read 133 pounds per hour.

g. Maximum endurance airspeed is determined by projecting vertically from 0.707 nautical miles per pound intersection with the LRC line, paralleling the flow lines until the maximum endurance line is reached. The maximum endurance airspeed is read as 50 KTAS and the corresponding range as 0.502 nautical miles per pound.

h. Fuel flow is determined by projecting vertically to the 50 KTAS line of the fuel flow plot, moving horizontally and reading 100 pounds per hour.

EXAMPLE 2: (FIGURE 14-17)

Gross weight at Start of cruise	2800 pounds
OAT	-20°C
Cruise altitude	Optimum
Cruise airspeed condition	LRC
Configuration	Armed

a. Enter the gross weight scale of the cruise chart at 2800 pounds and move to the highest altitude line of the grid. This altitude is the optimum altitude and in this case is 10,0010 feet.

NOTE

Since the optimum cruise altitude increases with decreasing gross weight, it may not always be possible to cruise at the optimum altitude due to lack of oxygen or other limitations.

b. Project vertically to the range scale and read 0.667 nautical miles per pound.

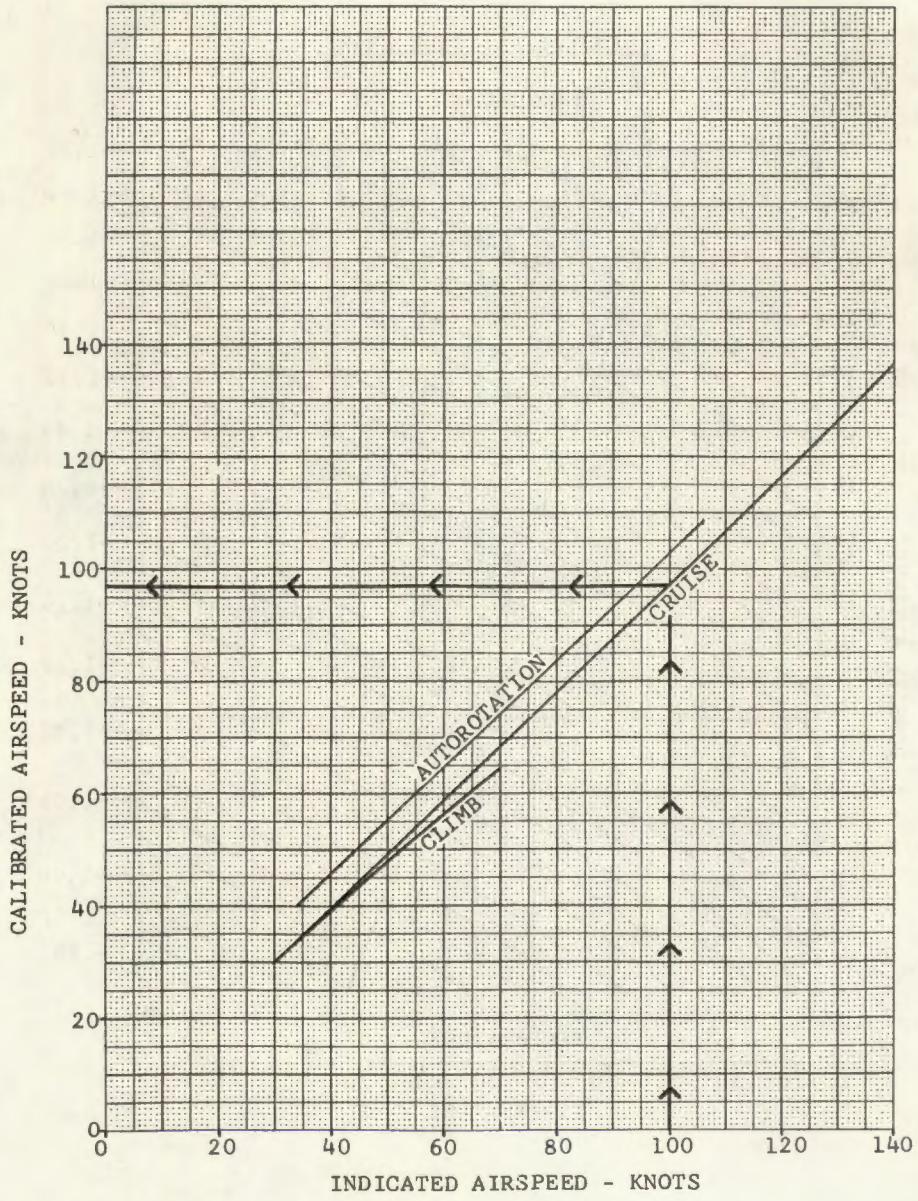
c. LRC airspeed is determined by moving vertically to the LRC baseline and projecting horizontally to read 102 KTAS. By referring to the maximum permissible speed plot, figure 14-18, for an OAT of minus 20°C, this airspeed is seen to be within the limit 107 KTAS.

e d. Fuel flow is determined by projecting vertically to 102 KTAS on the fuel flow grid and moving horizontally to read 153 pounds per hour.

