Acft 67-16301

TM 55-1520-214-10

CH 14-8-Dec 87
CH-15

TECHNICAL MANUAL

OPERATORS MANUAL

HELICOPTER OBSERVATION OH-6A

This copy is a reprint which includes current pages from Changes 1 through 13.

This manual supersedes TM 55-1520-214-10 dated 18 April 1974 including all changes.

HEADQUARTERS, DEPARTMENT OF THE ARMY
17 DECEMBER 1976

This manual is published for the use of all concerned.

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:
PAUL T. SMITH
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31 (qty rqr block no. 191) Operator and Crew Maintenance Requirements for OH-6 aircraft.

URGENT

CHANGE
NO. 13

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 20 November 1984

Operator's Manual

HELICOPTER OBSERVATION OH-6A

TM 55-1520-214-10, 17 December 1976, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
---	2-18.1/2-18.2
2-37 and 2-38	2-37 and 2-38
5-9 and 5-10	5-9 and 5-10
6-5 through 6-8	6-5 through 6-8
6-15 and 6-16	6-15 and 6-16
7-7 and 7-8	7-7 and 7-8
8-1 through 8-4	8-1 through 8-4
8-15 and 8-16	8-15 and 8-16
9-4.1/9-4.2	9-4.1/9-4.2
9-5 through 9-8	9-5 through 9-8
Index 5 and Index 6	Index 5 and Index 6

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

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31, Operator Maintenance Requirements for OH-6 aircraft.

URGENT

CHANGE
NO. 15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C.,

Operator's Manual

HELICOPTER OBSERVATION OH-6A

TM 55-1520-214-10, 17 December 1976, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
Warning	A and B
i and ii	i and ii
1-1 and 1-2	1-1 and 1-2
2-1 through 2-4	2-1 through 2-4
2-7 and 2-8	2-7 and 2-8
2-15 through 2-22	2-15 through 2-22
2-27 through 2-30	2-27 through 2-30
2-31 and 2-32	2-31 and 2-32
2-33 and 2-34	2-33 and 2-34
2-35 and 2-36	2-35 and 2-36
- - -	2-36A/2-36B
2-37 and 2-38	2-37 and 2-38
2-38.1/2-38.2	2-38A/2-38B
2-39 and 2-40	2-39 and 2-40
2-43 through 2-46	2-43 through 2-46
3-1 through 3-4	3-1 through 3-4
3-17 and 3-18	3-17 and 3-18
4-5 and 4-6	4-5 and 4-6
4-9 and 4-10	4-9 and 4-10
5-1 through 5-8	5-1 through 5-8
6-1 through 6-10	6-1 through 6-10
6-11 and 6-12	6-11/6-12
7-1 and 7-2	7-1 and 7-2
- - -	7-2A/7-2B
7-3 and 7-4	7-3 and 7-4
7-11 through 7-16	7-11 through 7-16
- - -	7-16A/7-16B
7-17 through 7-22	7-17 through 7-22
- - -	7-22A through 7-22M/7-22N
7-23 and 7-24	7-23 and 7-24
7-25 and 7-26	7-25/7-26
7-27 and 7-28	7-27 and 7-28
7-31 through 7-35/(7-36 blank)	7-31 through 7-35/(7-36 blank)
8-1 through 8-14	8-1 through 8-14
9-1 through 9-10	9-1 through 9-10
- - -	9-11 through 9-13/9-14
A-1/A-2	A-1/A-2
Index 1 through Index 6	Index 1 through Index 6
- - -	Index 7/Index 8

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

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31, -10 & CL Maintenance requirements for OH-6A Helicopter, Observation.

CHANGE NO. 12

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 10 October 1983

Operator's Manual

HELICOPTER OBSERVATION OH-6A

TM 55-1520-214-10, 17 December 1976, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Table of Contents	i and ii	i and ii
Chapter 1	1-1 and 1-2	1-1 and 1-2
Chapter 2	2-1 thru 2-10	2-1 thru 2-10
	2-15 thru 2-34.1	2-15 thru 2-34.1/2-34.2
	2-35 thru 2-38	2-35 thru 2-38.1/2-38.2
	2-39 and 2-40	2-39 and 2-40
	2-43 thru 2-46	2-43 thru 2-46
Chapter 3	3-1 thru 3-24	3-1 thru 3-28
Chapter 4	4-1 and 4-2	4-1 and 4-2
	4-5 thru 4-10	4-5 thru 4-10
Chapter 5	5-1 thru 5-13	5-1 thru 5-13/5-14
Chapter 6	6-1 thru 6-16	6-1 thru 6-16
Chapter 7	7-1 thru 7-8	7-1 thru 7-8
	7-15 and 7-16	7-15 and 7-16
	7-33 and 7-34	7-33 and 7-34
Chapter 8	8-1 thru 8-15	8-1 thru 8-19/8-20
Chapter 9	9-1 thru 9-2.1/9-2.2	9-1 thru 9-2.1/9-2.2
	9-3 thru 9-4.1/9-4.2	9-3 thru 9-4.1/9-4.2
	9-5 thru 9-8A/9-8B	9-5 thru 9-8
	9-9 and 9-10	9-9 and 9-10
Appendix A	A-1/A-2	A-1/A-2
Index	Index 1 thru Index 6	Index 1 thru Index 6

2. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

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

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31, Operator Maintenance Requirements for OH-6 aircraft.

CHANGE No. 11

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 11 January 1982

Operator's Manual

HELICOPTER OBSERVATION OH-6A

TM 55-1520-214-10, 17 December 1976, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 2	2-39 and 2-40	2-39 and 2-40
	2-43 and 2-44	2-43 and 2-44
Chapter 3	3-21 and 3-22	3-21 and 3-22
Chapter 5	5-1 and 5-2	5-1 and 5-2
	5-7 and 5-8	5-7 and 5-8
Chapter 6	6-3 thru 6-6	6-3 thru 6-6
Chapter 8	8-1 thru 8-6	8-1 thru 8-6
	8-7 and 8-8	8-8
Chapter 9	9-1 and 9-2	9-1 thru 9-2.1/9-2.2
	9-4.1/9-4.2	9-4.1/9-4.2
	9-5 thru 9-8	9-5 thru 9-8

2. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

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

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31, Operator Maintenance requirements for OH-6 aircraft.

CHANGE No. 10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 13 August 1981

Operator's Manual

HELICOPTER OBSERVATION OH-6A

TM 55-1520-214-10, 17 December 1976, is changed as follows:

1. Remove and insert pages as indicated below.

	Remove pages	Insert pages
Chapter 9	9-5 and 9-6	9-5 and 9-6

2. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

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

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31, Operator Maintenance Requirements for OH-6 aircraft.

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 or death.

STARTING ENGINES

Minimum rotor clearance is low enough to cause injury to personnel. Coordinate all cockpit actions with ground observer, fireguard is posted, if available. Ensure that rotor and blast areas are clear and fire guard is posted. Secure safety belts and shoulder harness in unoccupied seats to prevent fouling controls.

FIRE EXTINGUISHER

Exposure too high concentrations of extinguishing agent or toxic fumes produced by agent can endanger personnel by reducing the oxygen available for proper breathing. Provide adequate ventilation during use of the hand fire extinguisher. Do not allow extinguisher compound to contact the skin as it can cause frostbite or low temperature burns.

GROUND OPERATION

Engine will be started and operated only by authorized personnel. Reference AR 95-1.

FLIGHT OPERATION

Flight involving abrupt right hand turns should be avoided under downwind, low altitude, low airspeed conditions.

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.

ELECTROLYTE

Corrosive Battery Electrolyte (Potassium Hydroxide). Wear rubber gloves, apron, and face shield when handling leaking batteries. If potassium hydroxide is spilled on clothing, or other material wash immediately with clean water. If spilled on personnel, immediately start flushing the affected area with clean water. Continue washing until medical assistance arrives.

RADIOACTIVE MATERIALS

Those instruments having radioactive self-luminous dials will have a radioactive warning legend preceding 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 AR 755-15 and TM 3-261. (Refer to TB 43-0108.)

NOISE

Sound pressure levels in this aircraft during operating conditions exceed the Surgeon General's hearing conservation criteria as defined in TB Med 501. Hearing Protection Devices, such as aviator helmet or ear plugs, are required to be worn by all personnel in and around the aircraft during its operation.

HAZARDOUS CARGO

Items of cargo possessing dangerous physical properties, such as explosives, acids, flammable, etc., must be handled *with extreme* caution and in accordance with established regulations. (Refer to TM 38-250.)

Warning, Cautions, and Notes are used to emphasize important and critical instructions and shall be used for the following conditions:

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.

HANDLING HYDRAULIC FLUID (MIL-H-83282)

Prolonged contact with liquid or mist can irritate eyes and skin. After any contact with skin, wash contacted area with soap and water. If liquid contacts eyes, flush immediately with clear water. If liquid is swallowed, do not induce vomiting; get immediate medical attention. Wear rubber gloves when handling liquid. If prolonged contact with mist is likely, wear an appropriate respirator. When fluid is decomposed by heating, toxic gases are released.

Operator's Manual

HELICOPTER, OBSERVATION OH-6A

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Aviation Systems Command, ATTN: AMSAV-MMD, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1-1. General.

These instructions are for use by the operator. They apply to all OH-6A helicopters.

1-2. Warnings, Cautions, and Notes.

Warnings, cautions, and notes are used to emphasize important and critical instructions and are used for the following conditions:

WARNING

An operating procedure, practice, etc., which if not correctly followed, could result in personal 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 is essential to highlight.

1-3. Description.

This manual contains the best operating instructions and procedure for OH-6A aircraft. Primarily an observation type aircraft, it is capable of carrying a pilot and three passengers (one of whom may act as a crewmember-copilot or observer), cargo, or armament subsystem. The aircraft can be equipped with armor for combat operations, and can be used for target acquisition, reconnaissance, and command and control. Dual control provisions allow the aircraft to be flown from either the pilot or copilot seat. The observance of limitations, performance, and weight/balance data provided is mandatory. The observance of procedures is mandatory except when modification is required because of multiple emergencies, adverse weather, terrain, etc. Your flying experience is recongnized, and therefore, basic flight principles are not included. It is required that THIS MANUAL BE CARRIED IN THE AIRCRAFT AT ALL TIMES.

1-4. Appendix A, References.

Appendix A is a listing of official publications cited within the manual applicable to and available for flight crews.

1-5. Index.

The index lists, in alphabetical order, every titled paragraph, figure, and table contained in this manual. Chapter 7 Performance Data contains an additional index within that chapter.

1-6. Army Aviation Safety Program.

Reports necessary to comply with the safety program are prescribed in AR 385-40.

1-7. Destruction of Army Materiel to Prevent Enemy Use.

For information concerning destruction of Army materiel to prevent enemy use, refer to TM 750-244-1-5.

1-8. Forms and Records.

Army aviation flight record and aircraft maintenance records which are to be used by crewmembers are prescribed in AR 95-16, DA PAM 738-751, and TM 55-1500-342-23, Army Aviation Maintenance Engineering Manual – Weight and Balance.

1-9. Explanation of Change Symbols.

Changes, except as noted below, to the text and tables, including new material on added pages, are indicated by a vertical line in the outer margin extending close to the entire area of the material affected; exception: pages with emergency markings, which consist of black diagonal lines around three edges, may have the vertical line or change symbol placed along the inner margins. Symbols show current changes only.

A miniature pointing hand symbol is used to denote a change to an illustration. However, a vertical line in the outer margin, rather than miniature pointing hands, is utilized when there have been extensive changes made to the illustration. Change symbols are not utilized to indicate changes in the following:

(1) Introductory material.

(2) Indexes and tabular data where the change cannot be identified.

(3) Blank space resulting from the deletion of text, an illustration, or a table.

(4) Correction of minor inaccuracies, such as spelling, punctuation, relocation of material, etc., unless such correction changes the meaning of instructive information and procedures.

1-10. Aircraft Series Numbers.

a. Although all OH-6A aircraft are functionally similar, physical differences in avionics equipment, electrical harnesses and panels, instrument panel, engine air intake filters, etc., require separate maintenance instructions and illustrations for each of the alternate arrangements or configurations.

b. To readily distinguish between the various equipment configurations without repetitious review of helicopter serial number listings, the manufacturing series numbers (or production lot numbers) are included in paragraph titles, figure titles, and/or table titles where necessary to highlight applicability of the information.

c. If no aircraft series or serial number limitations are included in a given paragraph, figure or table, the information shall be considered applicable for all aircraft. Minor differences not relative to all aircraft in a series are separately noted where they apply.

1-11. Use of Words Shall, Should, and May.

Within this technical manual the word "shall" is used to indicate a mandatory requirement. The word "should" is used to indicate a non-mandatory but preferred method of accomplishment. The word "may" is used to indicate an acceptable method of accomplishment.

CHAPTER 2

AIRCRAFT AND SYSTEMS DESCRIPTION AND OPERATION

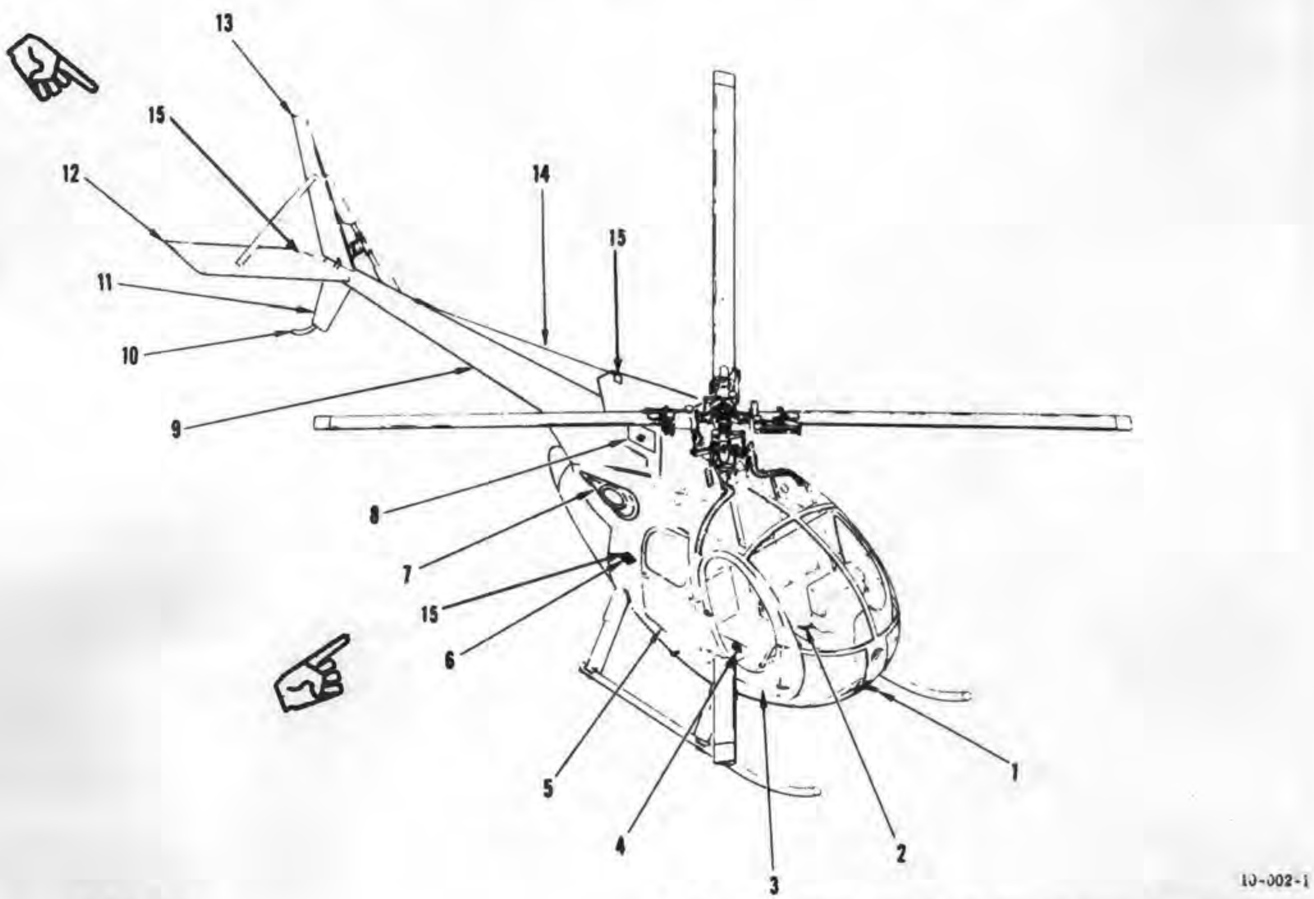
SECTION I — AIRCRAFT

2-1. General.

The OH-6A aircraft is a four place, dual control, single engine observation helicopter. It is equipped with a single main rotor, a tail rotor, and an oleo-damped skid-type landing gear. The four-bladed main rotor is fully articulated, with rotary-friction lead-lag dampers. The tail rotor is a two-bladed anti-torque rotor of the semi-rigid type. The aircraft is powered by a free turbine, turboshaft engine. The engine is mounted in the aft fuselage section directly behind the cabin. **Power is supplied to the rotors through a main transmission, a tail rotor transmission, and interconnecting drive shafts.**

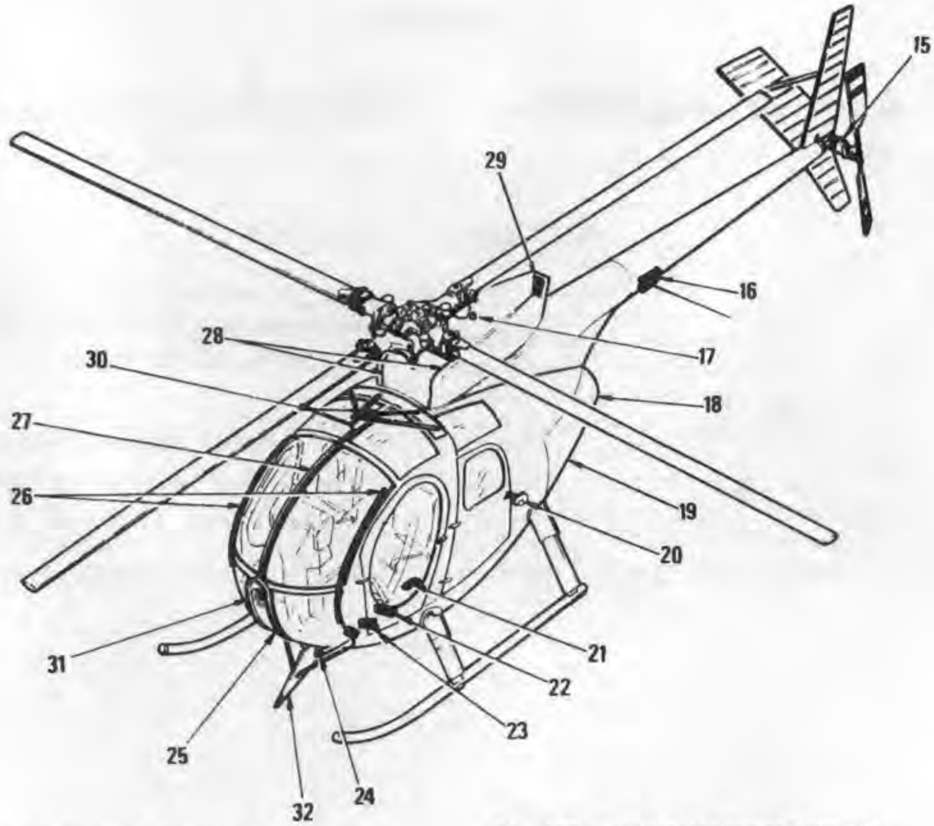
2-2. General Arrangement.

The general arrangement of the helicopter is shown in figure 2-1. This illustration identifies major features of the aircraft and locations of certain components to be checked during preflight inspections.