AIRSPEED CALIBRATION

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053035

Figure 14-1. Airspeed calibration chart

DENSITY ALTITUDE CHART

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

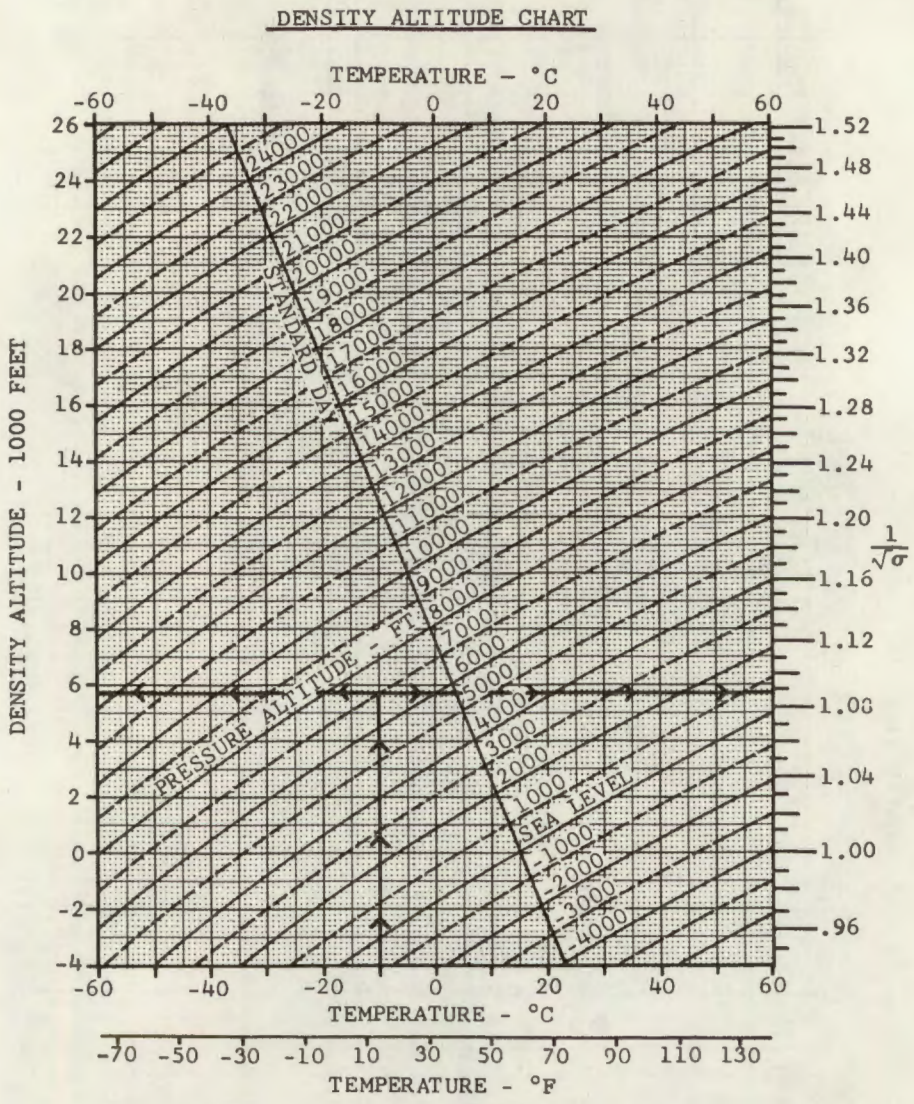


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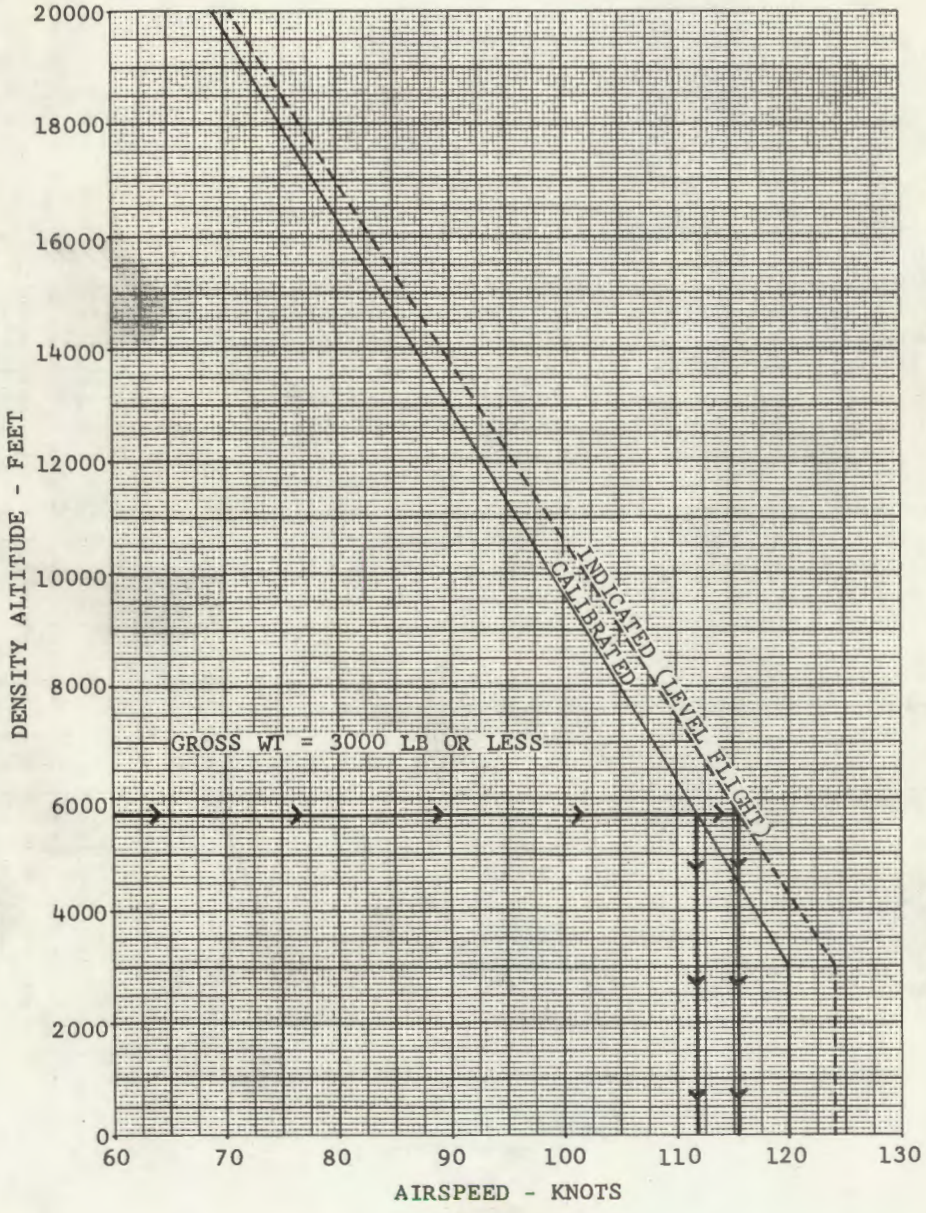
Figure 14-2. Density altitude chart

COMPONENT LIFE-MAXIMUM SPEED

6180 RPM - STANDARD DAY

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053037

Figure 14-3. Component life chart - maximum speed

POWER AVAILABLE

MILITARY POWER
PARTICLE SEPARATOR INSTALLED
6180 RPM

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

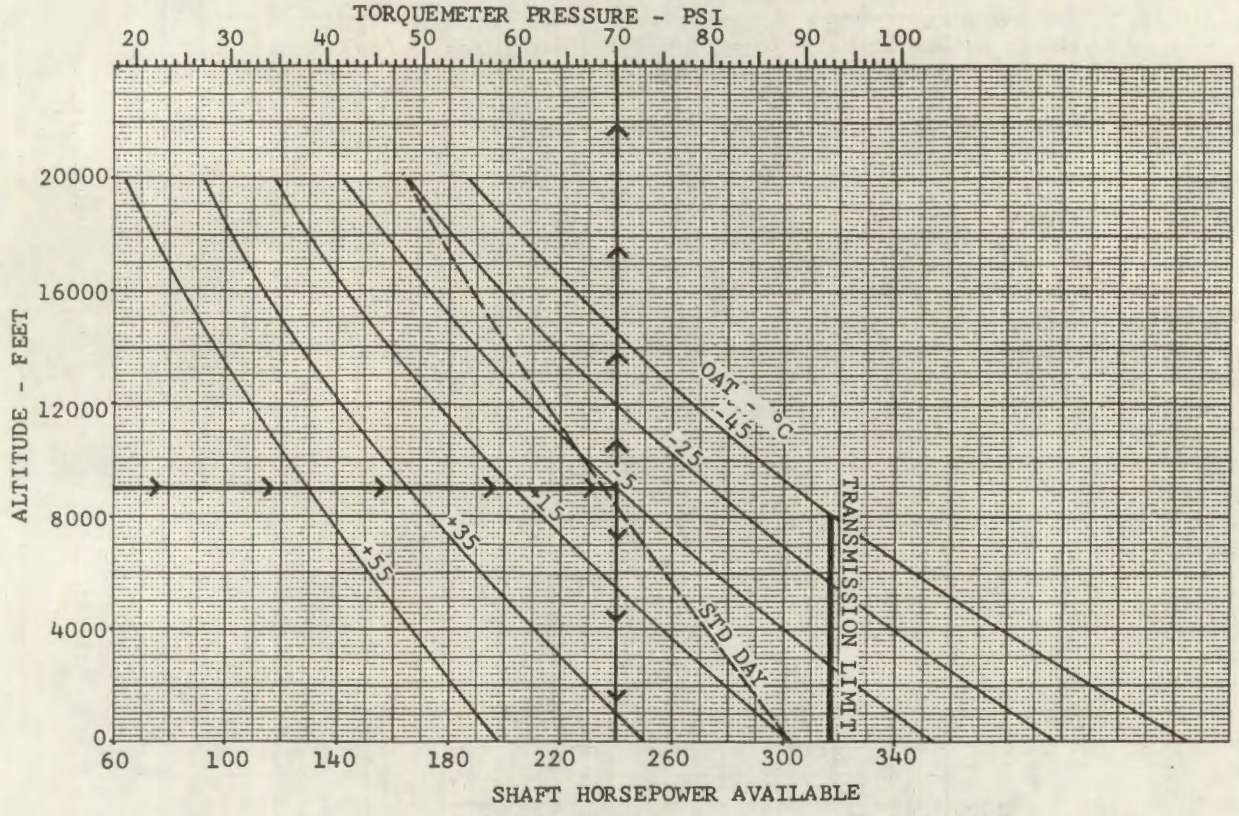


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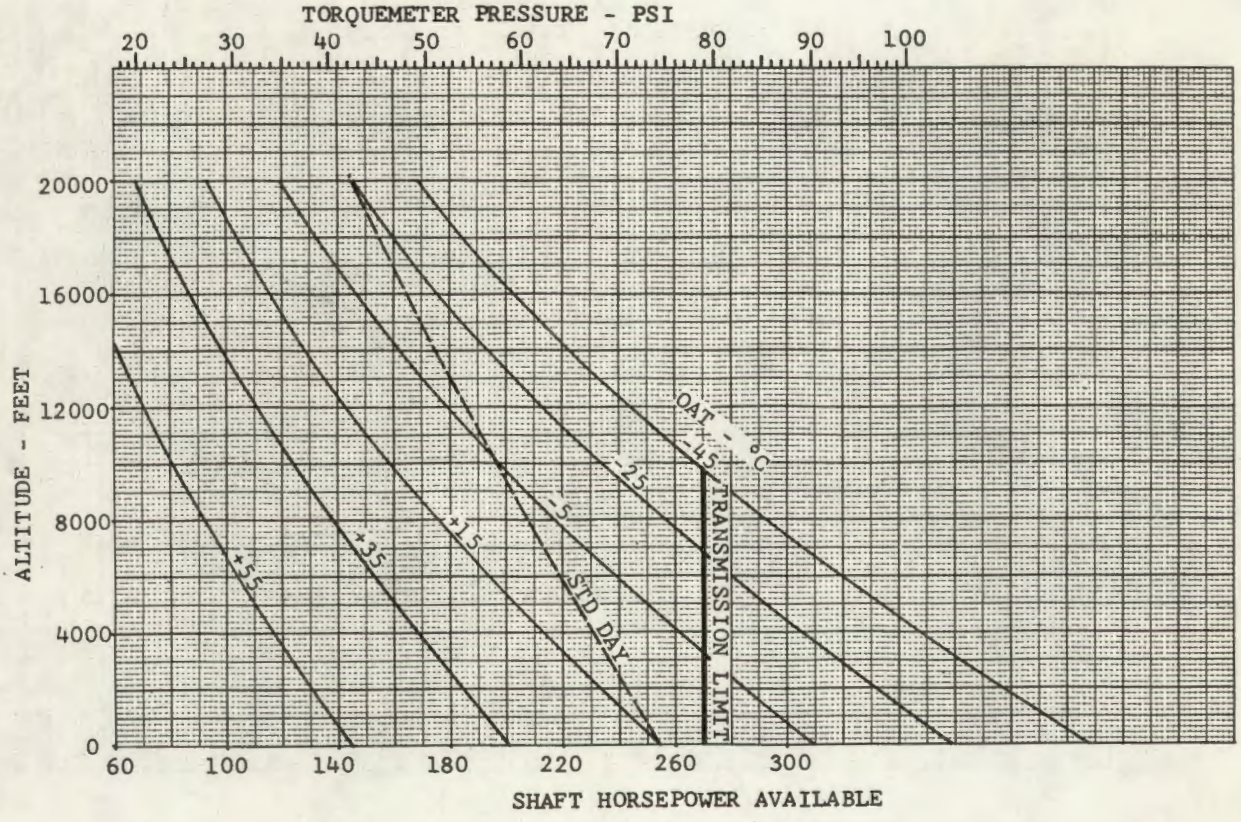
Figure 14-4. Power available chart - take-off power

POWER AVAILABLE

NORMAL POWER
PARTICLE SEPARATOR INSTALLED
6180 RPM

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053039

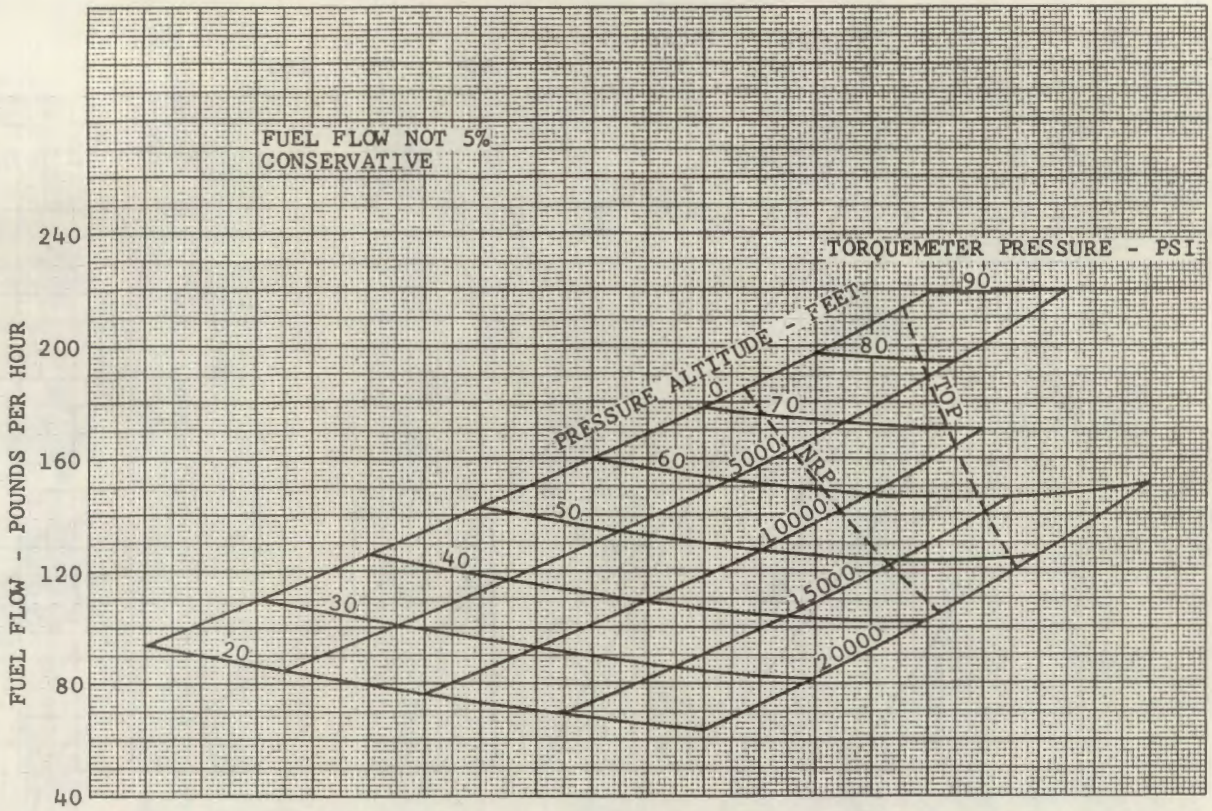
Figure 14-5. Power available chart - normal power

FUEL FLOW-6180 RPM

PARTICLE SEPARATOR INSTALLED

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053041

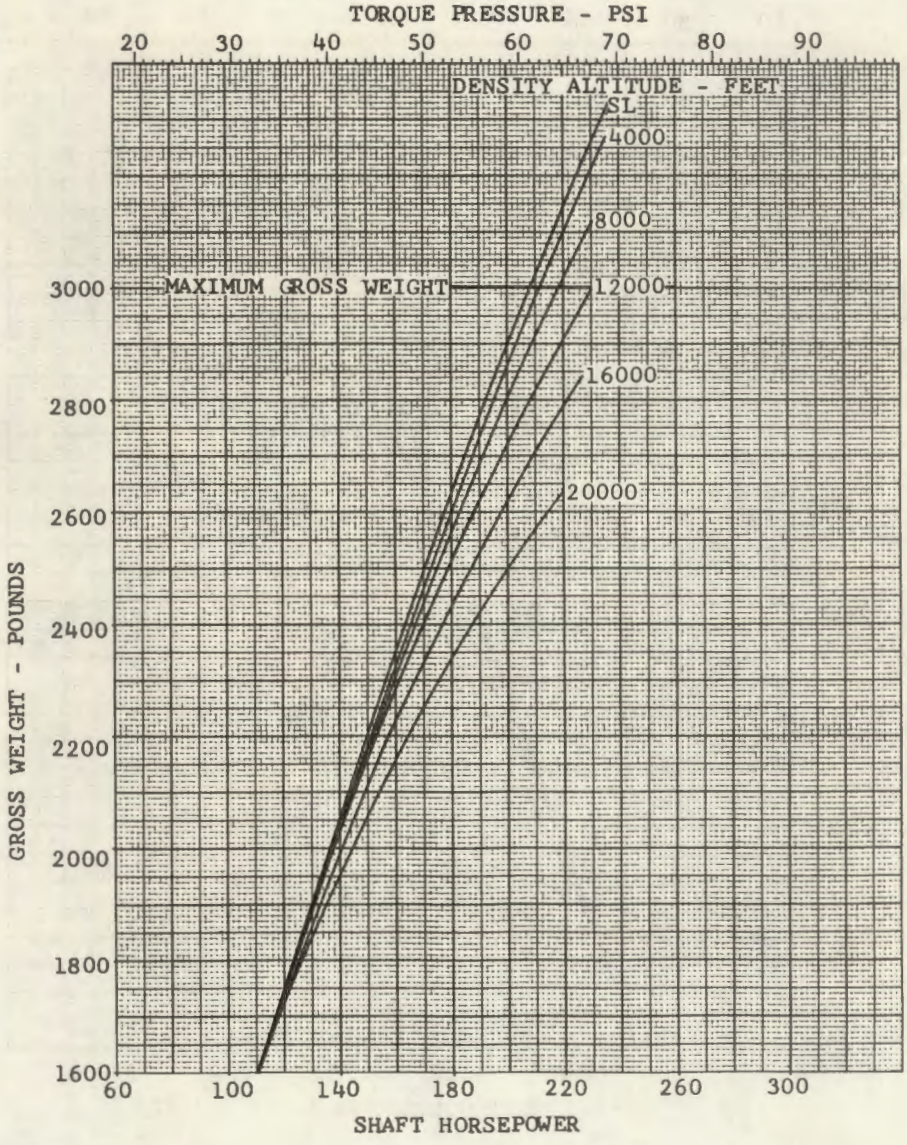
Figure 14-6. Fuel flow chart

TORQUE AND POWER REQUIRED TO HOVER

IN-GROUND EFFECT
2 FOOT SKID HEIGHT

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053042

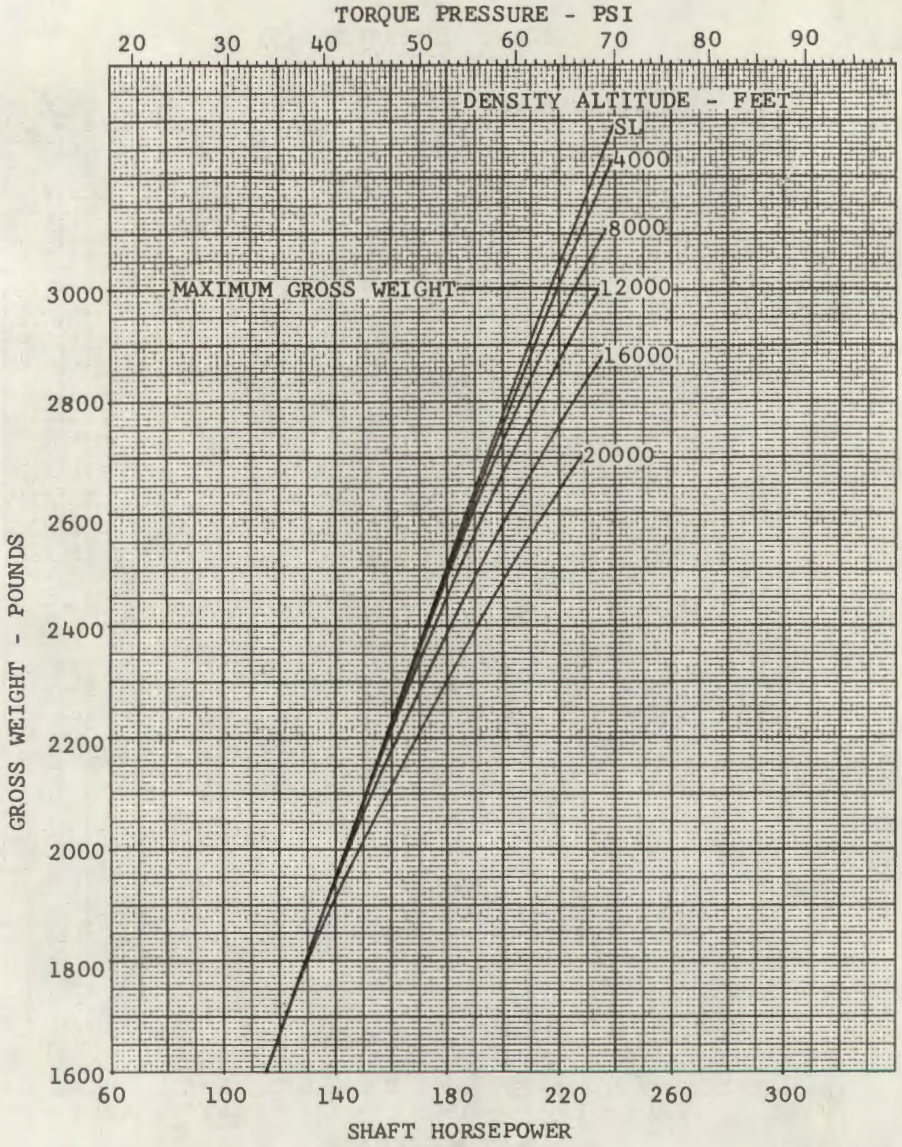
Figure 14-7. Torque and power required to hover chart - in ground effect (Sheet 1 of 2)