1. Pitot tube
2. Canopy
3. **Cockpit door**
4. External power receptacle
5. **Cabin door**
6. Navigation light (green)
7. Engine exhaust stack (upward exhaust system)
8. Air filter bypass door/plenum chamber access door
9. Tailboom
10. Tailskid
11. Lower vertical stabilizer
12. Horizontal stabilizer
13. Upper vertical stabilizer
14. ADF sense antenna (series 1 and 2 aircraft)
15. NVG position light

Figure 2-1. General Arrangement Diagram. (sheet 1 of 2)



15. Navigation light (white)
16. No. 2 FM comm antenna (not installed on all aircraft)
17. Upper anticollision light
18. Engine exhaust stack (aft exhaust system)
19. Engine compartment door
20. Navigation light (red)
21. Lower anticollision light
22. ADF loop antenna (typical)
23. IFF antenna (series 3 aircraft)
24. ADF sense antenna (series 3 aircraft)
25. Landing/hover light
26. FM homing dipole antenna (typical)
27. FM comm antenna (part of airframe)
28. Engine inlet fairing
29. UHF/VHF antenna
30. WSPS upper cutter
31. WSPS mid section deflector
32. WSPS lower cutter

Figure 2-1. General Arrangement Diagram. (sheet 2 of 2)

2-3. Aircraft Weight.

For information regarding aircraft weight operating limitations, refer to chapter 5, section IV.

2-4. Principal Dimensions.

Principal dimensions for the aircraft are given in figure 2-2.

2-5. Turning Radius and Ground Clearance.

Figure 2-3 provides information necessary for adequate clearance during ground maneuvering or taxiing/hovering.

2-6. Main Differences Table

Significant differences in design and operation between aircraft series are given in table 2-1.

2-7. The Aircraft.

The aircraft consists of the following main structural sections: the fuselage, the tailboom, a horizontal stabilizer, an upper and a lower vertical stabilizer, a tail skid, and skid type landing gear. These major parts of the aircraft structure are described in the following paragraphs.

2-8. Fuselage.

a. Forward Section. The fuselage forward section includes the canopy installation and pilots door frames.

b. Lower Section. **The fuselage lower section comprises the cockpit seat support structure, cockpit floor, cargo compartment floor, underfloor electronics compartment and battery area, floor and seat support bulkheads and associated structure, the center beam assembly, landing gear fittings, and the fuel tank support structure.**

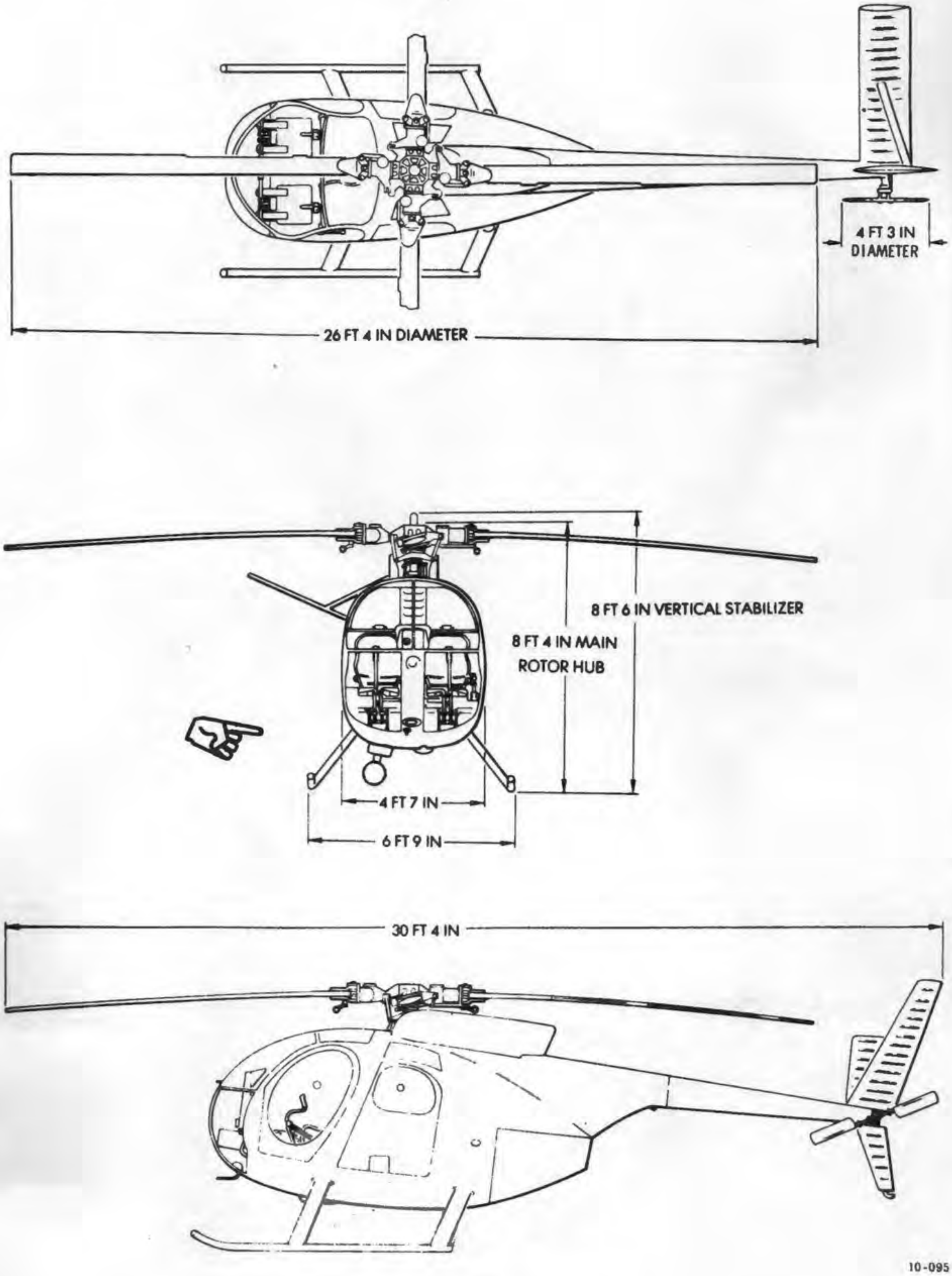
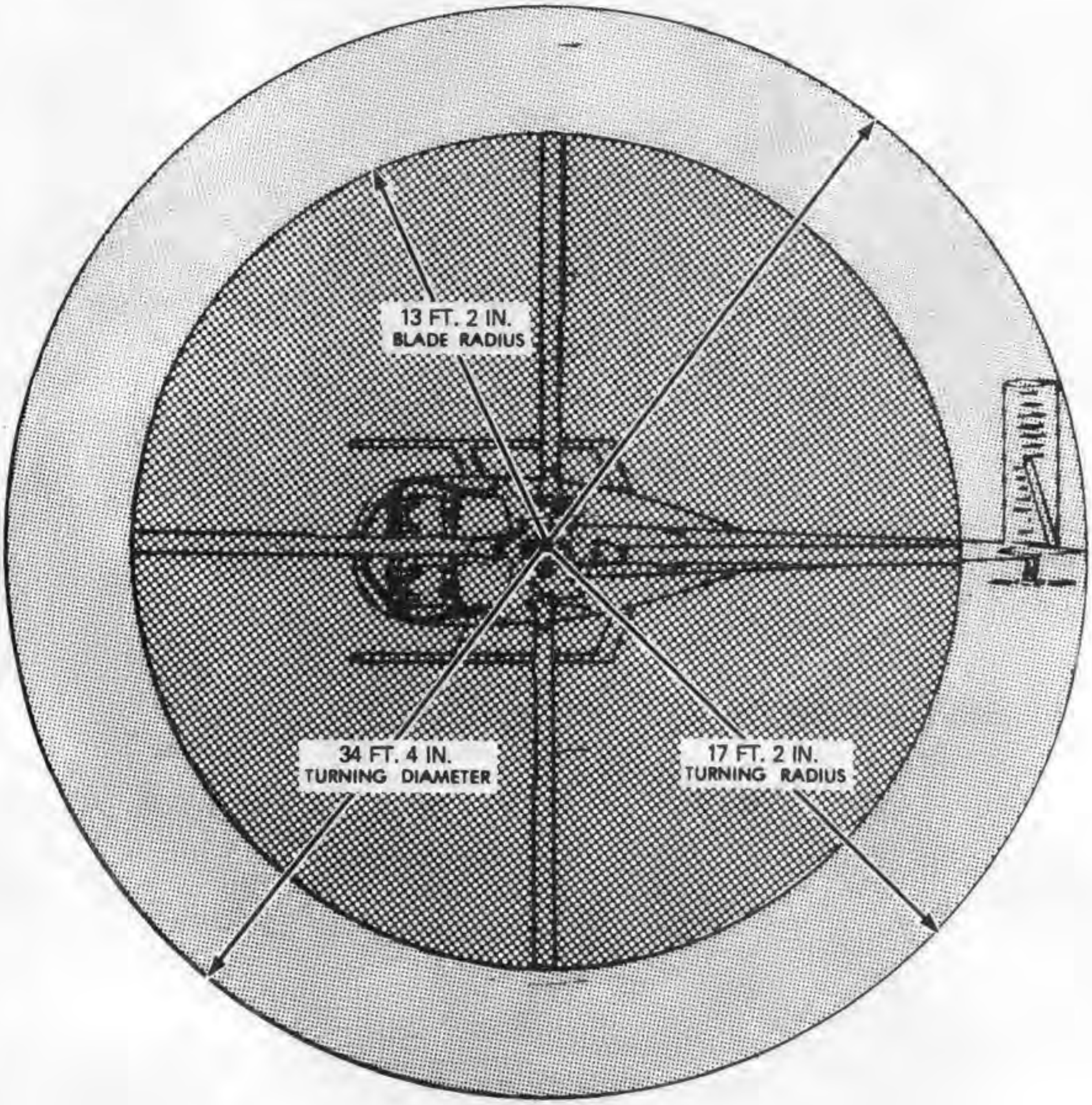
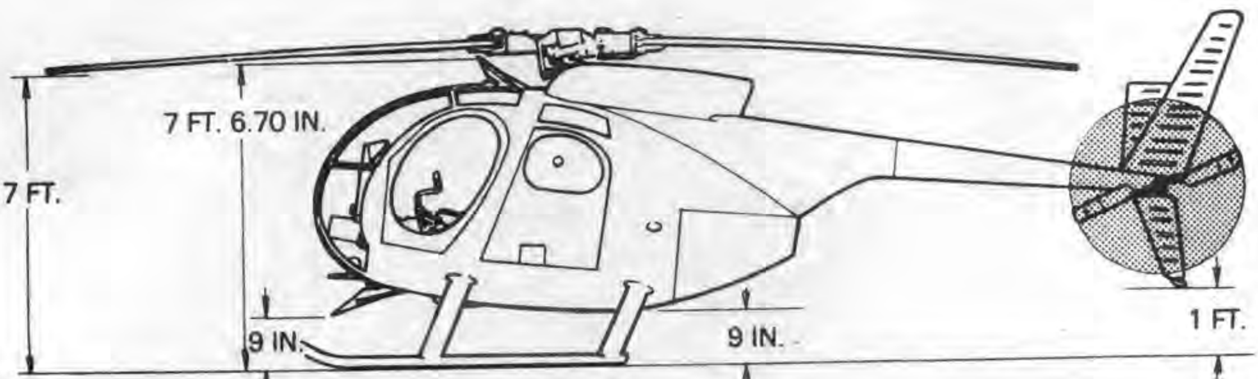


Figure 2-2. Principal Dimensions.



TURNING RADIUS
(HOVER)



ROTOR CLEARANCES

Figure 2-3. Minimum Turning Radius and Ground Clearance

Table 2-1. Main Differences Table

Item	Aircraft Series 1 and 2	Aircraft Series 3 (Note 4)
Engine air filter (barrier filter)	Bypass air control release located in cockpit, overhead and center	
Engine air filter (particle separator)		Bypass air control release located in cockpit, overhead and center. Filter ejector screen on engine air intake aft fairing, left side
Chip detector fault source identification (caution light(s))	Single caution light for all components (Note 1)	Individual component caution lights
Communications	UHF AN/ARC-51BX VHF AN/ARC-111 FM AN/ARC-54 ICS C-1611D/AIC	UHF/AM AN/ARC-116 VHF/AM ARC-115 FM ARC-114 (No. 1) ICS C-6533/ARC
Navigation	ADF AN/ARN-83	ADF AN/ARN-89

NOTES:

1. Source isolation test switch provided on series 2 aircraft

c. Aft Section. The fuselage aft section includes the main rotor mast support structure, **cabin** door frames, engine compartment, engine air inlet (plenum chamber) installation, engine inlet aft fairing, firewall installation, and the boom fairing.

2-9. Tailboom.

The tailboom assembly, a monocoque structure of aluminum skin over forged aluminum frames, houses the tail rotor drive shaft and tail rotor control rod, and supports the horizontal and vertical stabilizer tail surfaces. The major fittings are the station 197.78 frame fitting, a stabilizer and gearbox mounting frame, and a stabilizer leading edge mounting frame. Two lugs on the stabilizer leading edge frame support the forward ends of the horizontal and upper and lower vertical stabilizers. The tail rotor transmission and the tail rotor are attached to the tailboom. The tail rotor shaft damper is also housed within the tailboom.

2-10. Horizontal Stabilizer.

The horizontal stabilizer is an airfoil section attached to the aft right side of the tailboom, and has a dihedral angle of 25 degrees. The horizontal stabilizer serves to aid longitudinal stability during forward flight. An airfoil shaped stabilizer strut is attached between the horizontal and upper vertical stabilizers.

2-11. Vertical Stabilizers.

Two airfoil sections, an upper and a lower vertical stabilizer, are attached to the tailboom. The airfoil of the upper vertical stabilizer has a 5-degree twist which improves tail rotor pedal neutral position during cruise flight. The vertical stabilizers serve to minimize yaw and provide lateral stability during forward flight. The tail skid is a formed tube attached to the root rib of the lower vertical stabilizer. It extends just below the bottom rib of the lower vertical stabilizer and serves to protect the lower vertical stabilizer from damage during ground handling or in case of a tail-low landing.

2-12. Landing Gear.

The landing gear consists of a pair of tubular aluminum alloy skid runners attached to the aircraft by means of struts, fairings, braces, and oleo shock dampers. See figure 2-4 for landing gear details. The oleo dampers cushion the upward and downward movement of the skids, while the braces limit forward and aft movement. A mixture of damper types are used. Five replaceable abrasion pads are installed on each skid to resist skid wear on hard surfaces. Fittings are provided on each skid runner to accommodate a set of ground handling wheels. Although the wheels are not considered to be part of the flight equipment, they may **be stowed in the cabin for ferry flights.**

2-13. Cockpit and Cabin Doors.

The aircraft has four doors: two for pilot/copilot entry, and two for passenger/cargo entry. The doors are forward-opening, being hinged at their forward edges to the fuselage forward section. Each door contains a handle-actuated latching mechanism. On armored aircraft the pilots and copilots inside door handles are relocated to the upper forward locking lever of the door latching mechanism because of the

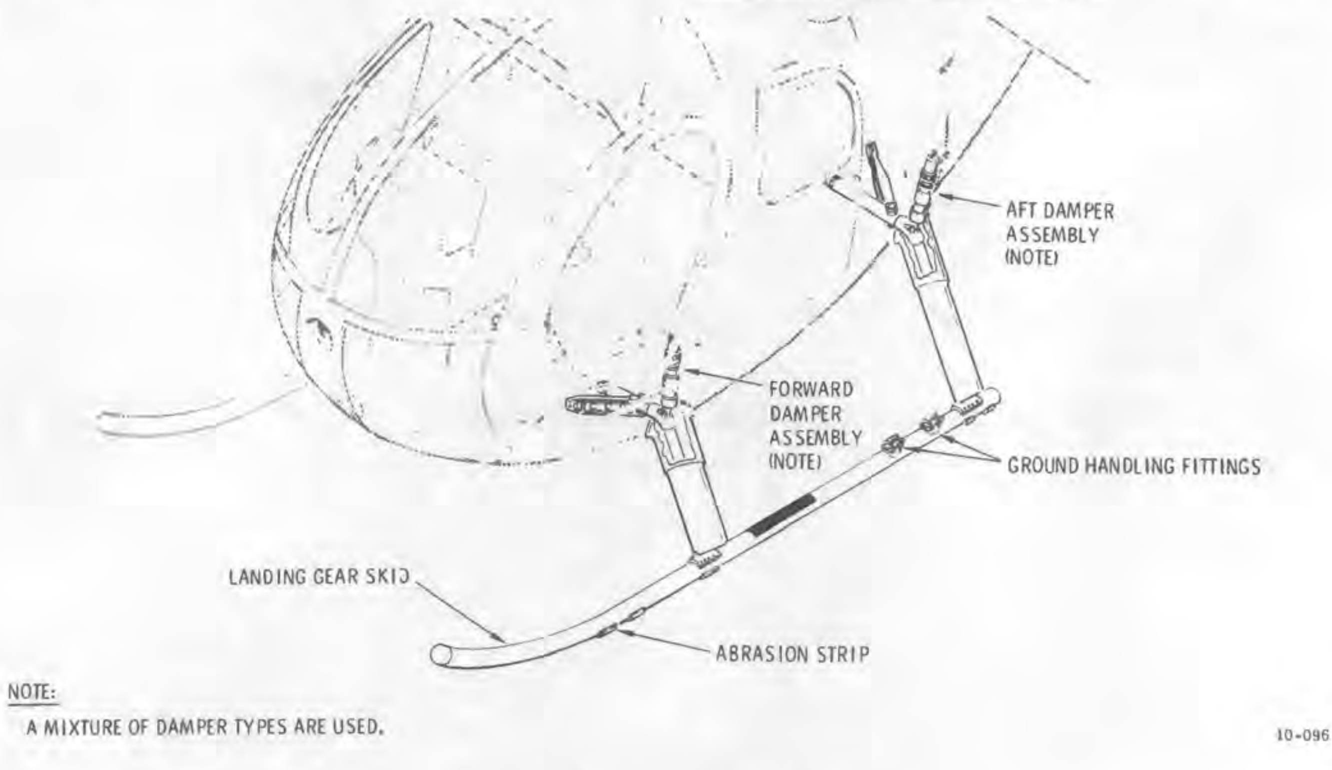
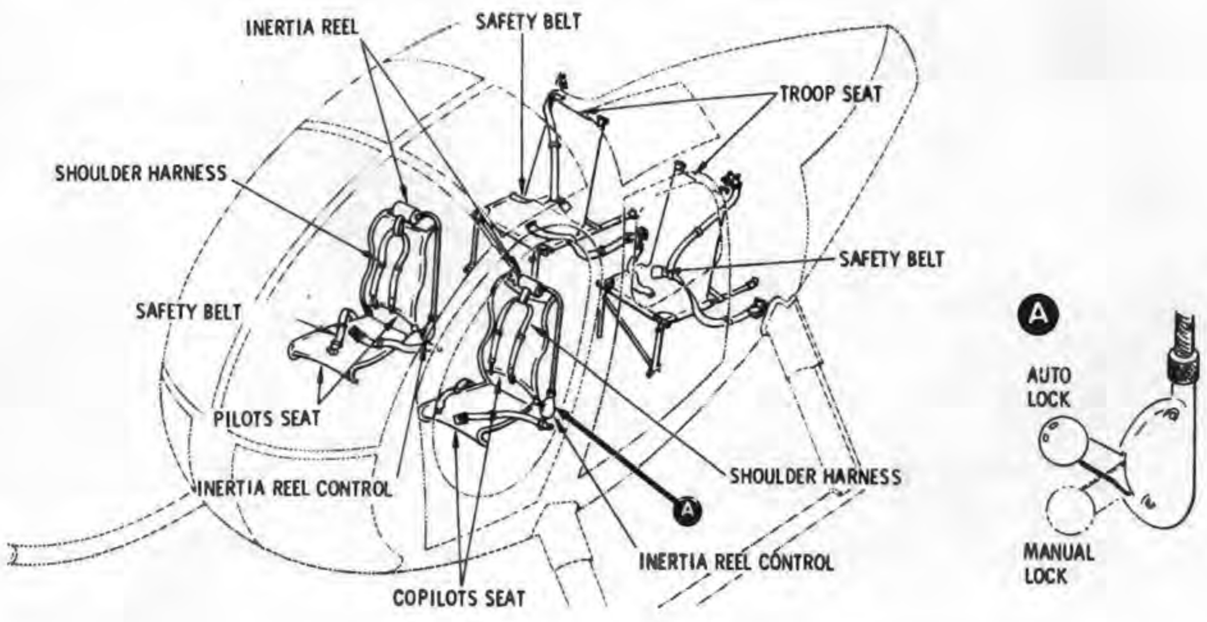


Figure 2-4. Landing Gear Details

wrap-around configuration of the seatback armor. A plastic doubler is provided on the center reinforcement strip of the door window as a door pull to ease the leverage required to actuate the latching mechanism from inside the flight compartment. The two cabin doors are similar except for an armament door at the lower left edge of the left cabin door. The cabin door latching mechanism consists of four lever-type latches that are interconnected. The outward swing of the doors is limited by a rubber stop within each hinge bracket in the fuselage structure. Each of the four doors is equipped with a jettison mechanism for emergency jettisoning of the entire door assembly.

a. Jettison Devices. An emergency release handle (illustrated in chapter 9) is provided on each door. The doors are released by a manual pull on the emergency release cable. The pins at the end of the cables act as pivots for the door hinges and when pulled, permit the hinges to uncouple. The door must always be unlatched to relieve the pressure of the door seals on the hinges before operating the jettison handles.



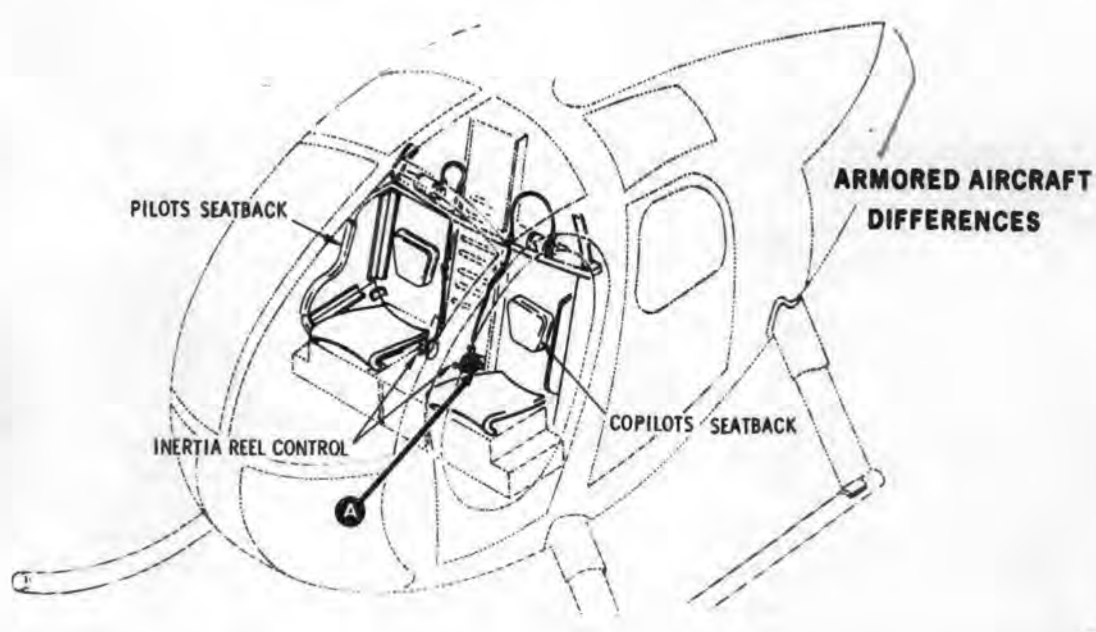
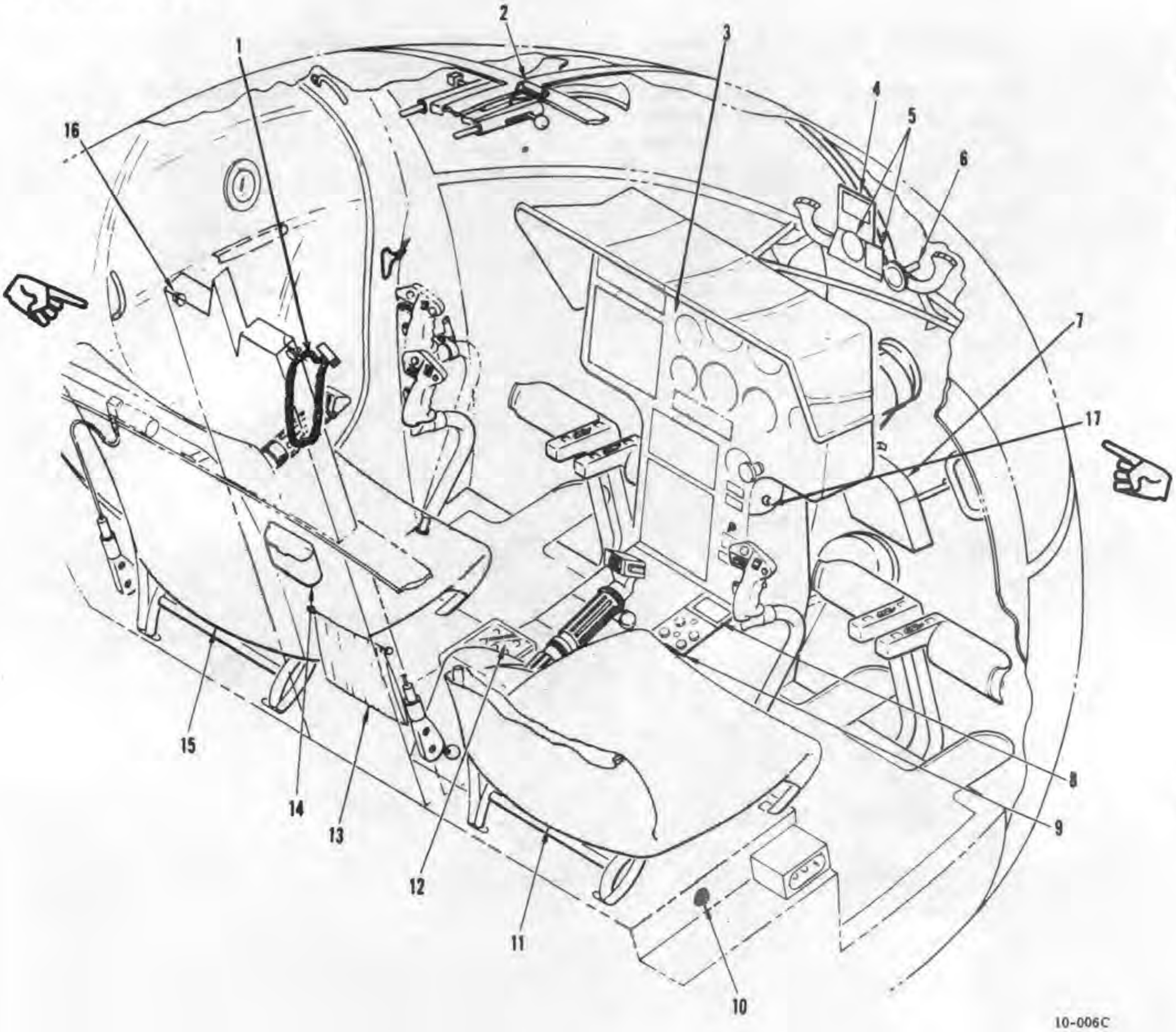


Figure 2-5. Seats, Safety Belts and Shoulder Harness.



1. Utility light
2. BYPASS AIR CONTROL release handle
3. Instrument panel
4. Pilots Vne card
5. Compass and compass card
6. Outside air temperature thermometer
7. **Data case**
8. Ashtray
9. Electrical control console
10. Ignition keylock switch
11. Pilots seat
12. Circuit breaker panel
13. Map case
14. Ashtray
15. Copilots seat
16. Utility light alternate location
17. NVG position light switch

Figure 2-6. Flight Compartment.

2-14. Seats, Safety Belts and Shoulder Harness.

a. Pilots and Copilots Seats. The pilots and copilots seats (fig. 2-5) are equipped with safety belts, shoulder harnesses, inertia reels, and reel controls. On armored aircraft, the pilots and copilots seatbacks are replaced with wrap-around protective armor. The inertia reel applies tension to the shoulder harness and is remotely controlled by a manually operated two-position reel **control mounted on the seat structure at the left side of the pilot and copilot. On armored aircraft, the copilots inertia reel is relocated to the right side of the seat. The reel control is connected to the reel by a flexible control cable. When the reel control lever is placed to DOWN, or MANUAL LOCK (with any strap extension), forward travel of the strap is prevented; with the reel control lever at UP, or AUTOMATIC LOCK, unrestrained reeling in either direction is possible until a sudden tension load**

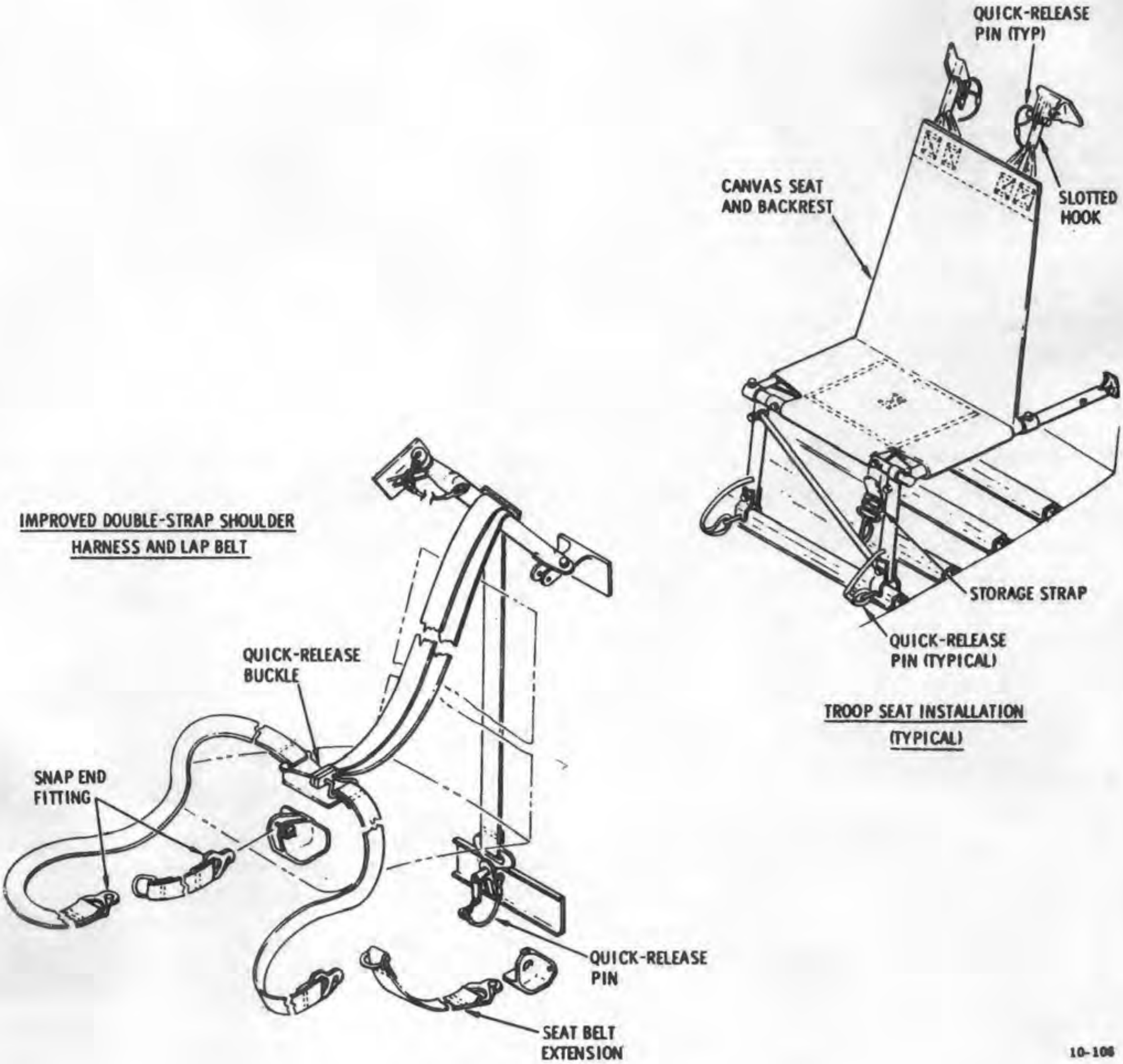


Figure 2-7. Troop Seats.

is imposed on the strap. Sudden tension locks the strap harness, limiting forward travel to no more than an additional half-inch. Any relaxation of the forward tension on the harness and strap after automatic locking takes place allows the strap to retract back into the reel. The reel control lever must be reset to MANUAL LOCK and then back to AUTOMATIC LOCK for continued automatic (unrestrained) reel operation. The forward limit of strap extension is preset to allow a maximum travel of approximately 18 inches.

b. Troop Seats. Two troop seats are installed side by side in the cabin and are fastened by quick-release pins to the station 124.00 bulkhead. Each troop seat consists of a tubular frame that supports the seat portion of the canvas seat and backrest, two legs, mounting brackets, two backseat attach fittings, and six quick-release pins (fig. 2-7). Each troop seat can be folded to allow use of the entire cabin floor space. Provisions are made for a seat belt and harness for each passenger. On aircraft not modified for the improved seat belt/harness, the seat belt/harness incorporates snap end fittings for ready installation and removal, and has a quick-release friction type buckle. On aircraft so modified, the seat belt incorporates seat belt extensions and snap end fittings, and the shoulder harness is attached by a quick-release pin at the firewall bulkhead. The seat belt and harness join together in a snap-over latch-type buckle.

2-14.1. Wire Strike Protection System (WSPS).

a. The WSPS provides protection against frontal impacts with horizontally strung mechanical and power transmission cables. The basic system consists of an upper cutter/deflector, a windshield protector/deflector and a lower cutter/deflector, (Figure 2-1, Sheet 2 of 2).

b. The lower cutter assembly features a "Breakaway Tip" designed to shear when relatively large ground contact forces are experienced and before helicopter structural damage is incurred. However, the tip shear rivets are designed to withstand the smaller forces experienced during wire strikes and the tip will still effectively deflect wires/cables into the cutter blades. Loss of "Breakaway Tip" is not cause for grounding of aircraft. However, it should be replaced as soon as practical.

SECTION II — EMERGENCY EQUIPMENT

2-15. Emergency Equipment.

The emergency equipment contained in the aircraft consists of a fire extinguisher and a first aid kit. Emergency equipment is illustrated in chapter 9.

a. Fire Extinguisher. A pressurized monobromotrifluoromethane (CF3Br) fire extinguisher is vertically mounted in a quick-release support located on the floor at the right side of the pilots seat. The fire extinguishing compound is released by a hand operated lever on top of the extinguisher. Serviceability of the extinguisher is indicated by the presence of a light-gage safety wire across the actuating lever. Operating instructions are printed on the extinguisher.

b. First Aid Kit. A first aid kit is located on the control bulkhead between the pilots and copilots seats.

2-16. Emergency Procedures.

Refer to chapter 9 for emergency procedures.

SECTION III — ENGINE AND RELATED SYSTEMS

2-17. Engine.

The aircraft is equipped with a free turbine turboshaft engine located directly behind the cabin in the aft fuselage section. The engine consists of a multi-stage axial-centrifugal compressor, a single combustion chamber, a two stage gas producer turbine, and a two-stage power turbine which supplies engine output power. Either a T63-A-5A or T63-A-700 engine may be installed. Both engines are dynamically, functionally, and operationally identical. The major engine components are a compressor, conbustion section, turbine, and power and accessory gearbox. The engine has a dry sump type lubrication system with a external oil tank and oil cooler. A gear-type pressure and scavenge pump assembly is mounted within the power and accessory gearbox. Indicating-type magnetic chip detectors are installed at the bottom of the power and accessory gearbox, and the engine oil outlet connection. The engine incorporates a compressor acceleration bleed air system to provide rapid engine response during starting and acceleration. A normally open bleed air valve mounts on a fifth-stage bleed manifold which is an integral part of the compressor case. The valve closes when compressor discharge pressure exceeds fifth-state bleed pressure. This occurs at nominal gas producer speeds (N1) of 72 to 82 percent. Two ports are provided on the diffuser scroll to supply compressor bleed air for aircraft systems. Bleed airflow is limited to four percent of total engine airflow. A temperature measurement system to measure gas producer turbine outlet temperature (TOT) consists of four chromel-alumel thermocouples that are electrically averaged and routed to an engine terminal block for connection to the temperature indicating system. On armored aircraft, a box-shaped fuel control armor assembly is mounted below the engine. The box-shaped armor provides ballistic protection for the engine fuel pump, gas producer fuel control, power turbine governor, and most of the interconnecting lines. The mounting position also protects the lower section of the power and accessory gearbox. The compressor underside is also protected by a channel-shaped, laminated steel plate. The armor plate is mounted in the compressor air inlet recess of the firewall. An adjustable fue' control heater valve, located at the right side of the starter-generator, provides heat on the fuel control for operation in below freezing or unique meteorological conditions. Major engine components are shown in figures 2-8 and 2-9.

2-18. Engine Cooling.

The engine cooling system consists of two small ducts on the inside leading edges of the engine air

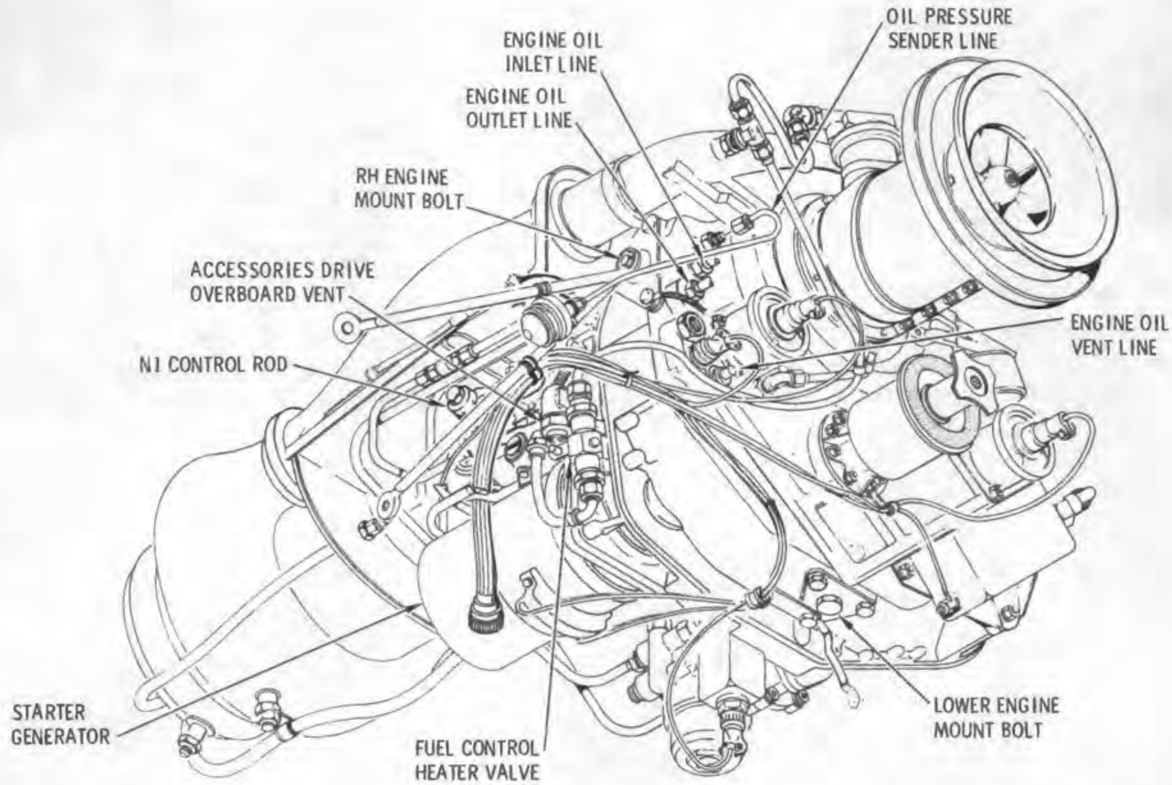


Figure 2-8. Engine View, Right Side.