TORQUE AND POWER REQUIRED TO HOVER

IN-GROUND EFFECT
4 FOOT SKID HEIGHT

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053043

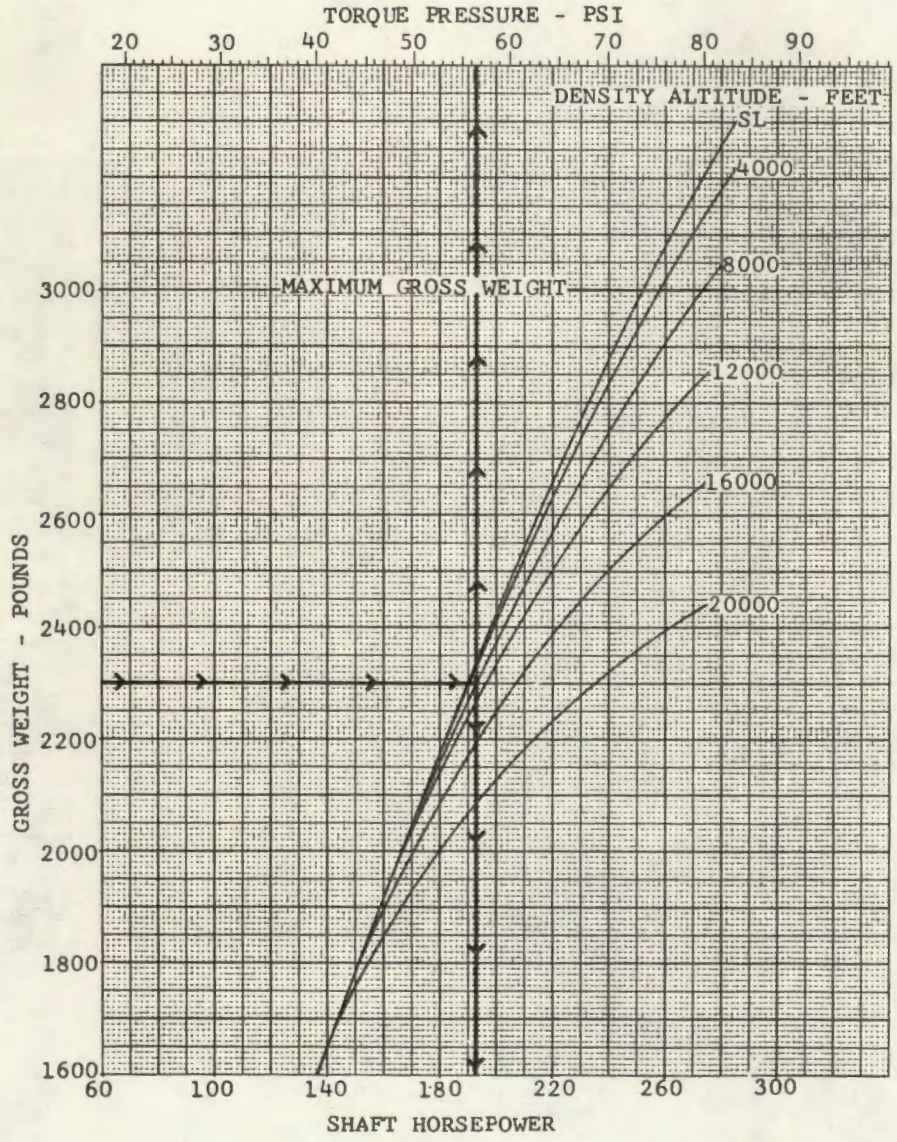
Figure 14-7. Torque and power required to hover chart - in ground effect (Sheet 2 of 2)

TORQUE AND POWER REQUIRED TO HOVER

OUT-OF-GROUND EFFECT

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053044

Figure 14-8. Torque and power required to hover chart - out of ground effect

HOVERING CEILING

IN-GROUND EFFECT - 2 FOOT SKID HEIGHT
PARTICLE SEPARATOR INSTALLED

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal

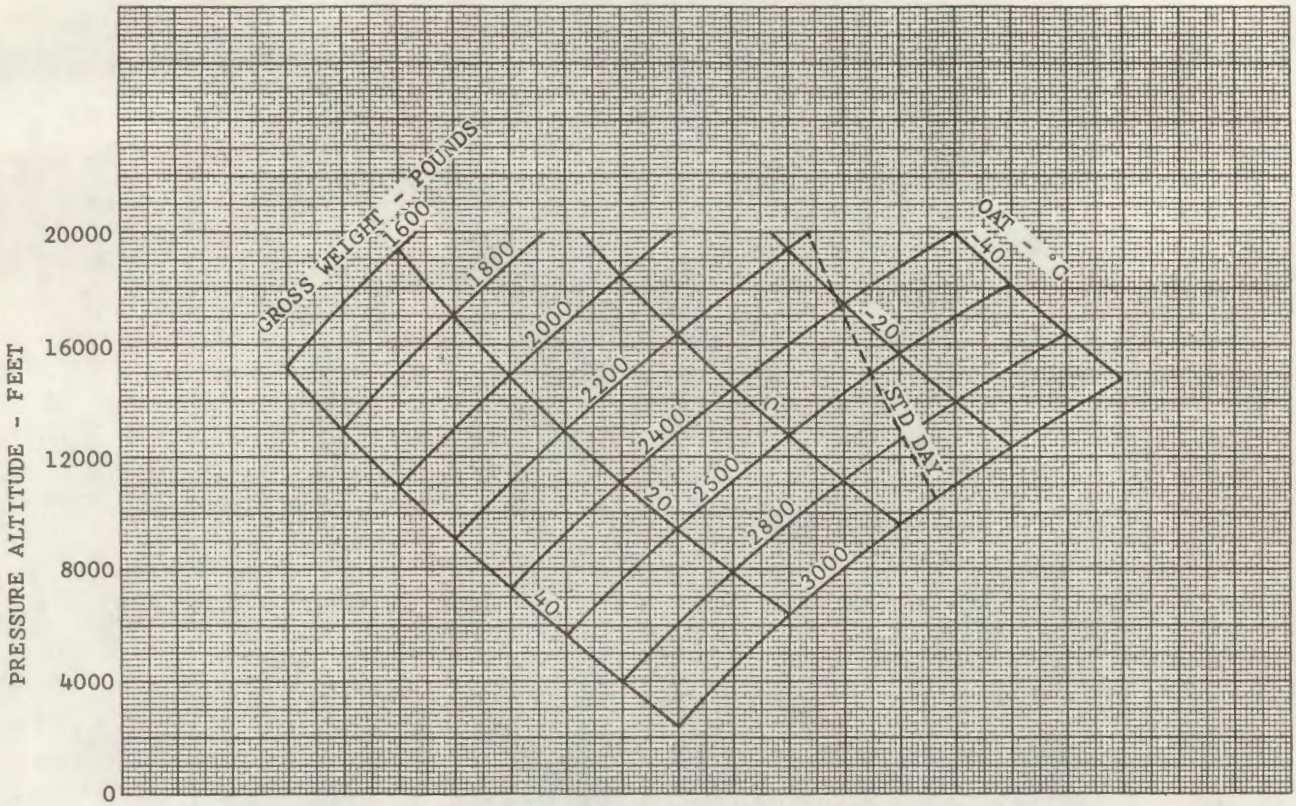


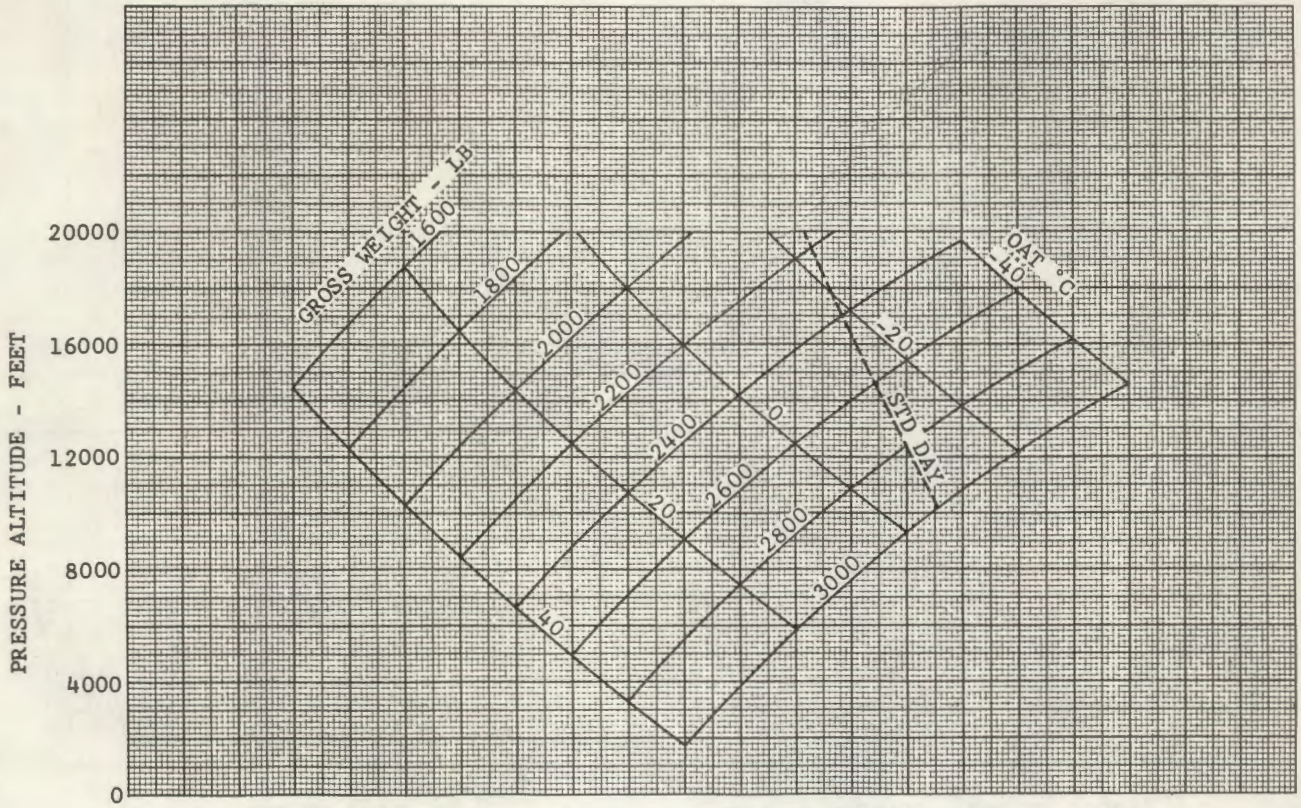
Figure 14-9. Hovering ceiling chart - in ground effect (Sheet 1 of 2)

HOVERING CEILING

IN-GROUND EFFECT - 4 FOOT SKID HEIGHT
PARTICLE SEPARATOR INSTALLED

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053046

Figure 14-9. Hovering ceiling chart - in ground effect (Sheet 2 of 2)