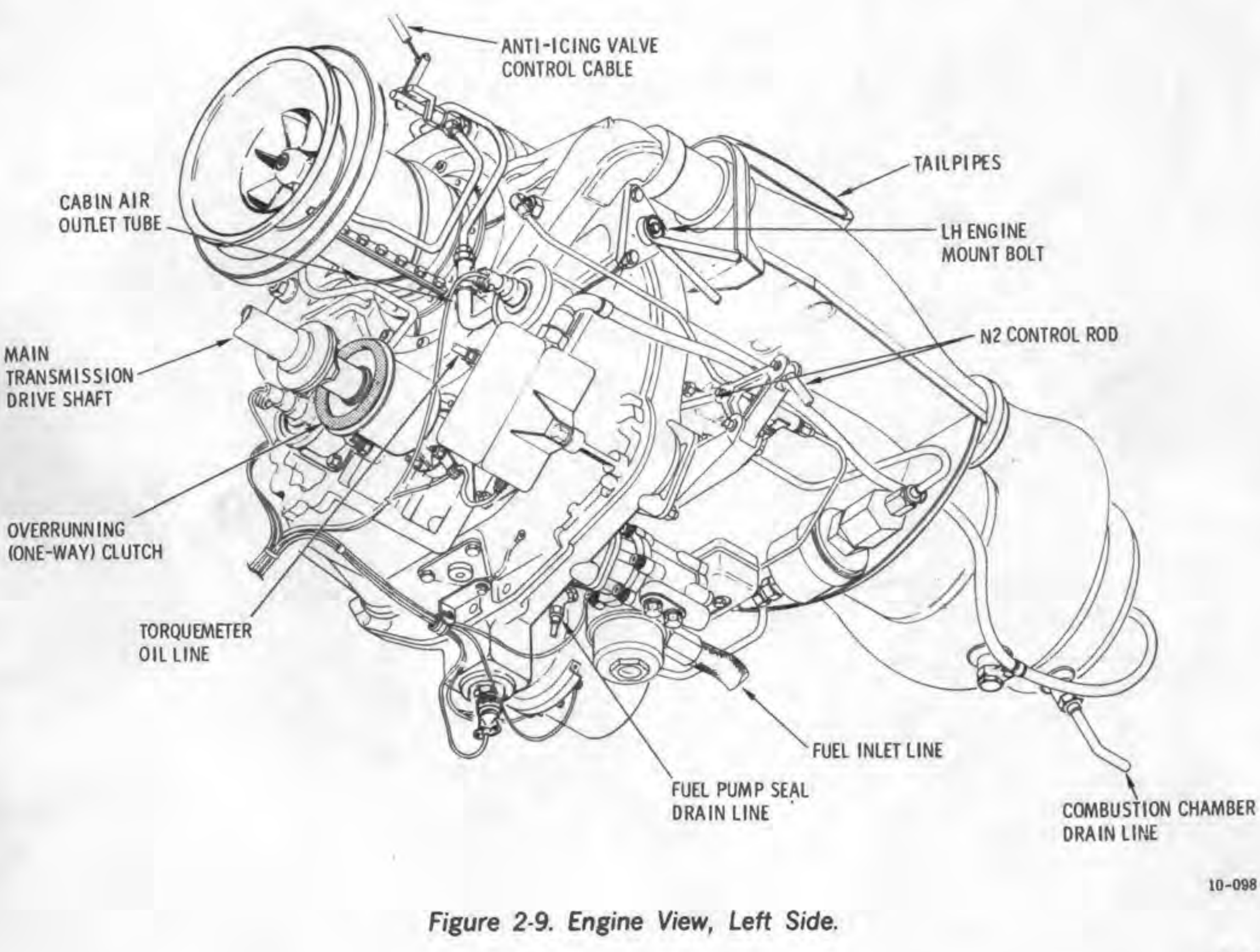


Figure 2-9. Engine View, Left Side.

inlet. These ducts divert cooling air to the main transmission, oil cooler, and then into the engine compartment. A portion of the air bypasses the oil cooler and is delivered directly to the engine compartment. The air exhausts from the engine compartment through an annular opening around the exhaust pipe, between the pipe and engine cowling doors. Information regarding the oil cooler blower is provided in paragraph 2-49.

2-19. Engine Induction System.

The engine air induction system consists of an engine air filter and an air inlet installation (plenum chamber). On series 1 and 2 aircraft, the air induction systems have a horizontally mounted barrier-type engine air filter assembly (fig. 2-10) installed over the plenum chamber, inside the engine air inlet aft fairing. Series 3 aircraft air induction systems have a vertically mounted inertial particle separator air filter housed behind the main rotor mast, at the forward end of the engine air inlet aft fairing. See figure 2-10. Atmospheric air enters the engine air inlet front fairing. Air flows from the front fairing through the air filter to the plenum chamber above the engine air inlet bell, through the inlet screen above the inlet bell, to the compressor inlet. Each type of filter unit has a filter bypass door which can be manually tripped open to allow atmospheric air to bypass the filtering system.

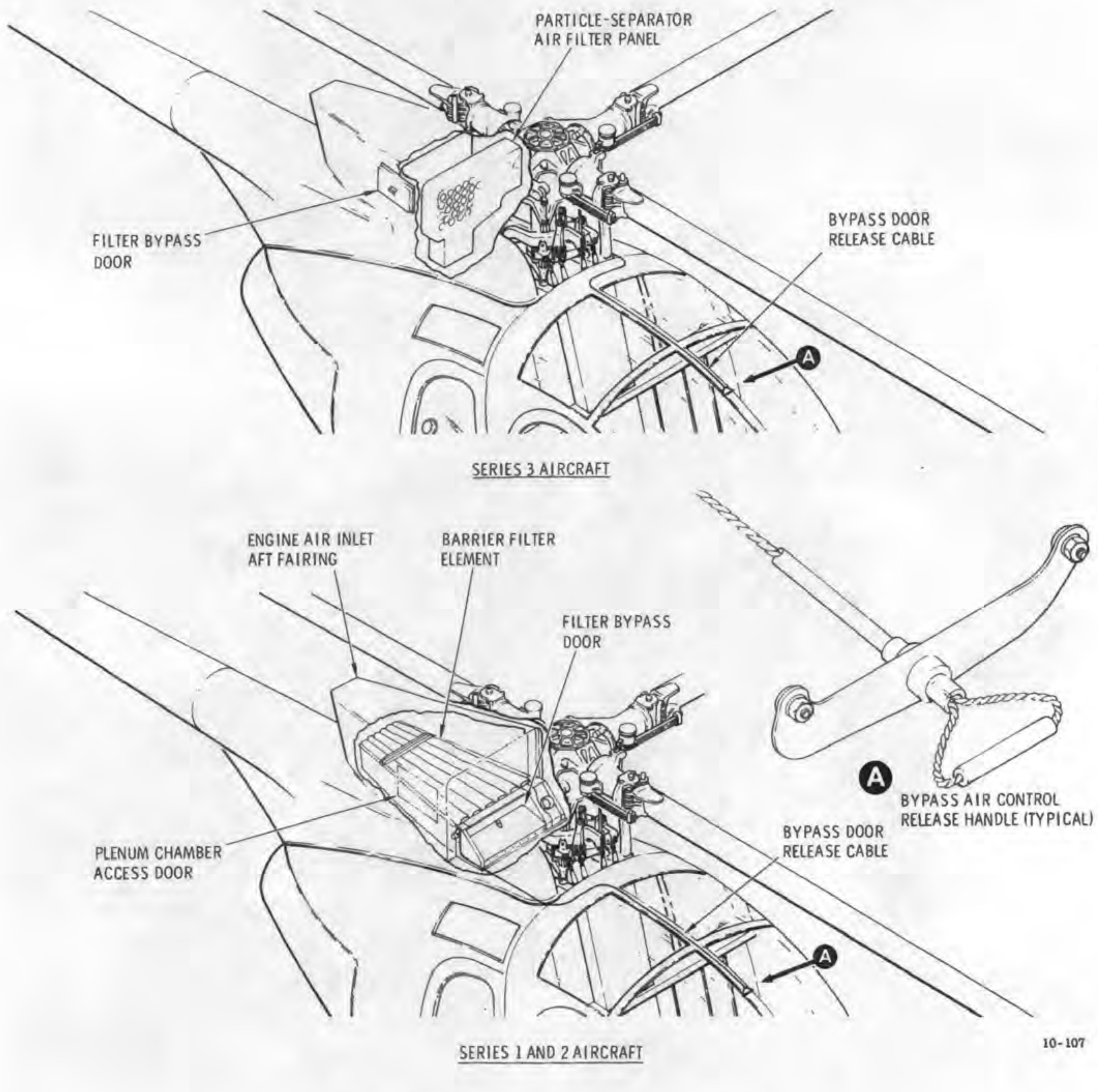


Figure 2-10. Engine Induction System Filters.

2-20. Engine Barrier Filter (Series 1 and 2 Aircraft).

The engine filter used on series 1 and 2 aircraft is located over the plenum chamber to provide filtration of air flowing into the engine air intake. See figure 2-10. The filter assembly consists of a filter unit, bypass door, bypass air control release, and bypass air control indicator system. When the bypass door is closed, air passes through the filter element. When the filter becomes clogged or excessively dirty, and pressure in the engine air intake plenum chamber is less than the outside air pressure, the BYPASS AIR caution light on the instrument panel illuminates. A bypass door located on the front of the filter frame can be opened to permit air to bypass the filter element by means of the bypass air control release handle (fig. 2-10) located overhead in the pilots compartment. When the BYPASS AIR CONTROL release handle is pulled out, the bypass door will remain open and cannot be returned to the closed position during flight. To close the filter bypass door it is necessary to remove the plenum chamber access door (fig. 2-11), reach into the aft fairing, and manually return the door trip lever to the vertical position, and then re-set the door to the closed and latched position. Reinstall access door after resetting the filter bypass door.

2-21. Inertial Particle-Separator Air Filter (Series 3 Aircraft).

The engine air filter used on series 3 aircraft is an inertial particle-separator type and is contained within the engine air intake aft fairing located above the

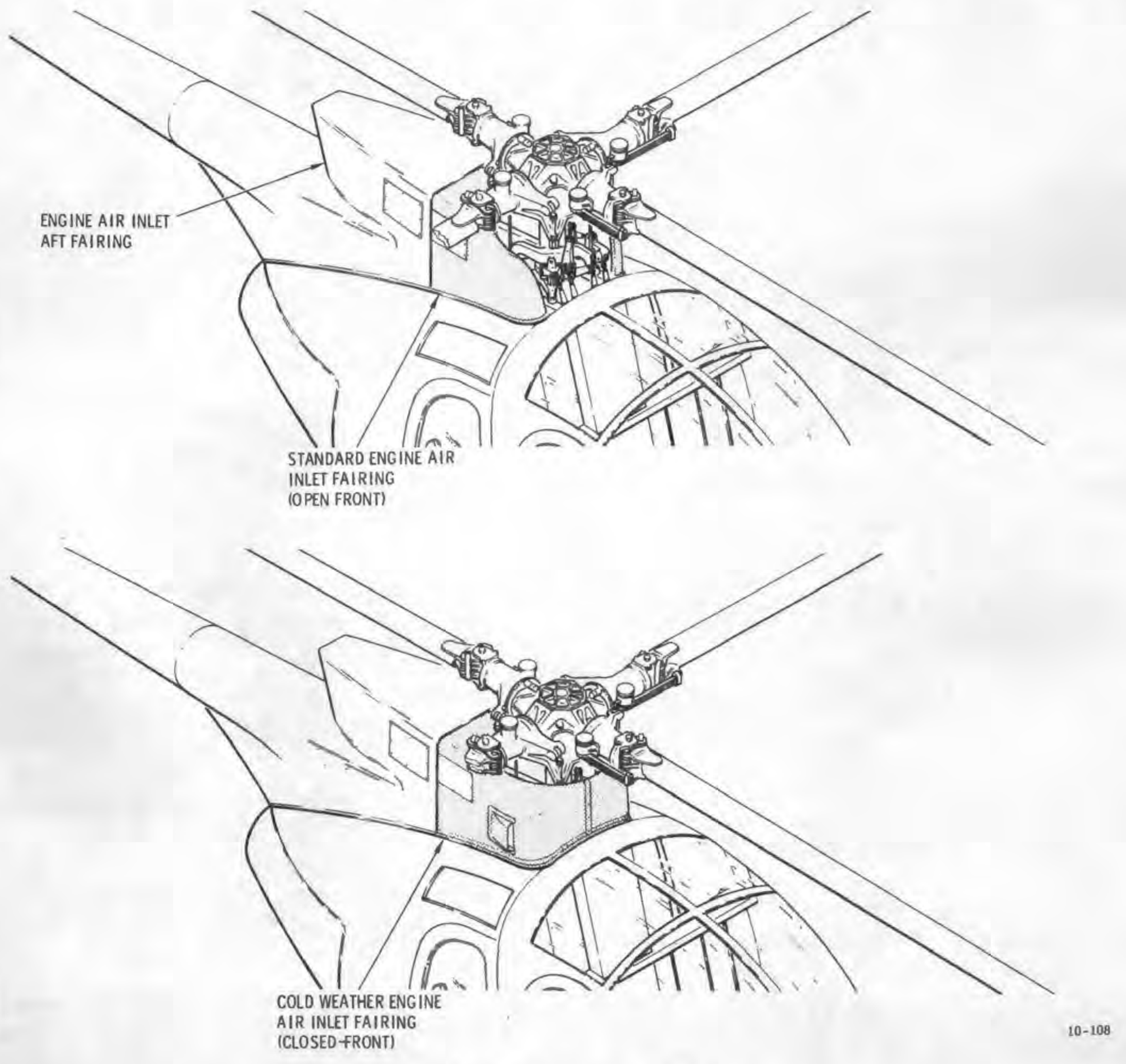


Figure 2-11. Engine Air Inlet Fairings.

plenum chamber. See figure 2-10. The filter assembly provides filtration of air flowing into the engine air intake and provides protection against foreign object entry. The filter unit consists of the filtering and particle separating system, bypass door, bypass air control release mechanism, bypass air control indicating system, and an engine bleed-air powered scavenging system. The system filters intake air, and separates and ejects contaminates overboard. As air passes through the filter, swirl guides located inside the air filter panel cause the air to be swirled, thus separating the heavier contaminates. These contaminates and other foreign particles collect in the separator and are discharged overboard through the filter ejector located at the left side of the engine air inlet aft fairing. The inertial particle-separator air filter uses engine bleed air to scavenge the contaminates removed from the intake air. Operation of the scavenge system bleed air shutoff valve is controlled by the SCAV AIR-OFF switch (para 2-23). Should the filter assembly become clogged, and pressure in the plenum chamber is less than the outside air pressure, the BYPASS AIR caution light illuminates. The bypass door located on the aft inlet fairing can be opened to permit air to bypass the filter by means of the BYPASS AIR CONTROL release handle (fig. 2-10) located overhead in the flight compartment. When the bypass door is opened, air may bypass the filtering system and flow directly into the plenum chamber. When the BYPASS AIR CONTROL release handle is pulled out the bypass door will remain open and cannot be returned to the closed position during flight. To close the filter bypass door, it is only necessary to grasp the handhold provided on the outside surface of the door (fig. 2-11) and pull the door outward to the closed and latched position.

2-22. Bypass Air Caution Light.

The bypass air caution light (fig. 2-12) marked BYPASS AIR is a rectangular amber light mounted on the right side of the instrument panel. The caution light illuminates when the pressure in the engine intake plenum chamber, downstream of the filter, is less than the outside air pressure. A differential pressure switch located on the downstream side of the filter activates the BYPASS AIR caution light. When the filter bypass door is opened on series 1 and 2 aircraft, the BYPASS AIR caution light will go out. On series 3 aircraft, the caution light will illuminate and the MASTER CAUTION light/switch will flash until the MASTER CAUTION light/switch is reset; the caution light will remain lit until the fault is cleared. (Refer to para 2-68.)

2-23. Engine Air Filter Scavenger (SCAV AIR-OFF) Switch (Series 3 Aircraft).

On series 3 Aircraft, a two-position SCAV AIR-OFF toggle switch (fig. 2-12) is provided on the edge-lighted switch panel. This switch provides control of the scavenging system shutoff valve. During takeoff, landing, hovering, or cruise operations in dusty atmospheric conditions, the bleed air shutoff valve should be opened by placing the switch to SCAV AIR position.

2-24. Snow Ingestion/Cold Weather Kit.

a. A snow ingestion/cold weather kit is used on certain aircraft to prevent snow ingestion and moisture freezing in the engine air induction system. Aircraft equipped with the cold weather kit may be identified by the alternate closed-front air inlet fairing surrounding the main rotor mast. See figure 2-11. (The standard engine air inlet fairing has an open front face.)

b. In addition to the closed-front inlet fairing, the cold weather kit modification includes a permanently installed hot air tube inside the forward end of the plenum chamber and an enlarged plenum chamber moisture drain system. The hot air tube uses a small, metered amount of engine bleed-air as a source of heat to prevent freezing of the plenum drain system. The hot air tube also serves to melt and drain away any moisture which may have drained into the plenum chamber and frozen following the previous engine shutdown.

NOTE

After the initial installation of the cold weather kit, the hot air tube operates continuously without any indicating system or controls.

c. The closed-front air inlet fairing is used only during periods of cold weather operation.

CAUTION

Use of the cold weather kit inlet fairing is subject to ambient air temperature restrictions. Refer to chapter 5.

2-25. Engine Inlet Anti-Icing.

An anti-icing system (fig. 2-18) is provided for the engine compressor inlet. The system consists of a manually operated push-pull control cable connected to an anti-icing valve lever located on the engine compressor scroll. The anti-icing valve control is mounted on the canopy structure; the control lever is to the left of canopy center above the pilot and copilot seats, and has a square white knob. Moving the control lever aft full travel to the latch notch opens the anti-icing valve completely; disengaging the control lever from the notch automatically shuts off anti-icing through the spring-loaded return of the lever to the forward (off) position. Use of the anti-icing system will normally be necessary only in extreme cold weather operation.

2-26. Engine Fuel Control System.

The aircraft employs a conventional control system whereby collective pitch of the rotor establishes the power output demand on the engine. For all practical

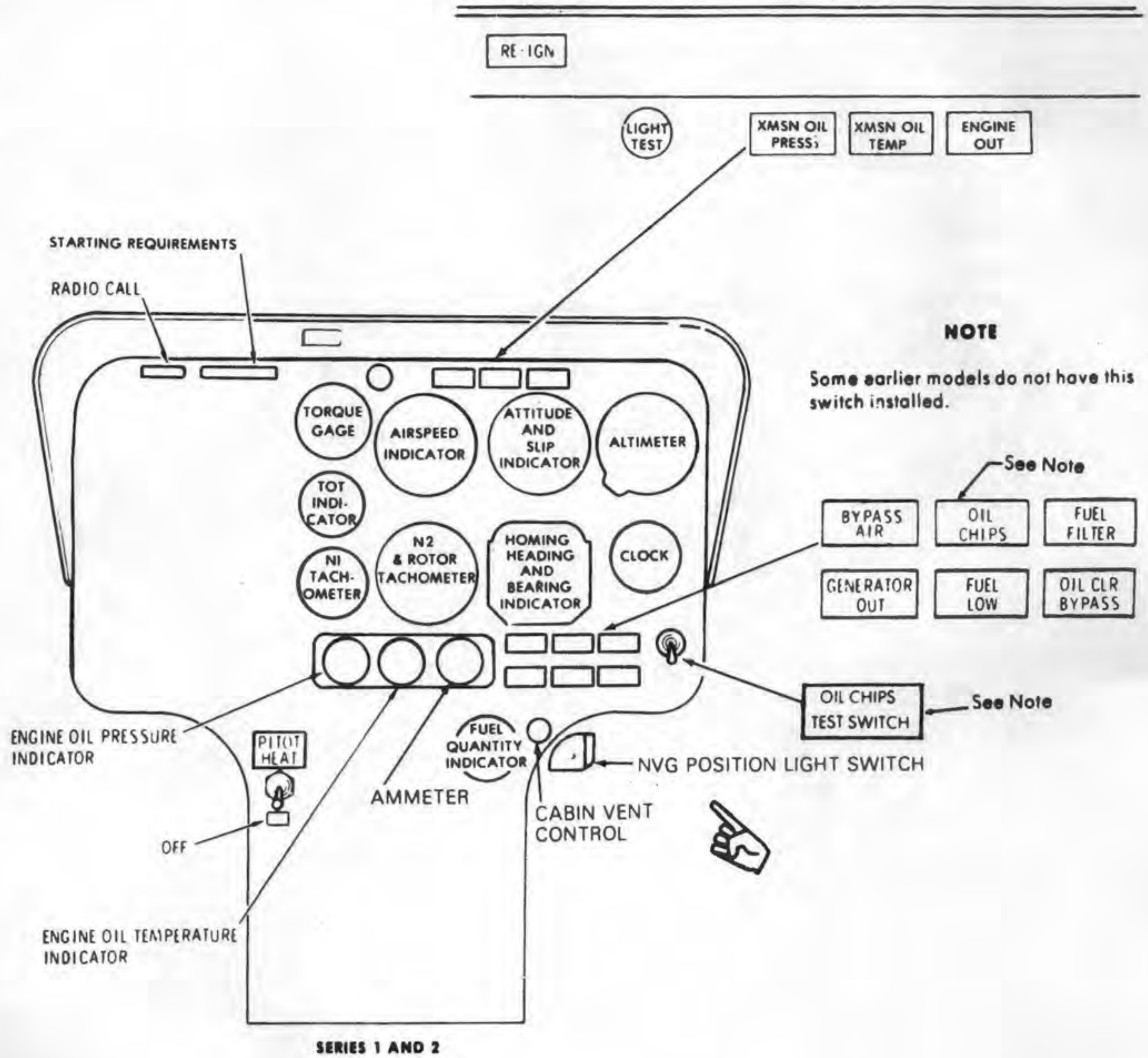


Figure 2-12. Instrument Panel (Sheet 1 of 2)

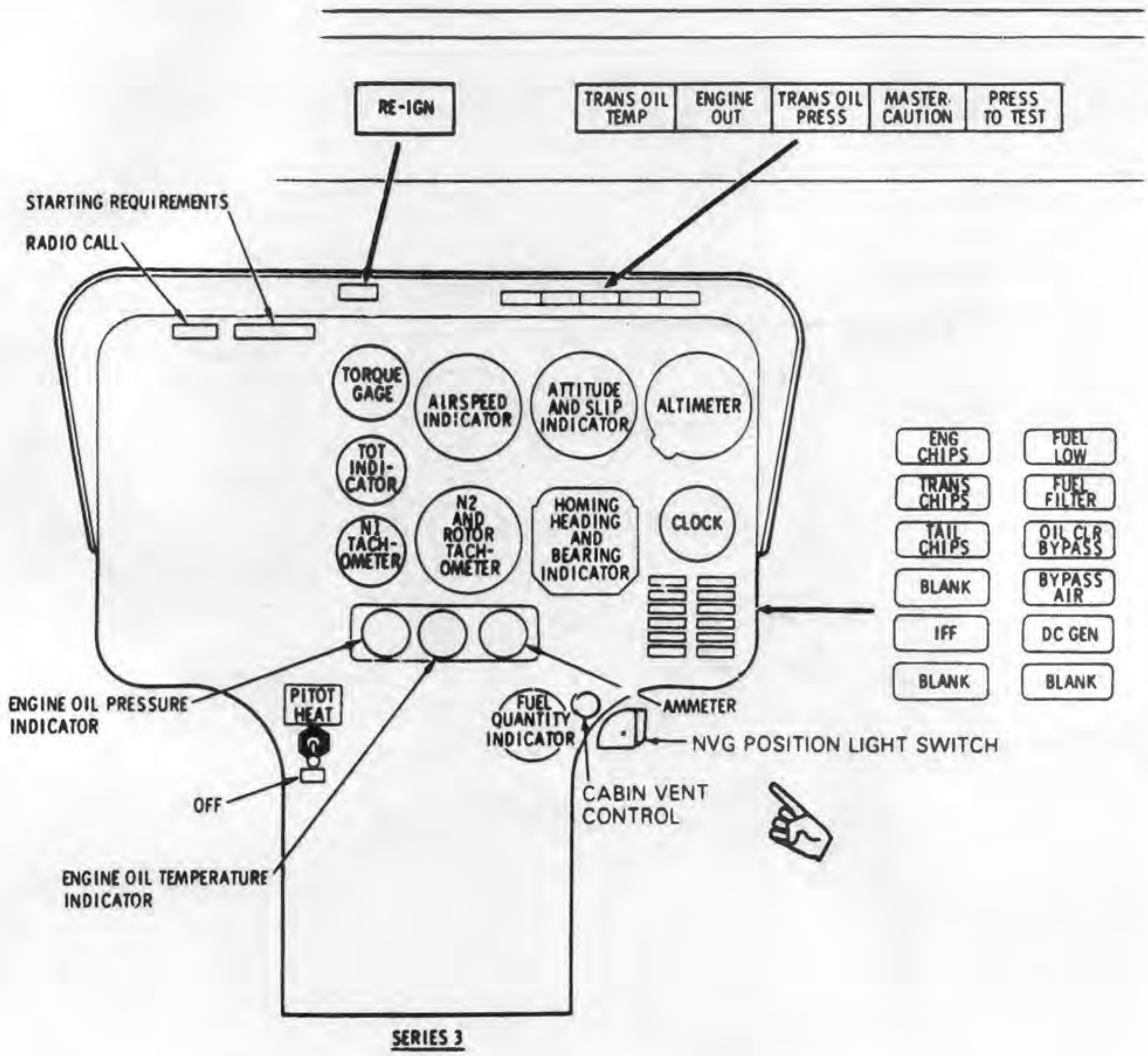


Figure 2-12. Instrument Panel. (sheet 2 of 2)

purposes, helicopter rotor speed (NR) is held constant by the engine and its control system. Through a coordinated system of bellcranks and linkages, the engine fuel control is connected to the twist grip throttles and the power turbine governor is connected to the collective pitch sticks. Any change in collective pitch creates a new power demand which is sensed by the power turbine governor which in turn schedules the gas producer fuel control to vary the speed (N1) of the gas producer turbine accordingly. The engine fuel control system includes a gas producer fuel control, a power turbine governor, a fuel nozzle, and an engine fuel pump and filter assembly, as described in the following paragraphs and illustrated in figure 2-8 and 2-9.

a. Gas Producer Fuel Control. The gas producer fuel control assembly is located in the fuel system between the fuel pump and the fuel nozzle. The fuel control is connected to and controlled by the twist grip throttles.

b. Power Turbine Governor. Gas producer speed levels are established by the action of the power turbine governor which senses power turbine speed. The power turbine governor, in turn, schedules the gas producer speed to a changed fuel flow to maintain output shaft speed. Power turbine speed (N2) is selected by a trim switch, and the power to maintain this speed is automatically maintained by power turbine governor action on the gas producer fuel control. A motor-actuated speed trimming device is installed in the linkage between the collective pitch sticks and the power turbine governor lever. It is operated by the governor trim switch on each collective pitch stick (10, fig. 2-13) and allows N2 speed to be varied over a range of approximately 97 to 105 percent.

c. Fuel Nozzle. The fuel nozzle is a single-entry, dual-orifice type unit which contains an integral valve for dividing primary and secondary fuel flow. This same valve acts as a fuel shutoff valve and keeps fuel out of the combustion chamber during shutdown.

d. Engine 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. The gear elements are arranged in parallel. Each pumping element has sufficient capacity to permit takeoff operation if the other element fails.

2-27. Throttle.

A twist grip throttle (12, fig. 2-13) is located at the forward end of each collective pitch stick. The twist grip has three positions; normal, idle, and cut-off. The twist grip is rotated fully left (away from the pilot) during all normal flight operations. Operation with the twist grip between this position and the idle position is unnecessary except in the case of an engine control system failure. With the twist grip fully left, N2 speed is controlled by the N2 governor switch on the collective sticks. The twist grip is rotated toward the right (toward the pilot) against the idle stop ring prior to engine shutdown and during practice autorotations. With the twist grip against the idle stop, N1 speed will be 62-65 percent. The twist grip can be rotated to the cut-off position by moving the idle stop ring forward on the collective stick and rotating the twist grip fully right. In this position all fuel flow to the engine is stopped. The initial portion of the engine start procedure is performed with the twist grip in this position.

2-28. Throttle Friction.

A knurled friction ring (13, fig. 2-13) provides the pilot the means to vary the friction on the throttle grip as well as a means of holding the grip at a fixed position. Friction on the grip is increased by turning the ring toward the left, and decreased by turning it in the opposite direction.

2-29. Oil Supply Systems.

The engine, main transmission, and tail rotor transmission are each lubricated by their own independent oil supply system. Refer to section XV for specifications, and servicing of the oil systems.

2-30. Engine Oil Supply System.

The engine oil supply system includes an oil tank assembly, a radiator-type heat exchanger oil cooler, oil cooler duct, oil temperature and pressure senders, check and drain valves, and related pressure and drain hoses and tubes needed to maintain a supply of properly cooled oil to the engine oil pump and internal distribution system. The engine oil tank is located aft **of the cabin on the right side of the aircraft, and contains a filler cap for oil replenishment and a transparent sight plug for visual inspection of the oil level.**

a. Engine Lubrication System-Armored Aircraft. In armored aircraft, the oil tank is self-sealing. Armor provisions also include a bypass valve between the engine and oil cooler. If the oil cooler is ruptured, it is bypassed and isolated from oil system pressure in the following manner. The self-sealing oil tank contains a low-level warning switch. The float-actuated switch detects when the oil level in the tank is approximately one quart low, and automatically activates a bypass system electrical circuit. An OIL CLR. BYPASS (or ENG OIL LOW BYPASS MODE) caution light and bypass valve are connected in the bypass system circuit. When the bypass system is energized, the light is illuminated and the bypass valve diverts the engine oil. Diverted oil flows directly to the oil tank, bypassing the oil cooler. Oil flow from the tank back to the engine is normal.

b. Engine Oil Cooler Bypass Caution Light. The engine oil cooler bypass caution light, marked OIL CLR. BYPASS (or ENG OIL LOW BYPASS MODE) (fig. 2-12) is mounted in the lower right side of the instrument panel. When illuminated, the light indicates that the low oil level warning switch in the self-sealing oil tank has been activated. The warning switch is normally open. When supply oil quantity drops below the low level operating limit (system approximately 1 quart low), a float on the switch probe causes the internal switch contacts to close. The closed switch grounds a relay. On series 1 and 2 aircraft, the relay supplies power from the CYCLIC TRIM circuit breaker, which energizes the bypass valve as well as the OIL CLR. BYPASS light. On series 3 aircraft, the relay supplies power from the OIL CLR-SCAV AIR circuit breaker, which energizes the bypass valve as well as the ENG OIL LOW BYPASS MODE light.

2-31. Engine 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 ignition exciter is energized by the starter-ignition switch on the pilots collective pitch stick, except under automatic re-ignition (restart) conditions (para 2-35). The engine ignition system derives its input power from the 28 vdc aircraft electrical system.

2-32. Engine Starting System.

The combination starter-generator is mounted on the engine power and accessory gearbox and serves as both an engine starter and the main electrical generator.

2-33. Starter-Generator.

During the time the starter switch is depressed, the generator field circuit is open to allow the starter to function as a series motor. A shear point is incorporated in the generator drive shaft to protect the engine drive from excessive torque loads. The power generating function is described in paragraph 2-61.

2-34. Starter Switch.

The engine starter-ignition switch is a pushbutton switch located on the pilots collective pitch stick. The switch (8, fig. 2-13) is marked START and is spring-loaded to OFF. When depressed, the switch energizes the starting relay, the ignition exciter, and the electric fuel pump. An ignition keylock switch is installed at the right side of the pilots seat (10, fig. 2-6). This keylock switch locks out the engine starter-ignition circuit, and the engine cannot be started unless the proper key is used to unlock the keylock switch. Electrical power to the starter and ignition systems is controlled by the BATT-OFF-EXT switch located on the console.

2-35. Automatic Re-ignition (Restart) System.

On aircraft equipped with a RE-IGN PRESS TO RESET indicator (fig. 2-12) an engine re-ignition system automatically energizes the engine ignition system whenever an engine-out condition is sensed by the engine power-out warning system. Normal starting and ignition, using the starter-ignition switch, remains unchanged. An ENGINE OUT warning light and audible signal indicate when engine N2 rpm decreases to 95 percent or less during flight with the throttle at FULL OPEN (governed) position. With the throttle at any position other than FULL OPEN, the 95-percent N2 powerout sensing function is disabled by a throttle actuated switch mounted at the base of the pilots collective pitch stick; this feature serves to deactivate the N2 engine out warning and engine re-ignition signal while the throttle is out of its FULL OPEN position (for example, during practice autorotation). A re-ignition time delay of 3 to 4 seconds occurs when the throttle is returned to the FULL OPEN position; this prevents erroneous engine-out warning and re-ignition while the engine accelerates to 95 percent N2 or above. Engine power-out warning and re-ignition also occur automatically whenever engine N1 rpm decreases to 55 percent or less, regardless of throttle position. Auto re-ignition is automatically limited to a duration of 5 seconds in order to prevent engine surge and to eliminate danger of post-crash fires.

2-36. Engine Instruments and Indicators.

The engine instruments and engine condition indicators are located on the instrument panel (fig. 2-12), as described in the following paragraphs. Operating ranges and limitation markings for all engine instruments are found in chapter 5.

2-37. Engine Instruments.

Engine instruments consist of a torque gage, turbine outlet temperature (TOT) indicator, N1 tachometer, N2 and rotor tachometer, engine oil pressure indicator, engine oil temperature indicator, and an ammeter.

a. Torque Gage. The torque gage (fig. 2-12), marked TORQUE PSI, continuously indicates the torque being developed at the engine output shaft. Oil pressure is routed from the torquemeter pressure port of the engine through metal tubing and nylon tubing to the gage.

b. Turbine Outlet Temperature (TOT) Indicator. The turbine outlet temperature indicator (fig. 2-12), marked TOT °C x 100, indicates engine exhaust temperature. The indicator is actuated by a self-generating thermocouple harness on the engine and is not dependent upon the aircraft electrical system.

c. N1 Tachometer Indicator. The N1 tachometer indicator (fig. 2-12), marked N1 PERCENT RPM, indicates the speed of the gas producer turbine. The N1 tachometer indicator is actuated by electrical current developed by the N1 tachometer generator mounted on the engine, and is not dependent upon the aircraft electrical system.

d. Engine (N2) and Rotor Tachometer Indicator. The engine (N2) and rotor tachometer indicator (fig. 2-12), marked N2 %RPM and ROTOR RPM X 100, has two dial scales and two concentrically mounted pointers

TEMP, is electrically actuated by a sender unit located on the engine.

2-38. Engine Warning Systems.

The engine warning systems include an ENGINE OUT warning light, an engine out audible signal, an engine power out warning control unit, and an OIL (or ENG) CHIPS caution light. The OIL (or ENG) CHIPS indicator light is wired in such a manner as to dim to a preset level whenever the INST LT dimming rheostat knob is turned away from OFF. The ENGINE OUT warning light circuit has no dimming capability.

a. ENGINE OUT Warning Light. The engine out warning light (fig 2-12), is a rectangular red light mounted either in the upper right side of the instrument panel or below the instrument panel hood. If the N1 tachometer generator output is approximately 15 volts or less (indicating N1 speed is 55% or less) the low rpm warning light flashing circuit and an audible warning signal circuit are energized in the engine power out warning control unit. The audible warning signal will occur only when the GEN-OFF switch is in the GEN position; however, the ENGINE OUT warning light will flash regardless of GEN-OFF switch position.

b. Engine Out Audible Signal. An engine out audible signal of 680 to 1700 Hz is produced, in conjunction with the ENGINE OUT warning light flashing, by a tone generator in the engine power out control unit. A small audio amplifier increases signal strength and feeds the amplified "beeping" tone into the radio headsets. The audible signal will occur only when the GEN-OFF switch is in the GEN position and N1 rpm is 55% or less.

c. Engine Power Out Warning Control Unit. The engine power out warning control unit produces both ENGINE OUT out warning light flashing and an audible signal tone. The low engine rpm audible warning signal circuit is activated by setting the GEN-OFF switch in the electrical control console to GEN. The control unit also produces warning light flashing for the transmission low oil pressure and high oil temperature warning lights (fig. 2-12). When the engine is not running, the engine power out light and the transmission oil pressure warning light flash alternately. The warning signals are interrupted approximately 150 times per minute. The WARNING LT (or ANN PANEL) circuit breaker provides 28 vdc input and circuit protection for the control unit. On aircraft equipped with an automatic re-ignition system (para 2-35) the control unit also monitors N2 rpm, controls engine re-ignition and timing, and also provides REIGN PRESS TO RESET light illumination signal. The engine re-ignition system is also deactivated when the GEN-OFF switch is placed at OFF.

d. Automatic Re-ignition Indicator Light. On aircraft equipped with an automatic engine re-ignition system (para 2-35), a rectangular amber light is mounted on the left underside of the instrument panel hood (fig. 2-12). The light, marked RE-IGN PRESS TO RESET, illuminates when automatic re-ignition has occurred. The system can be reset and the light extinguished by pressing the indicator face. Re-ignition system power is supplied through the AUTO RE-IGN circuit breaker (fig. 2-20) located near the switch panel. Illumination of the light and automatic re-ignition will occur when the GEN-OFF switch is in the GEN position.

e. Engine Chip Detector Caution Light. The engine chip detector caution light is a rectangular amber light mounted on the right side of the instrument panel. The caution light will illuminate whenever loose, ferrous metallic matter has been magnetically accumulated by either of two chip detectors in the engine oil system.

(1) On series 1 and 2 aircraft, the engine chip detector caution light (fig. 2-12) is marked OIL CHIPS. The caution light also illuminates if any one of three other chip detectors located in the main transmission and tail rotor transmission accumulate metal (para 2-49 and 2-50).

(2) On series 3 aircraft, the engine chip detector caution light (fig. 2-12) is marked ENG CHIPS. If either of the two engine chip detectors accumulate ferrous metal, the caution light will illuminate and the MASTER CAUTION light will flash until the MASTER CAUTION light/switch is reset; the caution light will remain lit until the fault is cleared. (Refer to para 2-68.)

f. Oil Chips Test Switch. **On series 2 and some series 1 aircraft, an OIL CHIPS TEST switch is located at the lower right corner of the instrument panel (fig. 2-12). This switch provides a means for isolation of the source of an oil chips fault to the tail rotor transmission, the main transmission, or in the engine. The three-position switch is spring-loaded to the center (unmarked) position and is operated as follows:**

(1) When the OIL CHIPS caution light is illuminated, hold the test switch at TAIL TRANS position; if the OIL CHIPS light extinguishes the oil chips fault is in the tail rotor transmission.

(2) If the OIL CHIPS light remains on, hold the switch at the MAIN TRANS position. The light will extinguish if the oil chips fault is in the main transmission.

(3) If the OIL CHIPS light does not extinguish in either of the previous switch positions, the oil chips fault is in the engine.

SECTION IV — FUEL SYSTEM

2-39. Deleted.

2-40. Fuel Supply System.

The CR fuel system is a pressure type (non-gravity feed) closed-circuit fuel system. The system is comprised of two *fuel* cells, a shutoff valve, engine-driven fuel pump and filter assembly (refer to paragraph 2-26), and a fuel quantity indicating system. A submerged-type electric fuel pump is installed in the left fuel cell (para 2-42). The two flexible fuel cells are located beneath the cabin floor, in the fuselage lower section. Both fuel cells are vented to the atmosphere through a check valve venting system to the underside of the fuselage; the vent valve is designed to close in the event of an abnormal aircraft attitude or roll-over accident. The fuel cells are highly resistant to gunfire (ballistic) damage. The fuel cell fillers, mountings, vents, and frangible (break-away) joints are designed to retain the fuel (and thus minimize post-crash fire hazards) in the event of aircraft damage. In armored aircraft, the engine fuel inlet hose in the engine compartment is self-sealing. A closed-circuit fuel filler receptacle (fig. 2-21) provides rapid refueling capability. See table 2-3 and refer to paragraph 2-69 for fuel specifications. For fuel quantity data refer to table 2-2. Refer to table 2-4 for listings of approved fuels.