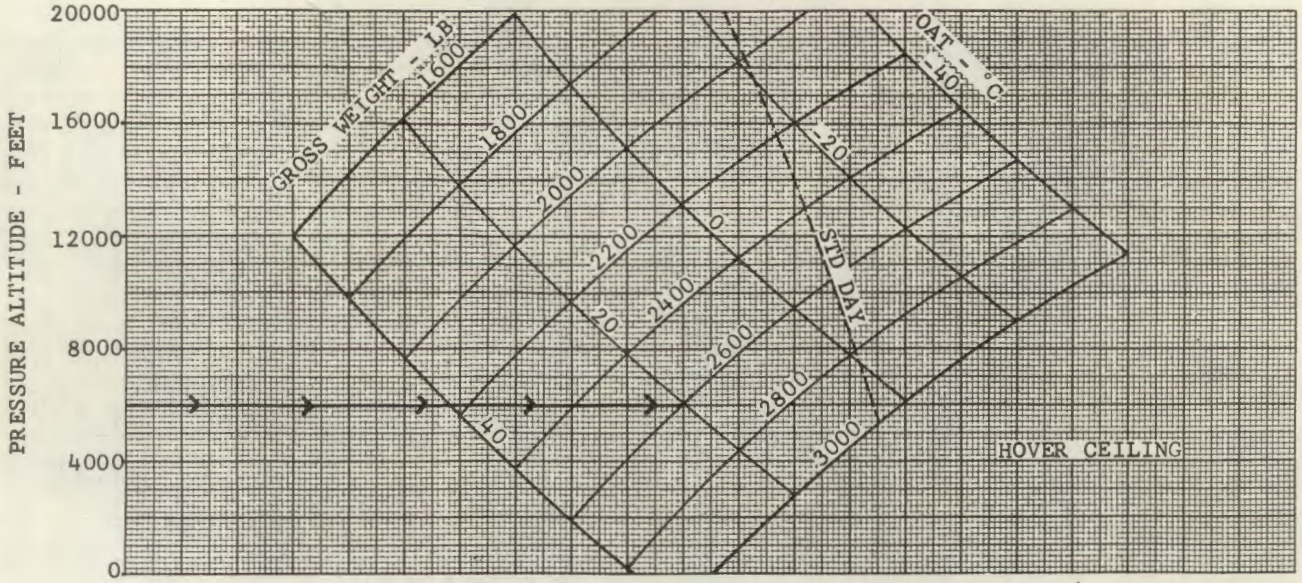
HOVERING CEILING

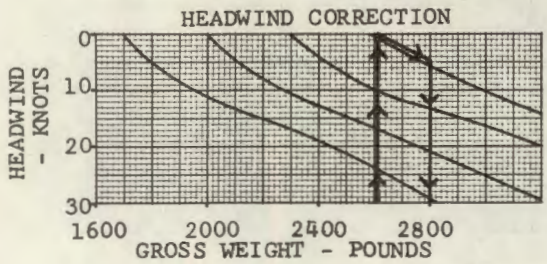
OUT-OF-GROUND EFFECT

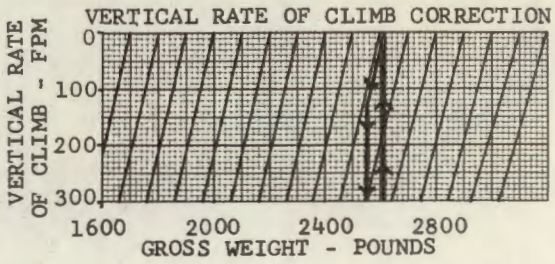
PARTICLE SEPARATOR INSTALLED

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal







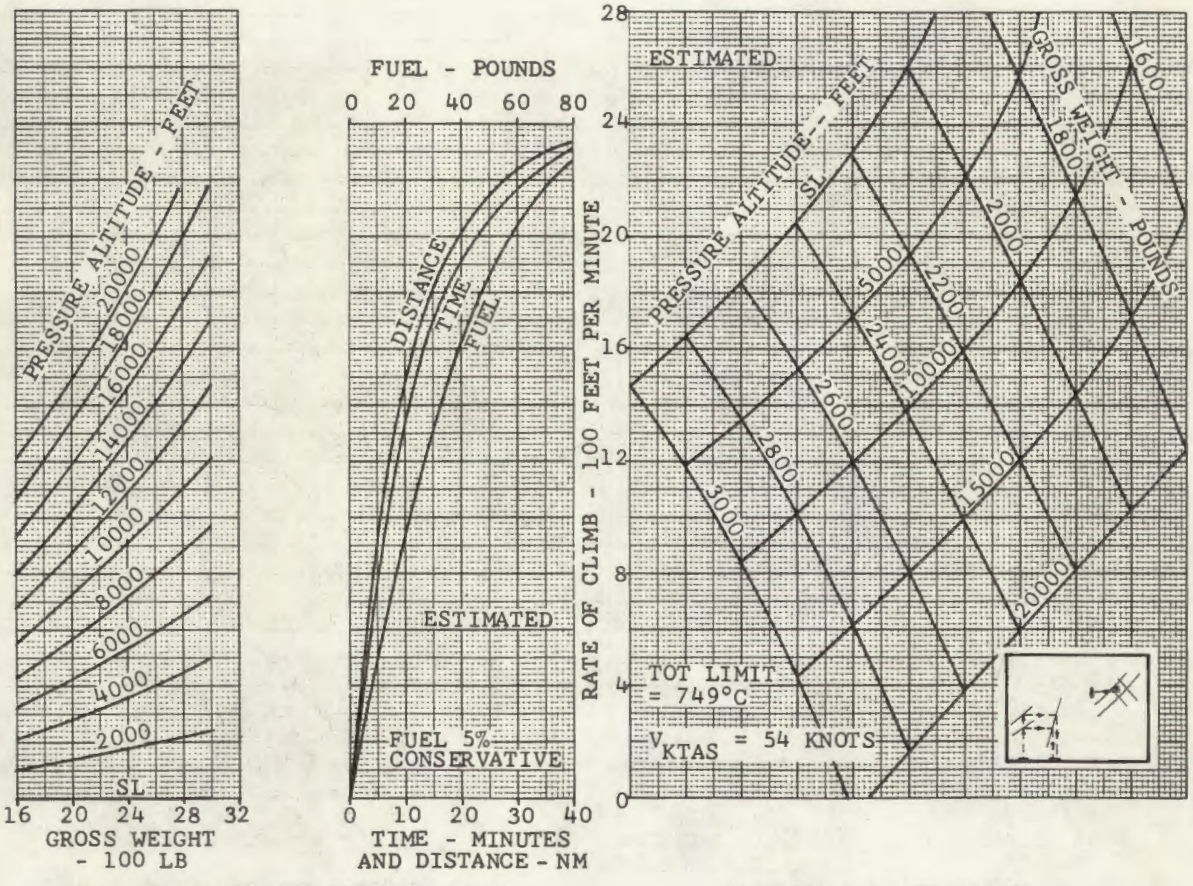
AV 053047

Figure 14-10. Hovering ceiling chart - out of ground effect

CLIMB PERFORMANCE
(MAXIMUM RATE OF CLIMB)
MILITARY POWER
STANDARD DAY

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



TIME, DISTANCE AND FUEL TO CLIMB - PARTICLE SEPARATOR INSTALLED

MAXIMUM RATE OF CLIMB STANDARD DAY, TAKEOFF POWER

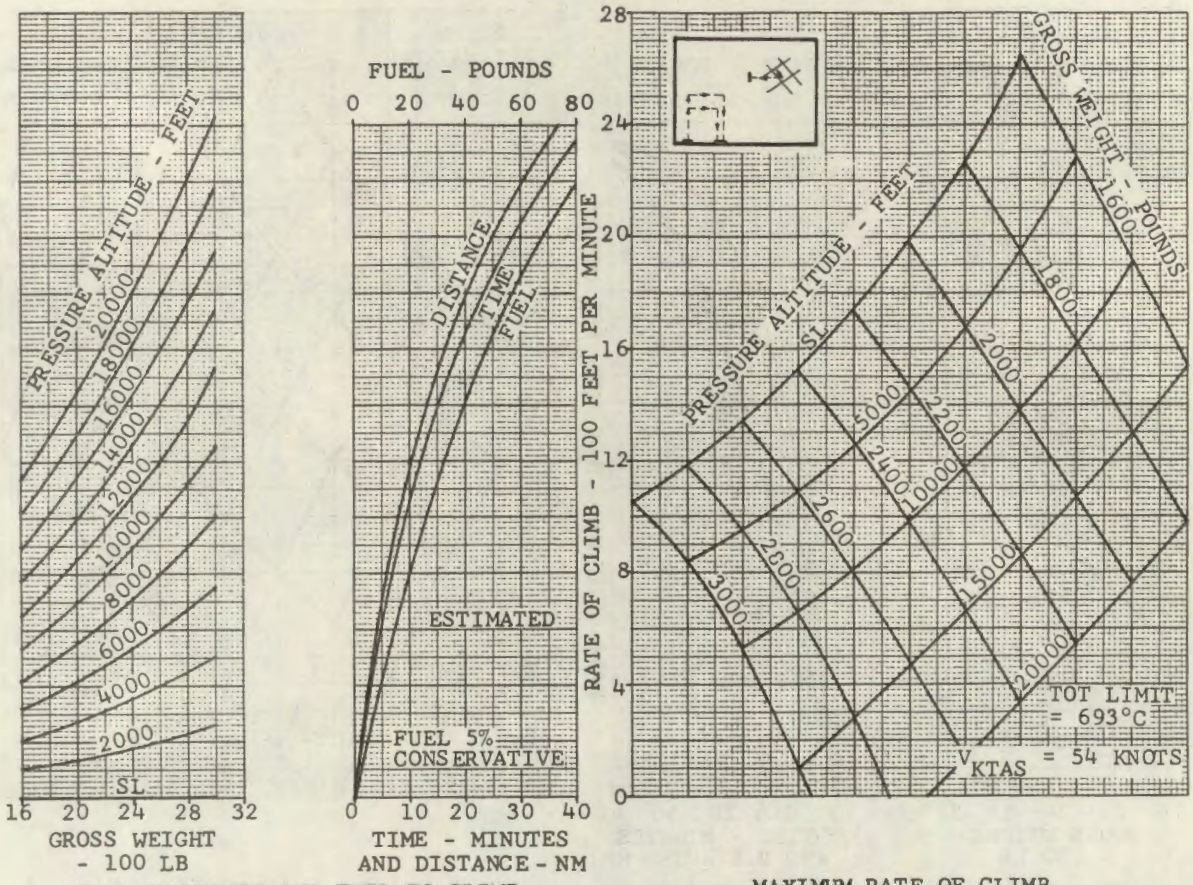