2-41. Deleted.

2-42. Fuel Supply System Components.

a. Fuel Cells. The two fuel cells are interconnected, rubberized-bladder type cells enclosed within the lower fuselage section, directly under the cabin floor. The fuel cell interconnection maintains a nearly equal fuel level, with fuel delivered to the engine from the left fuel cell, which also contains the fuel quantity tank unit. Non-crash-resistant fuel cells are self-sealing in the lower half of the cell. Crash-resistant fuel cells are 100 percent self-sealing. The supporting fuel cell structure is designed for crash resistance. The remotely actuated fuel shutoff valve is located at the top of the left fuel cell, adjacent to the fuel quantity tank unit, just below the access door in the cabin floor.

b. Electric Fuel Pump.

CAUTION

Operation of the electric fuel pump increases the possibility of post-crash fires, or engine compartment fires in the event of a fuel line break.

A 28 vdc, submerged-type fuel pump is located inside the left fuel cell. The electric fuel pump is used to provide a positive supply of fuel to the engine-driven pump during engine starting and during high altitude/high temperature flight operations. The pump operates automatically during engine starts due to electrical connection with the starting circuit. For operation other than starting, a FUEL PUMP toggle switch is provided on the edge-lighted switch panel. Power is derived from the FUEL PUMP circuit breaker (fig. 2-20) located either on the console panel adjacent to the switch panel, or the circuit breaker panel. The electric fuel pump must be used continuously (1) whenever the aircraft is operated on emergency fuel, (2) whenever the operating altitude exceeds 15,000 ft. MSL, (3) whenever ambient air temperature exceeds 40°C (104°F).

c. Fuel Quantity Indicator. Two different styles of fuel quantity indicators (fig. 2-12) are used on OH-6A aircraft. One group of indicators is marked LBS FUEL 400 LB CAPACITY, with major graduations at 0, 100, 200, 300 and F. The other group is marked LBS FUEL 356 LB CAPACITY, with major graduations at 0, 89, 178, 267 and 356. Both groups of indicators are used interchangeably. The indicators operate from 24 vdc power supplied by the INST & AC INV circuit breaker or the INST circuit breaker (fig. 2-20).

d. Fuel Valve Control Knob. The fuel valve control (fig. 2-20), marked FUEL VALVE and PULL TOO CLOSE, is a friction-lock, push-pull knob located on the electrical control console. Compressing the knob halves releases the friction lock to allow mechanical actuation of the fuel shutoff valve located on the fuel tank.

e. Fuel Pump Switch. A two-position FUEL PUMP-OFF toggle switch (fig. 2-20), is provided on the edge-lighted switch panel. The switch provides control for

Table 2-2. Deleted.

the fuel pump during flight or ground maintenance operations other than engine starting.

f. Fuel Quantity Low Caution Light. The fuel quantity low caution light (fig. 2-12), marked FUEL LOW, is a rectangular amber light mounted in the right-hand side of the instrument panel and, when illuminated, indicates that the fuel supply has diminished to approximately 35 pounds. A spring wire contact made by the tank unit float arm at the signal level completes a ground circuit to energize the caution light. On series 3 aircraft, the caution light will illuminate and the MASTER CAUTION light will flash until the MASTER CAUTION light/switch is reset; the caution light will remain lighted until the fault is cleared. (Refer to para 2-68.)

g. Fuel Filter Caution Light. The fuel filter caution light (fig. 2-12), marked FUEL FILTER, is a rectangular amber light mounted in the right side of the **instrument panel. When the fuel reaches a set differential pressure between the before and after fuel filter chambers, the fuel filter caution light is illuminated: Fuel will not bypass the filter until a slighty higher set differential pressure is reached. On series 3 aircraft, the caution light will illuminate and the MASTER CAUTION light will flash until the MASTER CAUTION light/switch is reset; the caution light will remain lighted until the fault is cleared. (Refer to paragraph 2-68).**

SECTION V — FLIGHT CONTROLS

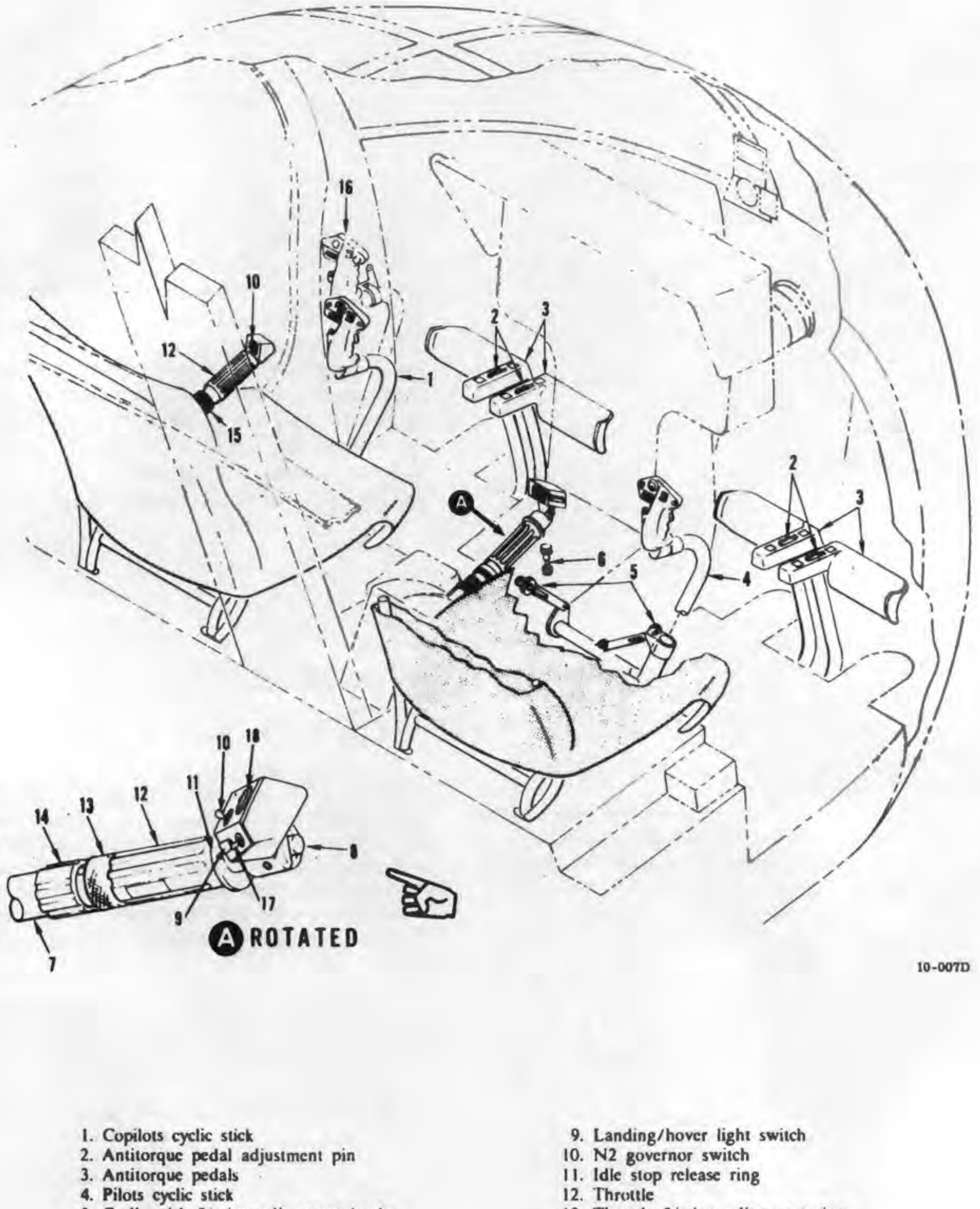
2-43. Flight Control Systems.

The flight control systems include three primary systems: the collective pitch control system, which governs the rate of ascent or descent; the cyclic pitch control system that controls horizontal movement; and the anti-torque control system that varies the heading of the aircraft. The aircraft also has three fixed airfoils on the tailboom; an upper vertical stabilizer, a lower vertical stabilizer, and a horizontal stabilizer mounted at a 25-degree angle upward from the horizontal. The airfoils surfaces serve to stabilize the aircraft during high speed forward flight. The horizontal stabilizer also maintains the aircraft in a relatively level attitude during high speed forward flight. Detailed descriptions of the flight control systems are contained in paragraphs 2-44 through 2-47.

2-44. Collective Pitch Control System.

The collective pitch control system includes dual collective pitch sticks mechanically linked to the main rotor swashplate, which in turn controls rotor blade pitch. Raising the collective pitch stick increases the incidence of the main rotor blades, while lowering the stick decreases the main rotor blade incidence; this action varies the lift developed by the main rotor blades and thereby controls the rate of ascent or descent.

a. Collective Pitch Stick. The aircraft is equipped with two collective pitch sticks (7, and 15, fig. 2-13), one of which is located to the left of the pilots seat, and the other to the left of the copilots seat. The two sticks are mechanically interconnected so that the movement



1. Copilots cyclic stick
2. Antitorque pedal adjustment pin
3. Antitorque pedals
4. Pilots cyclic stick
5. Cyclic stick friction adjustment knobs (lateral and longitudinal)
6. Fuel shutoff valve control
7. Pilots collective pitch stick
8. Starter-ignition switch
9. Landing/hover light switch
10. N2 governor switch
11. Idle stop release ring
12. Throttle
13. Throttle friction adjustment ring
14. Collective stick friction adjustment ring
15. Copilots collective pitch stick
16. Copilots cyclic stick stowage
17. **NVG Searchlight Control**
18. **NVG Searchlight Rotation Control**

Figure 2-13. Flight Controls.

of one stick moves the other stick simultaneously. The pilots collective pitch stick is different from the copilots collective pitch stick in that it contains more controls. The pilots collective pitch stick controls include: the N1 throttle (12, fig. 2-13), an idle stop release ring (11), an N2 governor trim switch (10), a landing light switch (9), a stick friction adjustment ring (14), a throttle friction ring (13), and a starter-ignition switch (8). The copilots collective pitch stick includes only an N1 throttle and an N2 governor trim switch.

b. Collective Pitch Stick Friction Controls. The pilots pitch stick friction adjustment ring (14), allows the pilot to vary the amount of effort required to raise and lower the collective pitch stick as well as increasing stick resistance to position change resulting from sudden changes in main rotor collective forces. The grip is marked with arrows indicating the direction of rotation for increasing or decreasing the friction. Friction can be applied or released with one hand by rotating the friction adjustment ring.

***c.* The collective stick friction mechanism is desiged so that positive locking of the pitch stick cannot be obtained at the maximum friction point. Safety of flight considerations require that the pilot be able to instantly overcome the established collective pitch stick position, without changing the friction adjustment, in the event of a power failure. There is no suitable check that the pilot can make, with the aircraft on the ground, to determine if maintenance adjustment of collective friction is correct. This is due to the large force application necessary to overcome the collective bungee and the blades resting on the droop stops. If stick friction is inadequate during flight, a maintenance inspection will be performed.**

***d.* It is possible to override the low friction point of the cam in the collective friction mechanism by holding the adjustment ring in the minimum friction (friction-off) position. This action can cause some friction to be reapplied. Always release the ring following full clockwise rotation for minimum friction to avoid possibility of unwanted friction.**

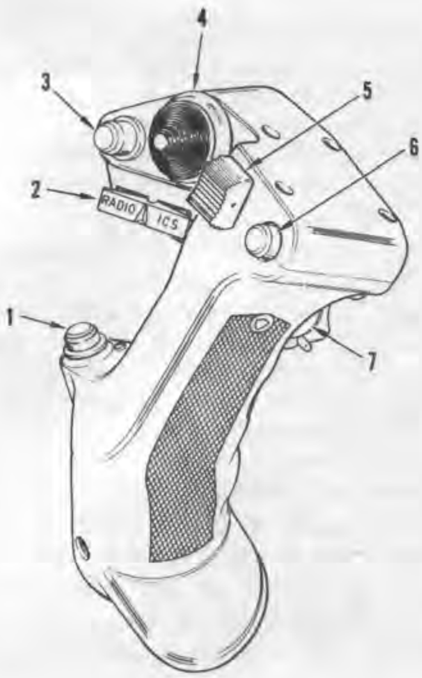
2-45. Cyclic Pitch Control System.

The cyclic pitch control system is a fully mechanical control system incorporating manually adjustable friction controls, a one-way lock to control longitudinal rotor forces, and dual cyclic sticks. The dual cyclic sticks are linked by push-pull rods to the cyclic longitudinal control mixer and the cyclic lateral control mixer, which in turn are linked to the main rotor swashplate. Any combination of lateral and longitudinal cyclic stick movement is mixed by the cyclic lateral and longitudinal control mixers and transmitted to the main rotor swashplate, which applies the combined motion to the main rotor blades by means of pitch change rods. Forward and rearward movement of the cyclic stick produces aircraft motion in a longitudinal direction, while movement of the cyclic stick from side to side produces aircraft motion in a lateral direction. This action varies the lift developed by the main rotor blades and thus serves as the primary control of horizontal flight.

a. Cyclic Control Stick. The aircraft is equipped with two cyclic control sticks (1, and 4, fig. 2-13), one of which is permanently located in front of the pilots seat, and a removable dual control stick directly in front of the copilots seat. The two sticks are mechanically interconnected so that the movement of one stick moves the other stick simultaneously. The door frame **structure, forward of the left cockpit door, is equipped with two clamping devices for stowage of a removed copilots cyclic stick. (The two quick-release ball-lock pins, used to secure an installed stick in its socket, are stowed in the socket when the stick is removed for stowage.) The switches on the cyclic stick grip are shown in figure 2-14.**

b. Cyclic Trim Control. Cyclic trim control consists of a cyclic trim switch located at the top of each cyclic stick grip, a pair of electrically operated actuators that vary spring tension produced by the longitudinal and lateral trim units, and various connecting linkage. The cyclic trim switches (4, fig. 2-14), each have five positions which are: normally OFF in the center, and momentary FORWARD, AFT, LEFT, and RIGHT. Both trim mechanisms include an electrically operated reversible motor and a cylindrical spring assembly connected to the cyclic pitch control linkage. When a trim switch is moved off center to any of four trim positions, 28-volt, direct-current power from the aircraft electrical power system energizes one of the trim motors to apply trim spring force in the desired direction. By momentarily moving the switch, very small trim increments may be obtained. Trim forces cannot be applied in two directions simultaneously; when both lateral and longitudinal corrections are desired, it is necessary to apply first one, then the other. The cyclic trim mechanism does not limit travel of the cyclic pitch control sticks; the pilot may override the trim forces at any time. A pushbutton circuit breaker (fig. 2-20), marked CYCLIC TRIM (or TRIM-CYCLIC) protects the trim motor circuits from electric overloads. On series 1 and 2 aircraft the CYCLIC TRIM circuit breaker also supplies power which energizes the oil cooler bypass valve as well as the OIL CLR. BYPASS **light. The cyclic stick reaction to lateral trim corrections is approximately twice as fast as its reaction to longitudinal trim corrections.**

c. Cyclic System Friction Control. The cyclic system friction controls include lateral and longitudinal friction adjustment knobs (5, fig. 2-13) that are located on the cyclic stick friction mechanism near the pilots seat.



1. Spare
2. RADIO-ICS switch
3. Spare
4. Cyclic trim switch
5. Armament elevation/depression switch
6. Spare
7. Armament trigger switch

10-100

Figure 2-14. Cyclic Stick Grip Switches.

The knobs can be rotated to adjust the amount of friction in the cyclic control system to a desirable level. Both controls are similar and are adjusted in an identical manner. Turning the knurled knobs applies pressure to a spring and a set of washers that moves against a slide mechanism.

d. Cyclic System One-Way Lock. The cyclic control system incorporates a one-way lock (unilock) that is located in the control linkage within the pilots seat structure. The uniloc is a push rod mechanism containing a hydraulically actuated check valve and a relief valve. When longitudinal force (feedback) originated by the main rotor tends to move the unilock (and cyclic stick) in an aft direction the check valve is seated. Seating the check valve prevents unwanted aft movement of the cyclic stick and shunts the feedback force into the aircraft structure. Normally, only very slight aft movement of the cyclic stick is required to unseat the check valve. Should the check valve, or push rod shaft that unseats the valve, gall and freeze in the valve-closed position, a force of approximately 30 pounds is necessary to open the relief valve and bypass the check valve. This force will then be required for each subsequent movement of the cyclic stick, either forward or aft. Conversely, should the check valve spring fail, the unilock will not function to shunt longitudinal feedback forces into the aircraft structure.

2-46. Dual Flight Controls.

The aircraft is equipped with removable flight controls for the copilots seat position. The copilots flight controls are essentially the same as those provided at the pilots location, except that the cyclic and collective friction adjustments are not duplicated, and certain electrical control switches have been omitted; refer to paragraphs 2-44 and 2-45. The copilots cyclic stick is readily removable and can be stowed in the aircraft when it is not needed. The dual collective stick is not designed for quick-disconnect removal.

2-47. Antitorque (Tail Rotor) Control System.

The tail rotor control system provides directional control of the aircraft by varying the pitch of the tail rotor blades. Depressing either of the antitorque pedals moves a system of bellcranks and pushrods that travels through the tailboom to the tail rotor assembly. Pushrod movement actuates the pitch change mechanism of the tail rotor assembly which provides control of the aircraft heading.

a. Antitorque Pedals. The antitorque control pedals (3, fig. 2-13) are located on the floor directly in front of the pilots and copilots seats. Pushing forward on the left pedal changes the aircraft heading toward the left, and pushing forward on the right pedal changes the aircraft heading toward the right. During flight the pedal position required to maintain a desired heading will vary, depending on main rotor torque variations, altitude, and weather conditions.

b. Antitorque Pedal Adjustment. When the aircraft is on the ground, the pedal-to-seat distance may be increased or decreased to suit the individual pilot by removing the quick-release pins (2, fig. 2-13) located on top of the pedal arms, repositioning the pedals and reinstalling the pins.

SECTION VI — HYDRAULIC AND PNEUMATIC SYSTEMS

(Not applicable)

SECTION VII — POWER TRAIN SYSTEM

2-48. Power Train System.

The power train system transmits engine power to the main rotor, the tail rotor, and the oil cooler blower. The power train system includes an overrunning clutch, the main (interconnect) drive shaft, an oil cooler blower, the main transmission, the main rotor drive shaft, the tail rotor drive shaft, and the tail rotor transmission (fig. 2-15).

2-49. Main Rotor Drive System.