AV 053048

Figure 14-11. Climb performance chart - Take-off power

CLIMB PERFORMANCE
(MAXIMUM RATE OF CLIMB)
NORMAL POWER
STANDARD DAY

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



TIME, DISTANCE AND FUEL TO CLIMB - PARTICLE SEPARATOR INSTALLED

MAXIMUM RATE OF CLIMB STANDARD DAY, NORMAL POWER

AV 053049

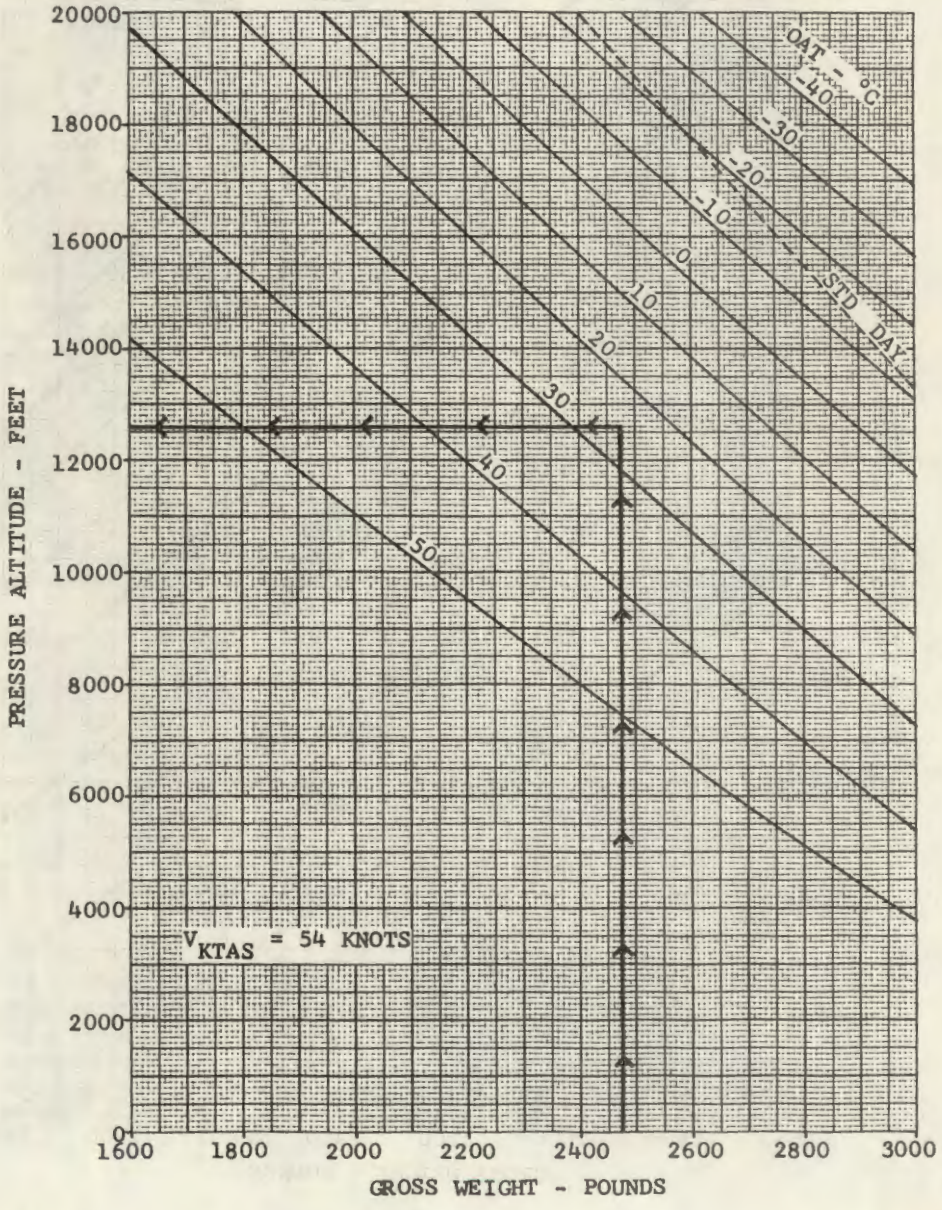
Figure 14-12. Climb performance chart - normal power

SERVICE CEILING

NORMAL POWER (54 KTAS)
6180 RPM - ALL CONFIGURATIONS

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053050

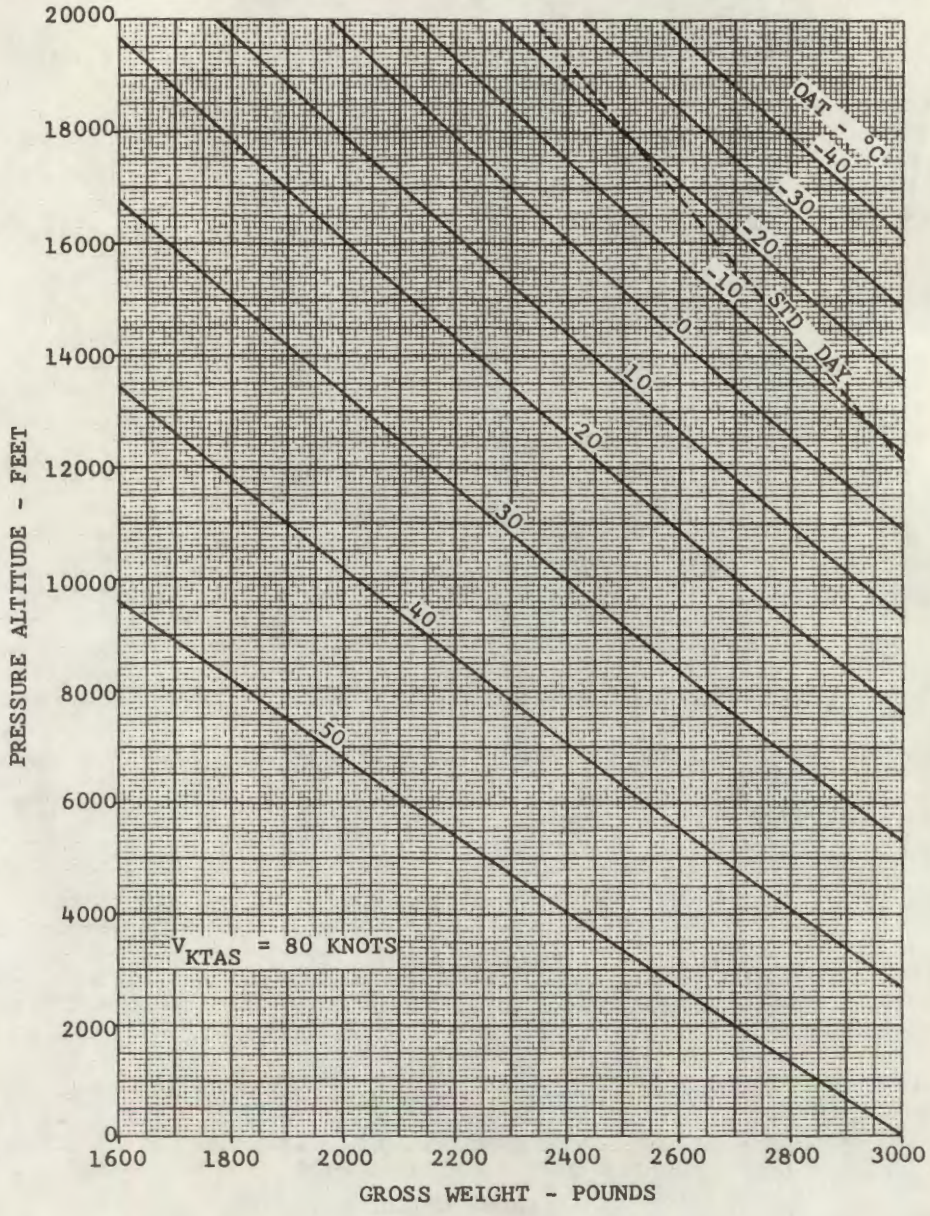
Figure 14-13. Service ceiling chart - 54 knots