The main rotor drive system consists of the overrunning clutch, main drive shaft, oil cooler blower, main transmission, and main rotor drive shaft.

a. Overrunning Clutch. The overrunning clutch is mounted on the forward face of the engine and transmits power from the engine to the main (interconnect) drive shaft. The purpose of the clutch is to disengage the engine from the remainder of the drive system in case of engine failure and during practice autorotations. The clutch has no external controls and disengages automatically whenever N2 rpm is less than the corresponding main rotor rpm.

b. Main Drive Shaft. The main drive shaft is a dynamically balanced shaft equipped with a flexible coupling and mounting flange at each end. The shaft connects the overrunning clutch to the transmission input shaft.

c. Main Transmission. The main transmission is mounted to the main rotor drive shaft mast support **structure directly above the cabin. The transmission is basically a two-stage speed reduction unit, utilizing the first reduction stage for the tail rotor drive system and the accessory drive trains, and the second stage to further reduce rpm for the main rotor. All of the gears are spiral-bevel type, except for the accessory drive gears which are spur type. The transmission housing is magnesium alloy. The input gearshaft connected to the engine transmits power to a second gear concentrically mounted on the tail rotor gearshaft, which in turn drives the output gear connected to the main rotor drive shaft and the accessory drive train. The accessory gear train drives the rotor tachometer generator and the transmission oil pump mounted on drive pades at the rear of the transmission. The transmission is lubricated by a self-contained lubrication system and oil supply. The oil pump contains a replaceable oil filter element. Transmission cooling is accomplished by air drawn over the housing by the oil cooler blower. Externally mounted transmission accessories include a combined breather-filler, an oil level sight plug, two chip detectors, an oil pressure warning sender and an oil temperature warning switch. See figure 2-21 for transmission servicing information and table 2-3 for lubricant specifications.**

d. Main Transmission Oil Level Sight Plug. The main transmission oil level sight plug is installed at the main transmission right side centerline. The plug has a transparent center window through which the oil level may be viewed. If the oil level is below the centerline of the plug, servicing is required. Refer to section XIV for lubricant specifications and capacities.

e. Main Transmission Oil Pressure Warning Light. On series 1 and 2 aircraft, the main transmission oil pressure warning light (fig. 2-12), marked XMSN OIL PRESS, is a rectangular red light mounted in the upper right side of the instrument panel. On series 3 aircraft, the transmission oil pressure warning light, marked TRANS OIL PRESS, is mounted under the instrument panel hood. In case of a reduction or loss of transmis**sion oil pressure below safe operating level, a pressure-sensing sender located in the transmission oil system energizes the low oil pressure warning light flashing circuit of the engine power out warning control unit (fig. 2-12).**

f. Main Transmission Oil Temperature Warning Light. On series 1 and 2 aircraft, the transmission oil temperature warning light (fig. 2-12), marked XMSN OIL TEMP, is a rectangular red light mounted in the upper right side of the instrument panel. On series 3 aircraft, the transmission oil temperature warning light, marked TRANS OIL TEMP, is mounted under the instrument panel hood. If the transmission oil **supply reaches an abnormally high temperature, a temperature-sensing switch located in the transmission oil system energizes the high oil temperature warning light flashing circuit of the engine power out warning control unit (fig. 2-12).**

g. Main Transmission Chip Detector Caution Light. On series 1 and 2 aircraft, the main transmission chip detector caution light (fig. 2-12), marked OIL CHIPS, is the same as that used for the engine chip detectors described in paragraph 2-38. Operation of the OIL CHIPS TEST switch, on aircraft so equipped, is described in paragraph 2-38. On series 3 aircraft, the main transmission chip detector caution light (fig. 2-12) is marked TRANS CHIPS. If either of the two main transmission chip detectors accumulate ferrous metal, the caution light will illuminate and the MASTER CAUTION light will flash until the MASTER CAUTION light/switch is reset; the caution light will remain lighted until the fault is cleared. (Refer to para 2-68.)

h. Oil Cooler Blower. The oil cooler blower is mounted on the input end of the main transmission and serves to draw cooling air over the main transmission in addition to supplying forced ambient air to the engine oil cooler, compartment heating system, and engine area. The blower consists of an impeller mounted on the transmission input gearshaft, within a

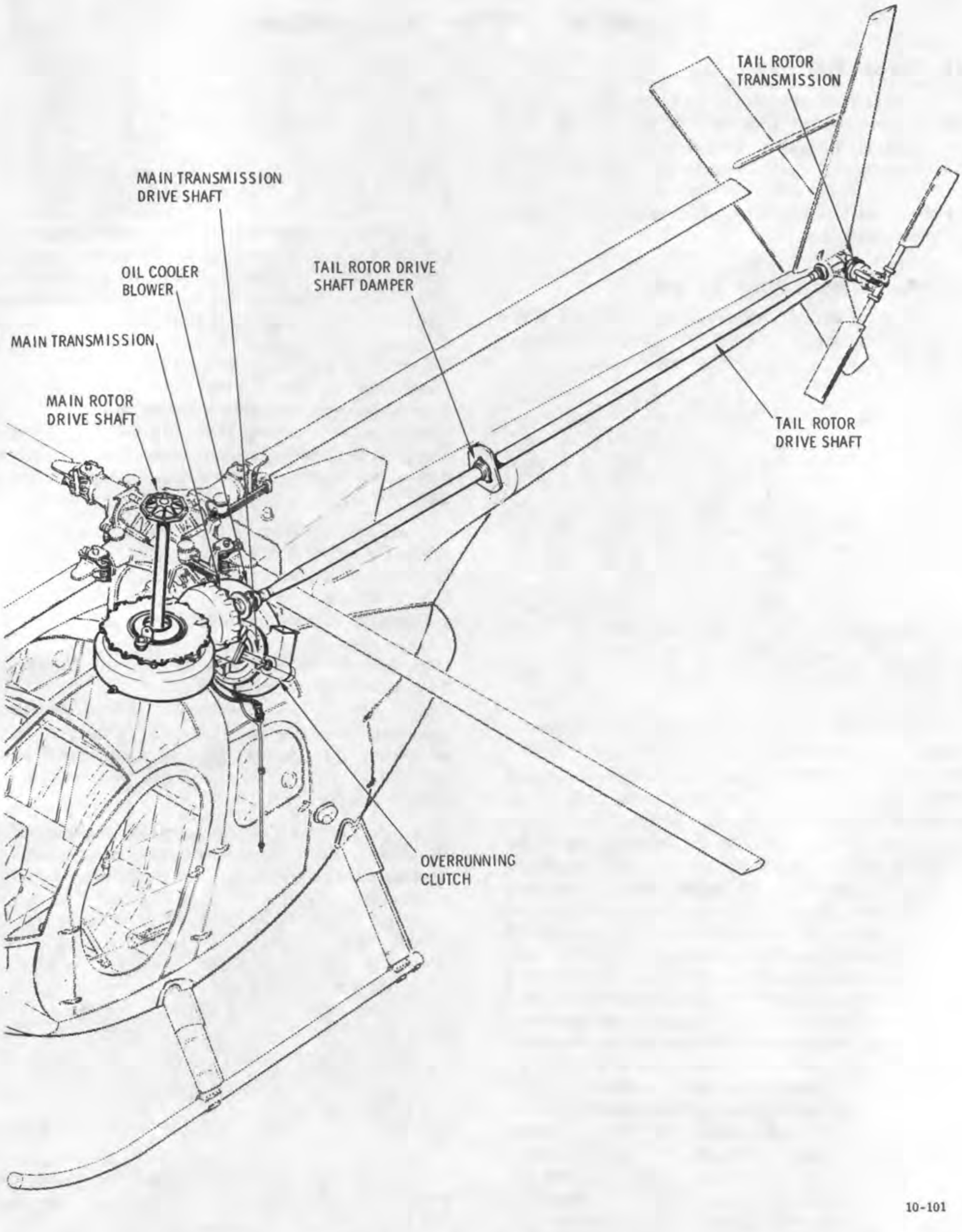


Figure 2-15. Power Train System.

scroll type enclosure attached to the transmission housing.

i. Main Drive Shaft. The main rotor drive shaft is a nitrided steel alloy forging having a spline coupling at one end that mates with the main transmission output shaft, and an octagonally shaped flange that attaches to the main rotor hub.

2-50. Tail Rotor Drive System.

The tail rotor drive system is comprised of the tail rotor drive shaft, the tail rotor drive shaft damper, and the tail rotor transmission. The drive system transmits power from the main rotor transmission to the tail rotor assembly.

a. Tail Rotor Drive Shaft. The tail rotor drive shaft connects the main and tail rotor transmissions. The drive shaft is a straight, dynamically balanced aluminum alloy tube equipped with mounting flanges at both ends.

b. Tail Rotor Drive Shaft Damper. The tail rotor drive shaft damper is located near the center of the shaft, and serves to damp-out shaft oscillations during the brief period of shaft resonance which occurs during acceleration from idle to operating rpm.

c. Tail Rotor Transmission. The tail rotor transmission (fig. 2-17), is mounted on the aft end of the tailboom and serves to support and drive the tail rotor assembly. The transmission delivers power from the tail rotor drive shaft to the tail rotor through a 90-degree directional change accomplished by means of a pair of steel spiral-bevel gears housed in a magnesium alloy case. The tail rotor transmission is equipped with a self-contained lubricant supply, an oil level sight plug, a combined breather-filler, and a magnetic chip detector. See figure 2-21 for tail rotor transmission servicing information and table 2-3 for lubricant specifications.

d. Tail Rotor Transmission Oil Level Sight Plug. The tail rotor transmission oil level sight plug is located at the rear of the tail rotor transmission. The plug has a transparent center window through which the oil level may be viewed. If the oil level is below the centerline of the plug, servicing is required. Refer to section XIV for lubricant specifications and capacities.

e. Tail Rotor Transmission Chip Detector Caution Light. On series 1 and 2 aircraft the tail rotor transmission chip detector caution light (fig. 2-12), marked OIL CHIPS, is the same as that used for the engine chip detectors described in paragraph 2-38. Operation of the OIL CHIPS TEST switch, on aircraft so equipped, is described in paragraph 2-38. On series 3 aircraft, the tail rotor transmission chip detector caution light is marked TAIL CHIPS. If the tail rotor transmission chip detector accumulates ferrous metal, the caution light will illuminate and the MASTER CAUTION light will flash until the MASTER CAUTION light/switch is reset; the caution light will remain lighted until the fault is cleared. (Refer to para 2-78.)

SECTION VIII — MAIN AND TAIL ROTOR GROUPS

2-51. Rotors.

The rotor system includes a four-bladed main rotor and a two-bladed tail rotor, both of which are gearbox driven and may be controlled by the pilot or copilot.

2-52. Main Rotor.

The main rotor (fig. 2-16) is located at the approximate center of the cg range and provides lateral control, longitudinal control, and the lifting force of the aircraft. The main rotor is fully articulated with offset flapping hinges and consists primarily of four manually foldable rotor blades attached to the rotor hub pitch housings with cross-connected retention straps, and associated pitch change control mechanism. The main rotor is controlled by the cyclic stick and collective pitch control stick through the swashplate mounted on the main drive shaft directly beneath the rotor. Information on the main rotor flight control system is provided in paragraphs 2-44 through 2-46. For main rotor speed ranges refer to chapter 5.

a. Main Rotor Blades. Each of the four main rotor blades is a balanced airfoil consisting of a wrap-around, aluminum alloy skin bonded to an extruded aluminum alloy spar, and an upper and lower root fitting, which attaches to lead-lag link fittings on the main rotor hub pitch housing. Pressure sensitive protective tape may or may not be present on the leading edges of the main rotor blades. One vibration absorber is installed on the lower inboard end of each main rotor blade. Each vibration absorber consists of two pendulums that pivot about a common axis. These pendulums are tuned to cancel out the first and second harmonic beats of the natural vibration frequency of each individual blade. The large pendulum counteracts any 3-per-revolution vibrations; the small pendulum counteracts any 5-per-revolution vibrations.

b. Main Rotor Hub and Pitch Housings. The main rotor hub assembly consists of a central hub which is attached to the main rotor drive shaft, and four identical pitch housing assemblies that are located 90-degrees apart and slightly offset. The pitch housing assemblies contain the pitch control bearing assemblies, and are connected by the blade pitch control rods to the swashplate. The pitch housings pivot on the pitch control bearings in response to collective pitch control stick motions.

c. Main Rotor Blade Dampers. A main rotor blade damper is mounted on each pitch housing of the main rotor hub assembly. The damper is connected to the inboard trailing edge of the associated main rotor blade by a damper arm to limit blade movement on

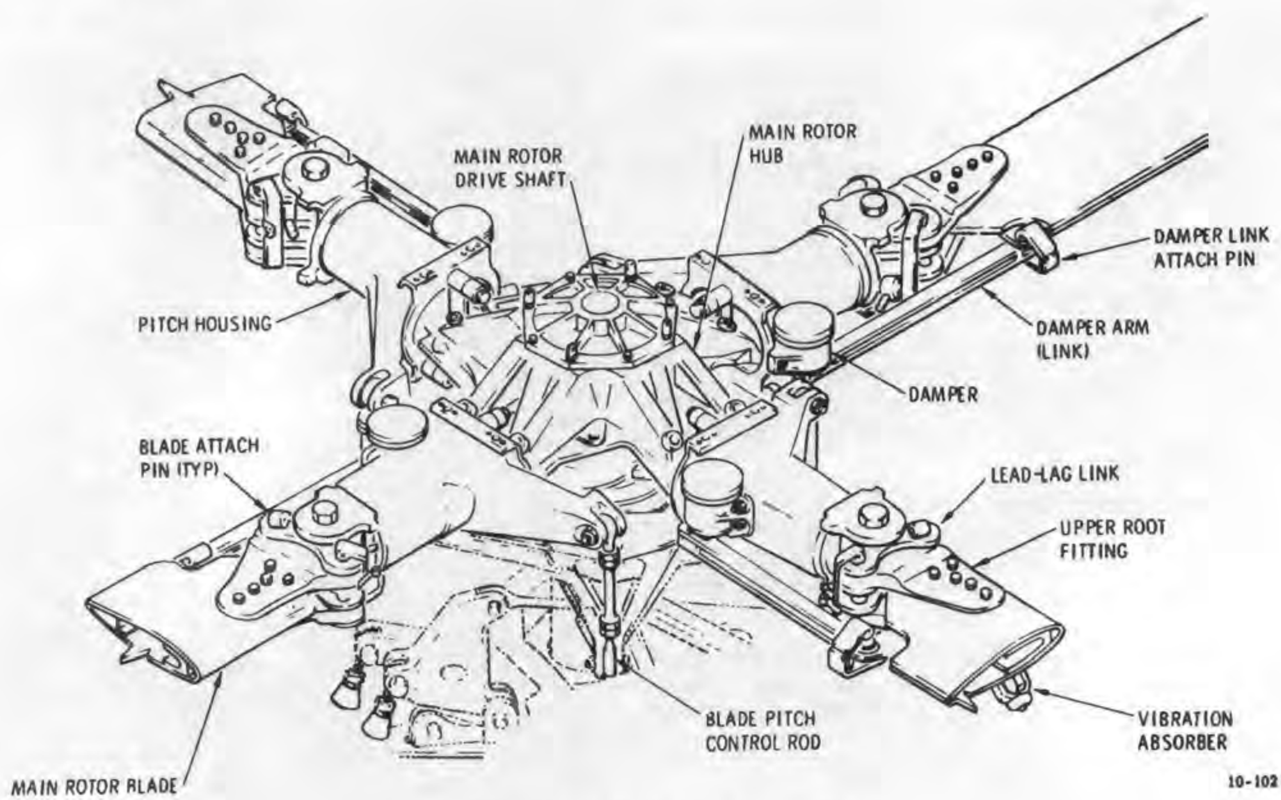


Figure 2-16. Main Rotor and Blades.

the lead-lag axis and to absorb lateral vibrations that may occur in the main rotor blades. The damper is a sealed unit, is not externally adjustable, and does not require regular servicing.

2-53. Tail Rotor.

The tail rotor (fig. 2-17) is mounted on the output shaft of the tail rotor transmission at the aft end of the tailboom. The primary purpose of the tail rotor is to counteract main rotor torque and control the heading of the aircraft. The rotor basically consists of a two variable-pitch blades mounted on a teetering delta hub. Pitch of the tail rotor blades is controlled by the tail rotor antitorque pedals. Information on the tail rotor flight control system is provided in paragraph 2-47.

SECTION IX – UTILITY SYSTEMS

2-54. Defogging System.

The aircraft has provisions for canopy defogging as **a function of the cockpit heating system. The four forward and two overhead diffuser outlets in the cockpit are located for use in canopy defogging. Canopy defogging sufficient to permit hovering can be accomplished in approximately 3 minutes at ambient temperatures ranging from -32°C (-24°F) to +46°C (116°F). Refer to section X for a complete description and operating procedures for the heating system, including defogging.**

2-55. Pitot Heat.

On certain aircraft, the pitot-static system is electrically heated for improved effectiveness during cold or inclement weather operation. Refer to paragraph 2-67 for a complete description and operation of the heated pitot-static system.

2-56. Engine Compressor Inlet Anti-icing.

An anti-icing system is provided for the engine compressor inlet. The system consists of a manually

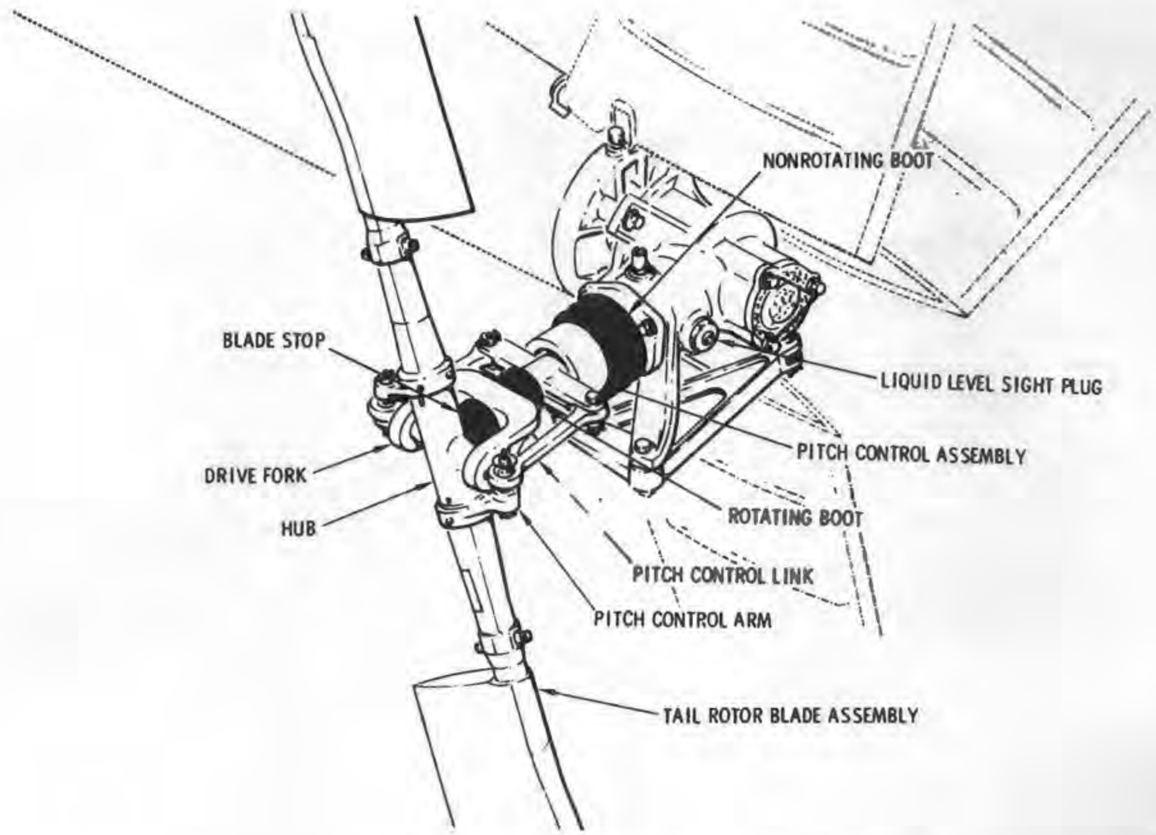


Figure 2-17. Tail Rotor and Tail Rotor Transmission.

operated push-pull control cable connected to an anti-icing valve lever located on the engine compressor scroll. The anti-icing shutoff valve controls the compressor discharge air routed to the compressor inlet and front bearing support hub. The control housing, with cable actuating knob, marked ENGINE DE-ICER, is attached to the overhead canopy frame (fig. 2-18). Movement of the control lever rearward to the latch notch opens the anti-icing valve completely. Releasing the control level from the notch results in spring-loaded return of the lever to the forward (off) position.

2-57. Miscellaneous Equipment.

Non-emergency equipment that is not part of a system covered elsewhere is contained in the following paragraphs.

a. Data Case. A data case is provided for stowage of aircraft log, handbook, and other data normally carried in the aircraft at all times. The case is attached to the canopy structure forward of the instrument panel (7, fig. 2-6).

b. Map Pocket. A map pocket for map and check list stowage is located on the canted bulkhead between the pilot and copilot (13, fig. 2-6). Decal identification MAP CASE AND CHECK LIST is located just above the pocket.

c. Ashtrays. Two ashtrays (8, 14, fig. 2-6) are provided in the aircraft. The cockpit ashtray is recessed in the forward righthand corner of the electrical control console. The cabin ashtray is mounted on the center of the canted bulkhead.

SECTION X — HEATING AND VENTILATING SYSTEMS

2-58. Heating, Defogging, and Ventilating System Limitations.