SERVICE CEILING

NORMAL POWER (80 KTAS)
6180 RPM - ALL CONFIGURATIONS

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



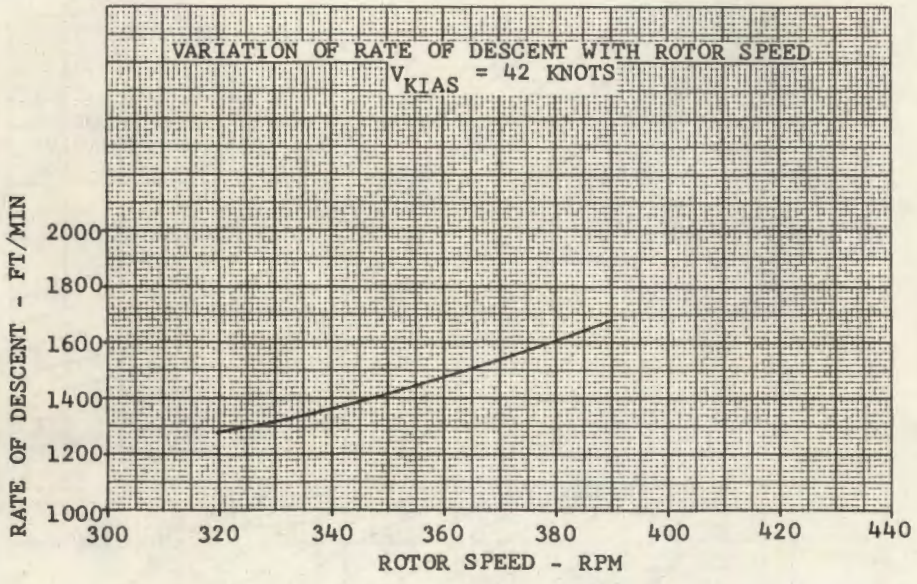
AV 053051

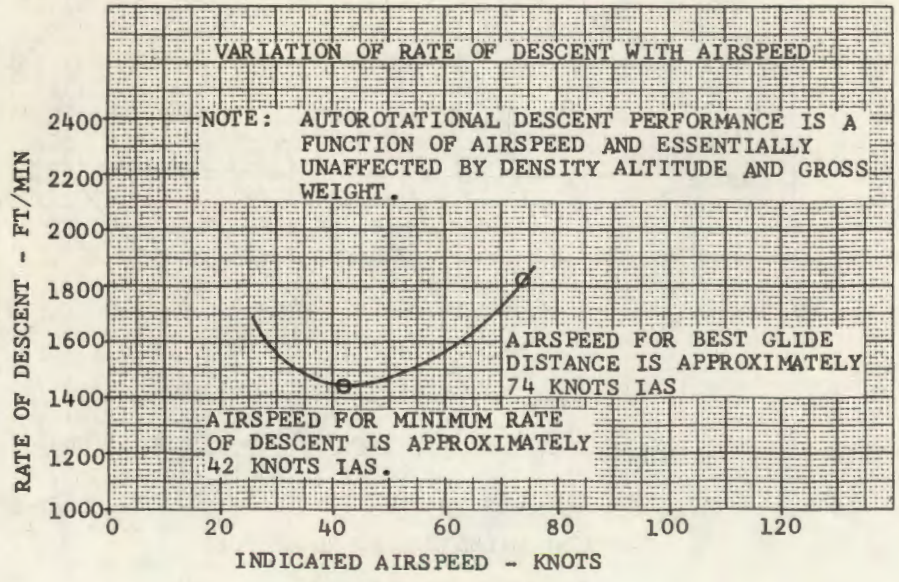
Figure 14-14. Service ceiling chart - 80 knots

AUTOROTATIONAL DESCENT

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal





AV 053052

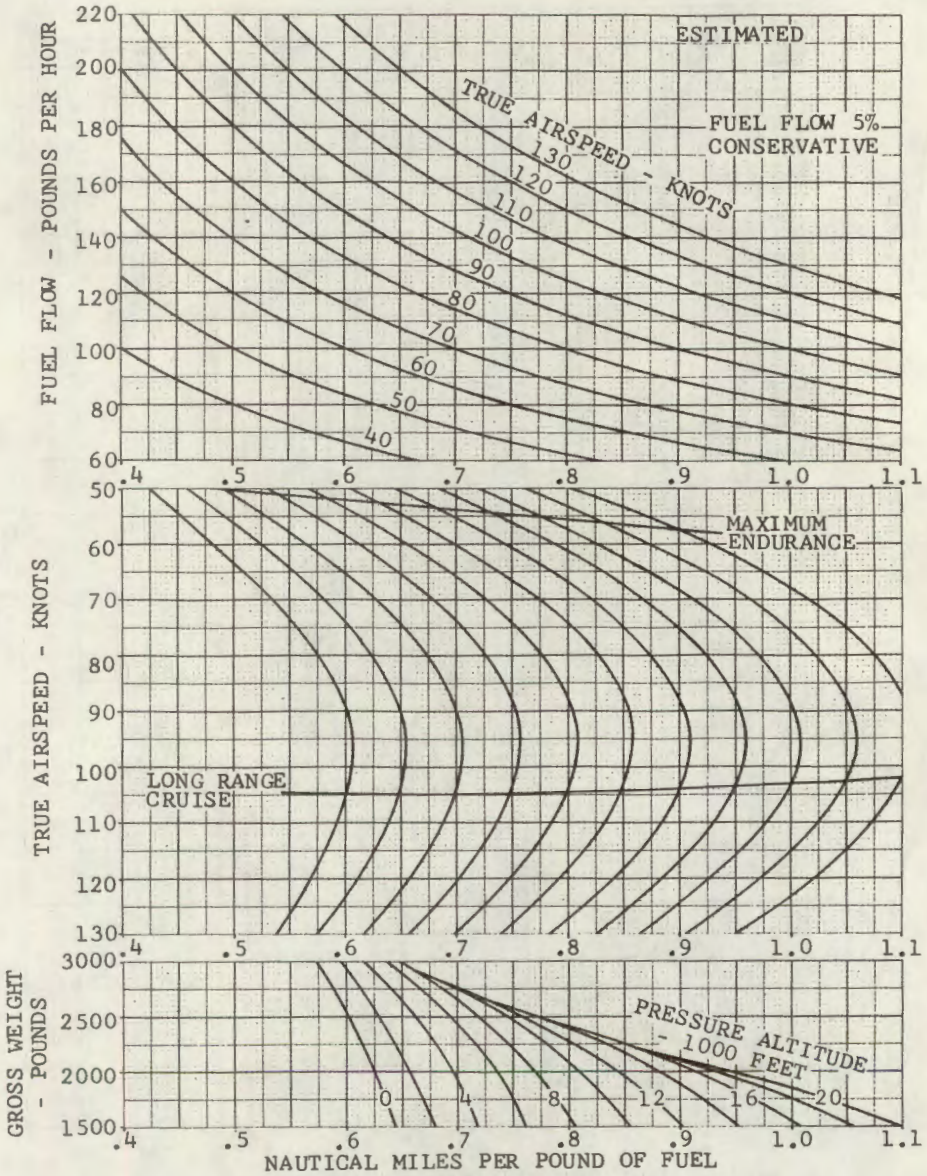
Figure 14-15. Autorotation descent

SPECIFIC RANGE
(NAUTICAL MILES PER POUND OF FUEL)

CRUISE SPEED
6180 RPM

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



CLEAN CONFIGURATION

AV 053053

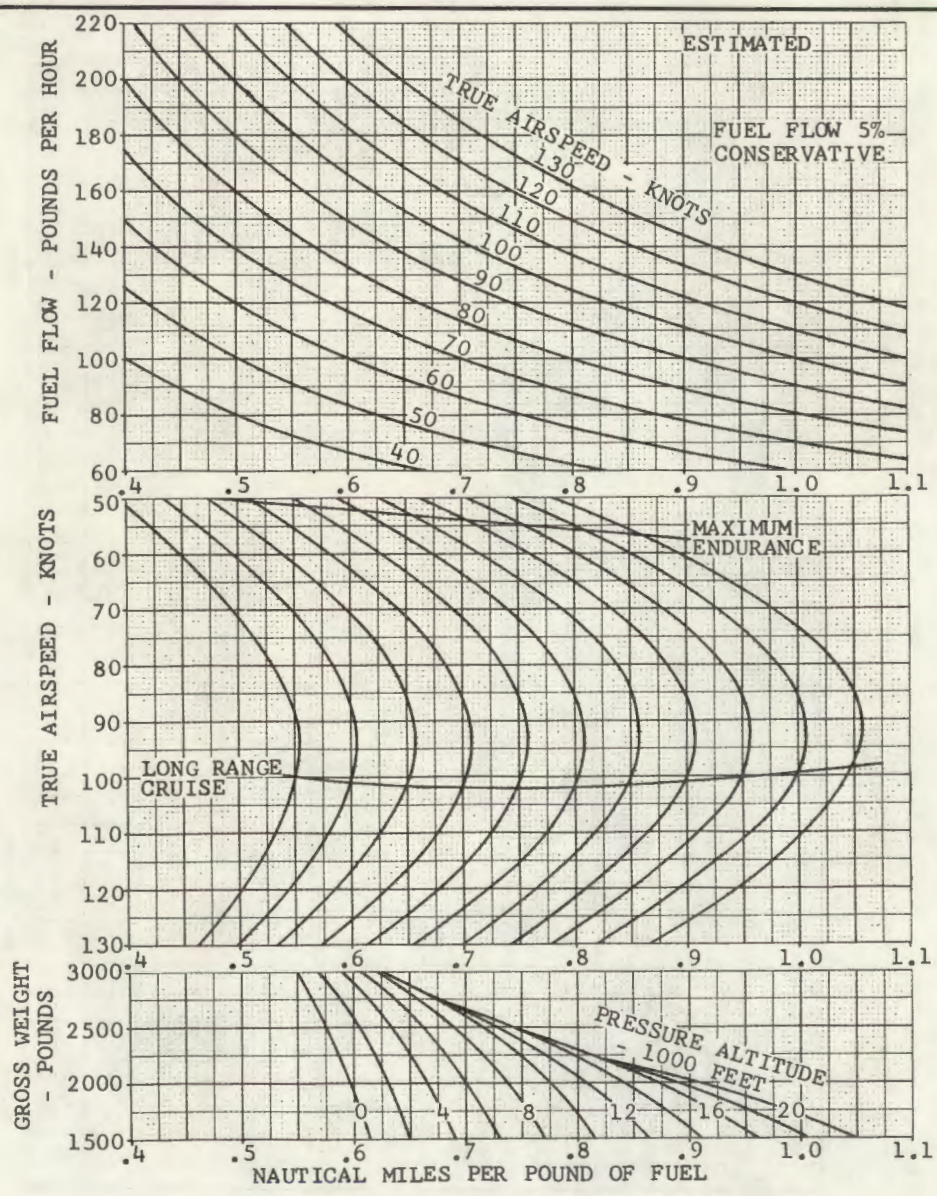
Figure 14-16. Specific range chart - cruise speed

SPECIFIC RANGE
(NAUTICAL MILES PER POUND OF FUEL)

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

CRUISE SPEED
6180 RPM

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



ARMED CONFIGURATION

AV 053040

Figure 14-17. Specific range chart - cruise speed

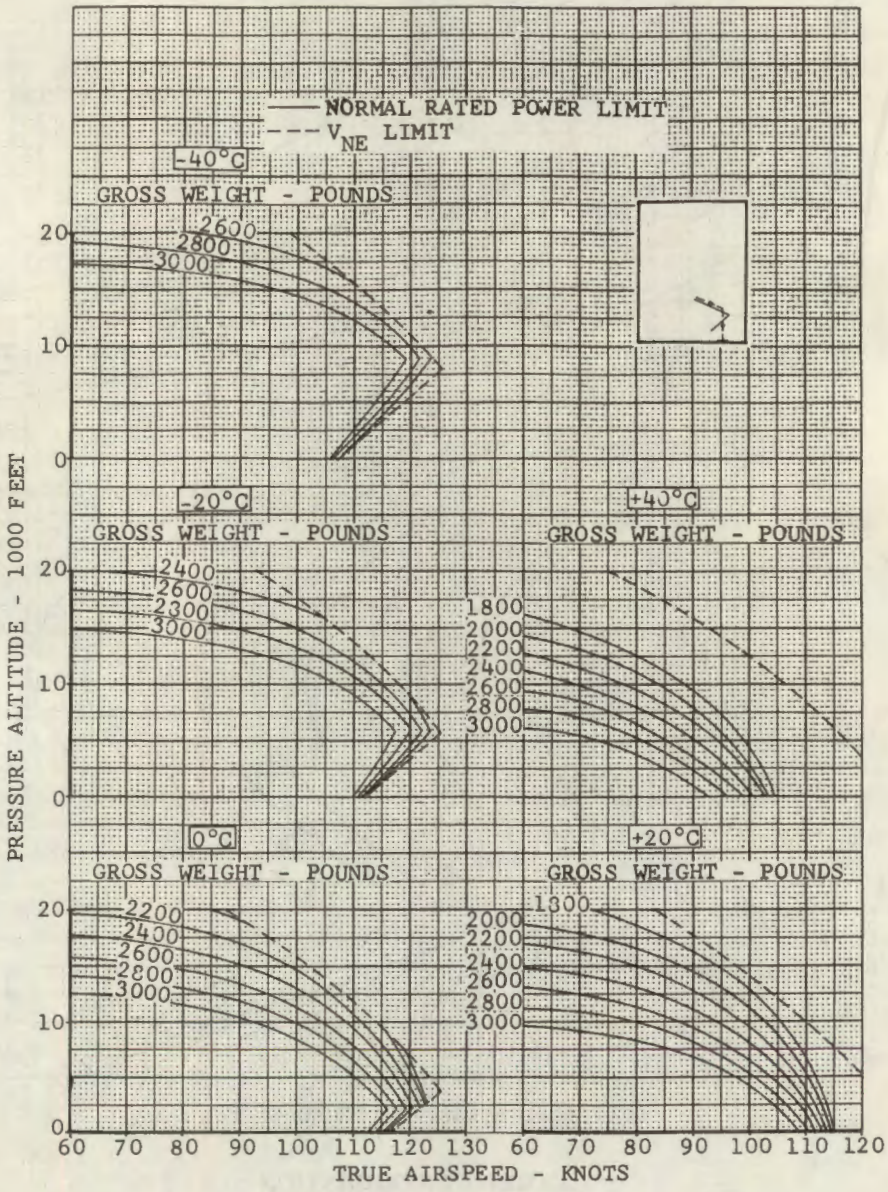
SPECIFIC RANGE
(NAUTICAL MILES PER POUND OF FUEL)

CLEAN CONFIGURATION

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

MAXIMUM PERMISSIBLE SPEED
6180 RPM

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



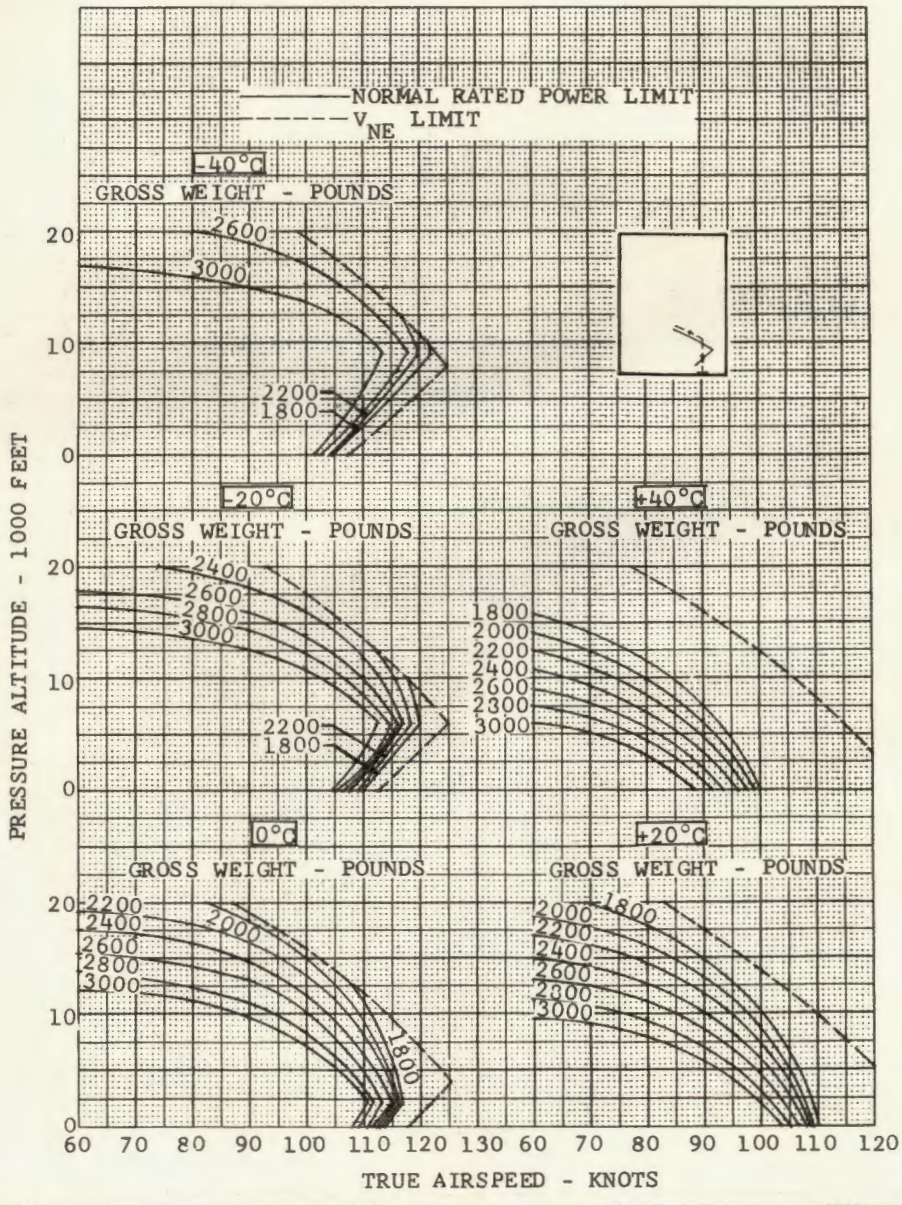
AV 053054

Figure 14-18. Specific range chart - maximum speed - clean

SPECIFIC RANGE
(NAUTICAL MILES PER POUND OF FUEL)
ARMED CONFIGURATION
MAXIMUM PERMISSIBLE SPEED
6180 RPM

Model(s): OH-58A
Data as of: January, 1969
DATA BASIS:

Engine(s): T63-A-700
Fuel Grade: JP-4
Fuel Density: 6.5 Lb/Gal



AV 053055

Figure 14-19. Specific range chart - maximum speed - armed

APPENDIX A

REFERENCES

NOTE

The following references of the issue in effect at the date of this publication are required for use by operational personnel in performance of their duties.

Maintenance Forms

DD Form 365 Series	Weight and Balance Record
DA Form 2407	Maintenance Request
DA Form 2408	Equipment Log Book Assembly (Records)
DA Form 2408-12	Army Aviator's Flight Record
DA Form 2408-13	Army Aviator's Flight Record
DA Form 2408-15	Service Record for Aircraft
DA Form 2408-17	Aircraft Inventory Record
AR 95-2	Flight Regulations for Army Aircraft
AR 95-16	Weight and Balance Army Aircraft
AR-55	Nuclear Weapon Jettison
AR-310-1	Military Publications (General Policies)
AR 310-3	Military Publications (Preparations and Processing)
AR 320-5	Dictionary of United States Army Terms
AR 320-50	Authorized Abbreviations and Brevity Codes
AR 385-25	Safety Studies and Reviews of Atomic Weapons Systems
AR 385-40	Accident Reporting and Records
AR 385-62	Firing Guided Missiles and Heavy Rockets for Training, Target Practice and Combat
AR 385-63	Regulations for Firing Ammunition
AR 700-1300-8	Malfunctions Involving Ammunition and Explosives (Reports Control Symbol ORD-43)
AR 746-2300-1	Colors and Marking of Vehicles and Equipment
AR 750-5	Organization Policies
AR 750-8	Command Maintenance Management Inspections

Maintenance Forms,

AR 755-15	Disposal of Unwanted Radioactive Material
DA PAM 310-1	Index of Administrative Publications
DA PAM 310-2	Index of Blank Forms
DA PAM 310-4	Bulletins, Lubrication Orders and Technical Manuals
TB 55-1500-311-25	Test Flight and Maintenance Operational Checks of Army Aircraft
TB 55-1500-314-25	Handling Storage and Disposal of Self-luminous Aircraft Instruments, Markers and Aircraft Engine Ignition Exciter Units Containing Radioactive Material.
TB 55-9150-200-25	Engine and Transmission Oils and Additives for Army Aircraft
TM 1-215	Attitude Instrument Flying
TM 1-225	Navigation for Army Aviation
TM 3-220	Decontamination
TM 3-261	Handling and Disposal of Unwanted Radioactive Material
TM 9-207	Operation and Maintenance of Ordnance Material in Extreme Cold Weather 0° to -65°F
TM 9-247	Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Material
TM 9-273	Lubrication of Ordance Material
TM 6920-210-14	Targets, Target Material, and Training Course Lay-Outs
TM 9-1305-200	Small Arms Ammunition
TM 38-750	The Army Equipment Record System and Procedures
FM 5-25	Explosives and Demolition
FM 21-6	Techniques of Military Instruction
FM 31-70	Basic Cold Weather Manual
SM 9-5-1340	FSC Group - Ammunition and Explosives
SB-38-100	Preservation, Packaging, and Packing Materials, Supplies and Equipment Used by the Army
TM 9-1005-298-12	Operator and Organizational Maintenance Manual - Helicopter, 7.62 Millimeter Machine Gun, High Rate, XM27E1 Armament Subsystem
TM 11-5826-227-20	Operation Instruction AN/ARN-89 Direction Finder Set
TM 11-5821-261-20	Operation Instruction AN/ARC-116 Radio Set
TM 11-5821-260-20	Operation Instructions AN/ARC-115 Radio Set
TM 11-5821-259-20	Operation Instructions AN/ARC-114 Radio Set

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