On series 3 aircraft with the engine air filter scavenge air system functioning, the maximum cabin heat must be manually restricted by approximately 50 percent. The cockpit and cabin are heated by a forced air system. Ambient air is drawn in by the oil cooler blower and mixed with engine bleed air at a heater control valve. Engine bleed air provides forced air flow through the heat ducts. The system includes an engine bleed air line connected to ducting, and a heater control valve located behind the heating system access door. Distribution ducting is routed overhead into the cockpit and downward into the cabin. One manually adjustable heat outlet is located on the rear bulkhead of the cabin. The ducting routed overhead and forward through the cockpit has six fanshaped diffuser outlets (fig. 2-18). Heat control is provided by a push-pull type cable that is manually actuated by a red heater valve control knob, marked CABIN HEAT AND DE-FOG, mounted on the canopy structure; the control lever is located to the right of canopy center, above the pilot and copilot seats. Moving the heat control lever to the aft extreme opens the hot air (engine bleed) section of the heater control valve to maximum and positions the cold (blower driven) air section for minimum cold air input. (A maximum of 4 percent bleed air is provided when full heat is selected, with the air filter scavenge air switched off.) Moving the control heat lever to the forward extreme shuts off the hot bleed air completely and also actuates the blower vane to the fully closed position. Any intermediate heat selections may be made to satisfy the compartment heat needs. The heat outlet in the rear of the cabin provides a controllable source of heated air at the selected temperature. In addition to providing compartment heating, the six diffuser outlets in the cockpit are located for best canopy defogging

a. Normal Operation.

(1) Cabin heat and defog: Move CABIN HEAT AND DEFOG lever forward or aft to select the air temperature desired. Initial movement of handle adds heat to the air.

(2) Cabin: Rotate cabin HOT AIR outlet left to open, or right to close. (Outlet is not adjustable from the cockpit.)

(3) To shut off heated air: Pull red knob full forward.

b. Emergency Operation. In the event of failure of the heater control valve pulley belt that actuates the cold air vane in conjunction with the hot air valve, proportional air mixing will not occur. If a selection of intermediate to minimum heat lever control positions does not significantly reduce the temperature level of airflow at the two overhead outlets, the lever should be moved to the full forward (closed) position.

2-59. Ventilation System.

The cockpit and cabin are ventilated by a large cabin vent control valve located in the front of the canopy, and by four smaller plastic ventilators, one in the approximate center of each door window. The cabin vent control valve is actuated by a push-pull cable knob, marked PULL FOR AIR, located below the caution lights on the instrument panel (fig. 2-18). The knob is a friction catch type which provides the means for holding the valve door open in the selected position against ram air during flight. The vent control valve housing is constructed so that incoming fresh air is diffused upward in a fan-shaped pattern, providing complete circulation through the aircraft. Additional fresh air can be admitted by rotating the circular plastic ventilators in the doors to direct airflow into the cockpit and cabin. The door ventilators can also be used to exhaust the compartment air by rearward positioning of the vent cutout.

a. Ventilator Operation. Adjust the PULL FOR AIR knob and the door ventilator positions for the desired fresh air intake and circulation.

b. Emergency Operation. There is no emergency operation of the ventilation system.

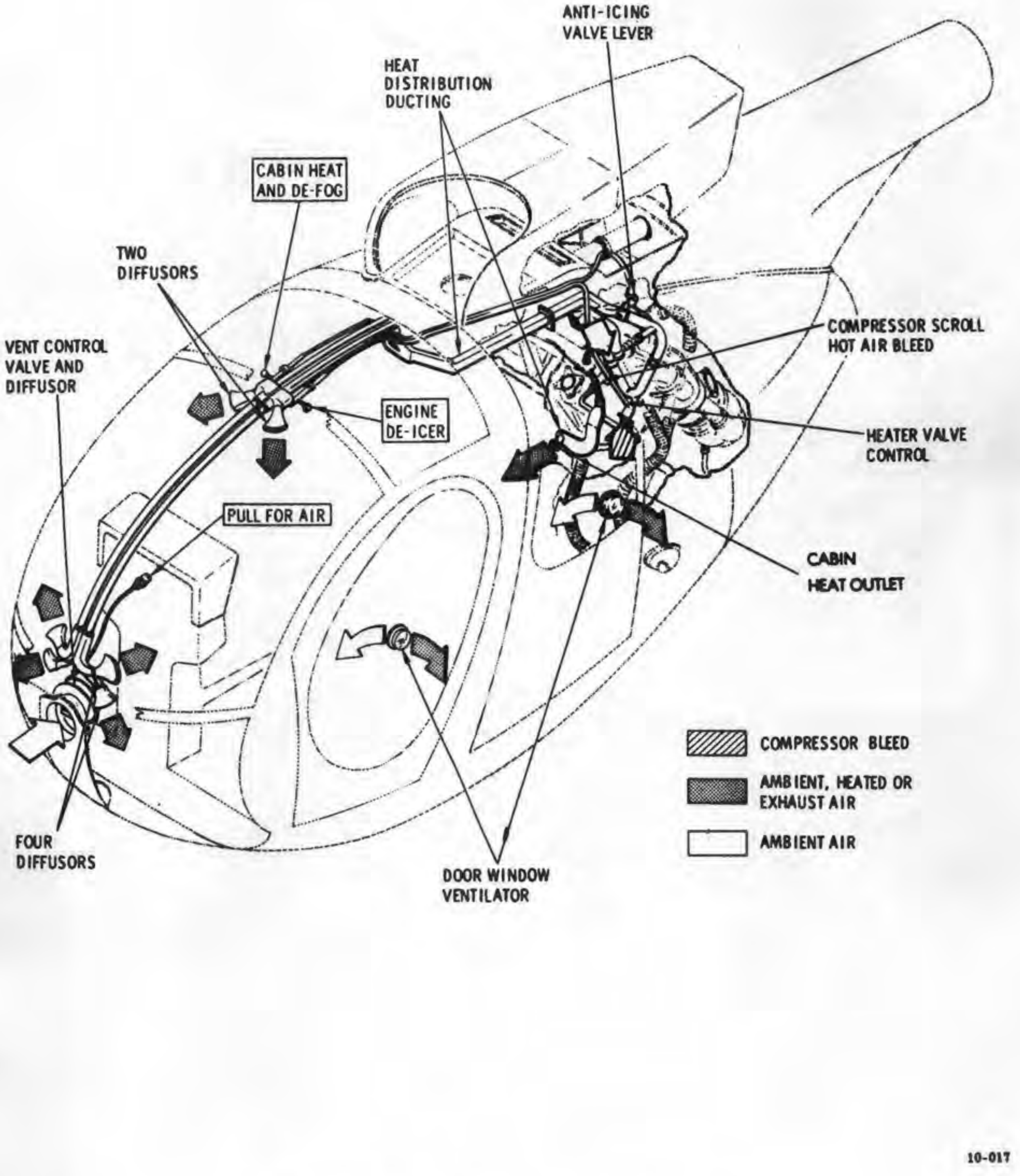
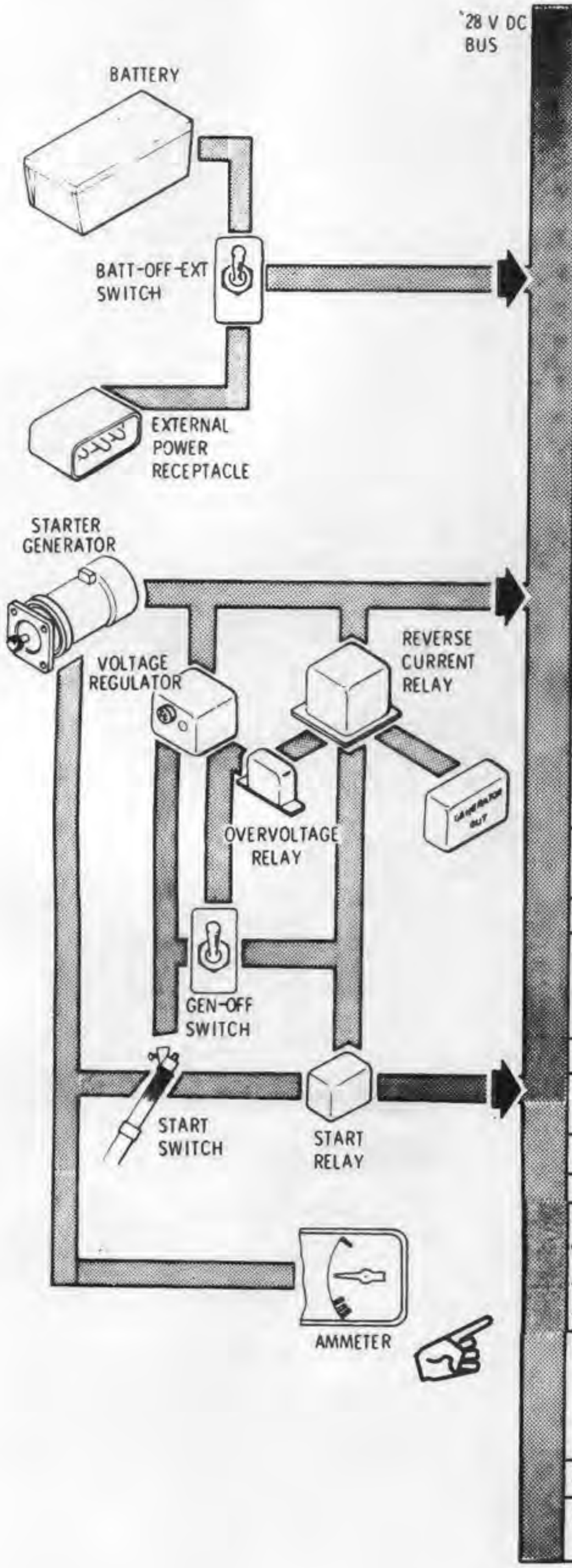


Figure 2-18. Heating and Ventilation System



SERIES 1 & 2 ACFT CIRCUIT BREAKER	CONTROLS (DISABLES)	SERIES 3 ACFT CIRCUIT BREAKER
UHF/VHF FM	COMMUNICATION	UHF-AM-TR VHF-AM-NO. 1 VHF-AM-NO. 2 VHF-FM-TR SEC SET-KY28
ADF	NAVIGATION	ADF
—	IFF	XPONDER-TEST XPONDER-TR
AIC	ICS	INTER-PHONE -PLT/CPLT INTER-PHONE -PASS
FUEL PUMP	ELECTRIC FUEL PUMP	FUEL-PUMP
AUX TANK-OFF (SWITCH/BREAKER)	AUXILIARY FUEL (TORSO TANK) BOOST PUMP UTILITY POWER	UTILITY POWER (SWITCH/BREAKER)
FUSE	GENERATOR	GEN-FLD
INST AC INV	FUEL QUANTITY AND INSTRUMENT PACK INSTRUMENTS INVERTER { ATTITUDE GYRO, DIRECTION GYRO, HOMING HEADING & BEARING INDICATOR	INST
CYCLIC TRIM	CYCLIC TRIM OIL COOLER BYPASS VALVE	TRIM-CYCLIC
—	FILTER SCAVENGE AIR OIL COOLER BYPASS VALVE	OIL CLR-SCAV AIR
N_2 GOV	N_2 GOVERNOR CONTROL	TRIM-N_2 GOV
—	INVERTER { ATTITUDE GYRO, DIRECTIONAL GYRO, HOMING HEADING & BEARING INDICATOR	INVERTER-OFF (SWITCH/BREAKER)
ARM POWER	GUN MOTOR (M27)	ARMAMENT-POWER
ARM	ARMAMENT ELEVATION SIGHT LAMP AND INDICATOR LIGHTS	ARMAMENT-CONT
POS LT	POSITION LIGHTS	POS
HOVER LT	HOVER (LANDING) LIGHT	LDG-HOVER
NVG POS LT	NVG POSITION LIGHT	NVG POS LT
SRCH LT PWR	SEARCHLIGHT POWER	SRCH LT PWR
SRCH LT CONT	SEARCHLIGHT CONTROL	SRCH LT CONT
WARNING LT	CAUTION AND WARNING LIGHTS INDICATOR LIGHTS ENGINE OUT WARNING UNIT UTILITY LIGHT	ANN PANEL
—	UTILITY LIGHT	CKPT-UT
PITOT HEAT	HEATED PITOT TUBE	PITOT HEAT

10-010F

Figure 2-19. Power Supply Diagram.

SECTION XI – ELECTRICAL POWER SUPPLY AND DISTRIBUTION SYSTEM

2-60. General

This electrical system shown schematically in figure 2-19 is supplied by a 28-volt, direct current, 150-ampere, engine driven generator in conjunction with a 24-volt battery and an external power receptacle. Control of the electrical system is provided by the switches and circuit breakers on the electrical control console, and the circuit breaker panel located between the pilot and copilot seats. All circuits of the electrical system are protected by push-to-reset or switch-type circuit breakers. Alternating current is supplied by a static inverter for the directional gyro and altitude gyro. Current demand of the electrical system is indicated by an ammeter on the instrument panel.

2-61. DC Power Supply System

The dc power supply system consists of the battery, the external power receptacle, the power selector switch, a starter-generator, generator control switch, generator caution light, and an ammeter.

a. Battery. The battery is a 24-volt, nickel cadmium battery capable of starting the engine in temperatures down to -32°C (-24°F). The battery is located beneath the left floor access door, in the electronics compartment.

WARNING

Corrosive Battery Electrolyte (Potassium Hydroxide). If potassium hydroxide is spilled on clothing, or other material, wash immediately with clean water. If spilled on personnel, immediately start flushing the affected area with clean water. Continue washing until medical assistance arrives.

b. External Power Receptacle. The external power receptacle (4, fig. 2-1) consists of a male connector that has three prongs: two large prongs and one small prong. The small prong provides a polarity guide while the other two are used as the positive and negative conductors. The receptacle is located at the right side of the pilots seat, inside the cabin door. A GPU power of 300 to 750 amps and 28 vdc is recommended.

c. Power Selector Switch. The power selector switch (fig. 2-20), marked BATT-OFF-EXT, is located on the electrical control console, and provides a selection of power sources. When in the BATT position, either battery or generator power is supplied to the main bus. The EXT position disconnects the battery from the bus and supplies external power from an external power source when external power is connected to the external power receptacle. The power selector switch does not control generator power, the generator circuit is controlled by the GEN-OFF switch.

d. Starter-Generator. The 150-ampere capacity starter-generator is mounted on the engine power and accessory gearbox and supplies 28-volt, direct-current power for operation of the aircraft electrical equipment and for battery charging. Generator operation is controlled by the GEN-OFF switch (fig. 2-20). At flight idle rpm and above, the voltage regulator automatically maintains the correct generator output voltage by varying the generator field current. On series 1 and 2 aircraft, the generator field circuit is protected by a 15-ampere fuse (visible and accessiblt secured to the instrument panel wiring harness forward of the panel). On series 3 aircraft, the generator field circuit is protected by the GEN FLD circuit breaker (fig. 2-20) located on the circuit breaker panel. When an overvoltage condition occurs, an overvoltage relay is energized by the voltage regulator. The overvoltage relay opens the switch circuit of the reverse current relay to remove generator output from the bus. The reverse current relay prevents the battery from discharging through the generator when the output voltage falls below battery voltage. The aircraft electrical systems operate from the battery when the generator is OFF and the BATT-OFF-EXT switch is at BATT. The starter function is described in paragraph 2-32.

e. Generator Switch. A generator switch (fig. 2-20), marked GEN-OFF, is located on the electrical control console. When in the GEN position, the generator is connected to the 28 vdc bus; when in the

OFF position, the generator is disconnected from the bus. (Refer to para 2-38 for other functions of generator switch).

f. Generator Caution Light. The generator caution light (fig. 2-12), marked GENERATOR OUT (or DC GEN), is a rectangular amber light mounted in the right side of the instrument panel. If the GEN-OFF switch is in the GEN position, and generator output voltage is less than battery voltage, the caution light will be illuminated. On series 3 aircraft, the caution light will illuminate and the MASTER CAUTION light will flash until the MASTER CAUTION light/ switch is reset; the caution light will remain lighted until the fault is cleared (Refer to para 2-68).

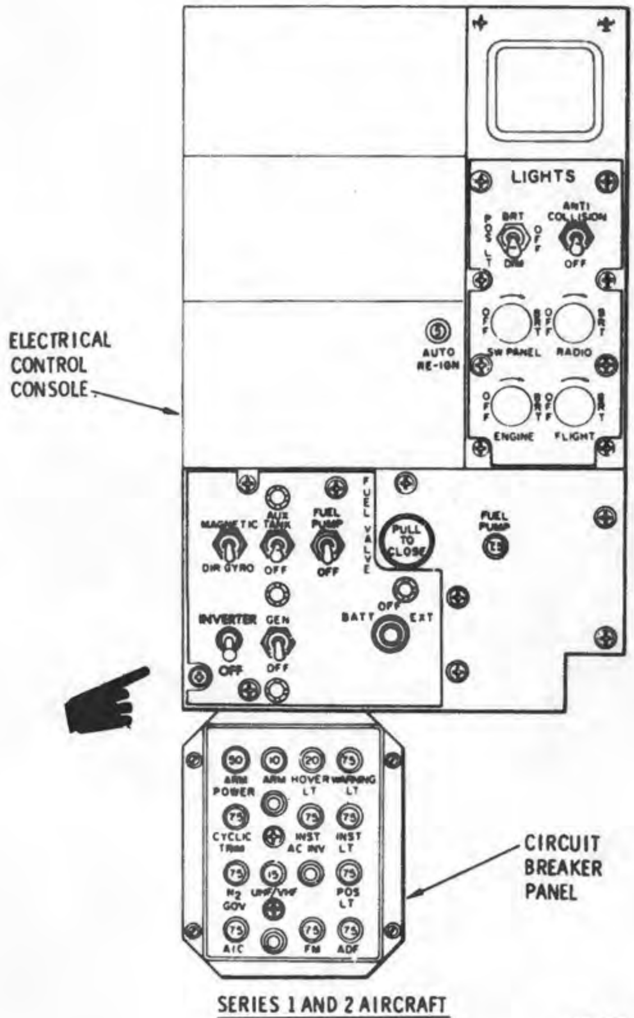
g. Ammeter. A direct-current ammeter (fig. 2-12), marked DC AMP, is housed in a 3-pack instrument cluster, along with the engine oil pressure indicator and engine oil temperature indicator. The ammeter is graduated from -150 to +150 amperes, with major graduations of -150, -75, 0, +75, and +150. An ammeter plus scale reading indicates the current demand of the aircraft electrical system during normal generator operation. Minus amperage is indicated only during engine starting and shows the current demand of the starter.

2-62. AC Power Supply System

The ac power supply system consists of one static, solid state inverter and inverter switch. The inverter will provide power for both the attitude indicator and the directional gyro. The inverter mounts within the structure under the pilot's seat. The inverter changes 28 vdc input into 115v, 400 Hz, ac output. The inverter switch marked INVERTER-OFF (fig. 2-20) is located on the electrical control console. The switch supplies 28 vdc from the INST and AC INV circuit breaker (fig. 2-20) to the inverter. Should the inverter fail, the power OFF warning flags in the attitude gyro and directional gyro provide visual indication of the malfunction.

2-63. Electrical Control, Light Control, and Circuit Breaker Panels.

The electrical control console and circuit breaker panel (fig. 2-20) provide the switches and circuit breakers for controlling the various aircraft electrical systems. One electrical control panel, one light control panel, and one circuit breaker panel are provided within reach of both the pilot and copilot. The control panels contain rheostats, toggle switches, and switch-circuit breakers which are used for electrical power and interior and exterior light control. The FLIGHT-OFF-BRT light power rheostat (fig. 2-20) must always be fully rotated to OFF during daylight operation of the aircraft. When this rheostat is moved from the full off position, the warning and caution light dimming circuit relay is energized. On series 1 and 2 aircraft, dimming reduces indicator lamp brilliance by approximately 50 percent. On series 3 aircraft, dimming reduces annunciator panel lamp brilliance to less than one percent. The lowered brilliance is difficult to see in bright daylight and could cause an illuminated caution signal to be overlooked. The circuit breaker panel contains push-to-reset circuit breakers which can be manually pulled to OFF.

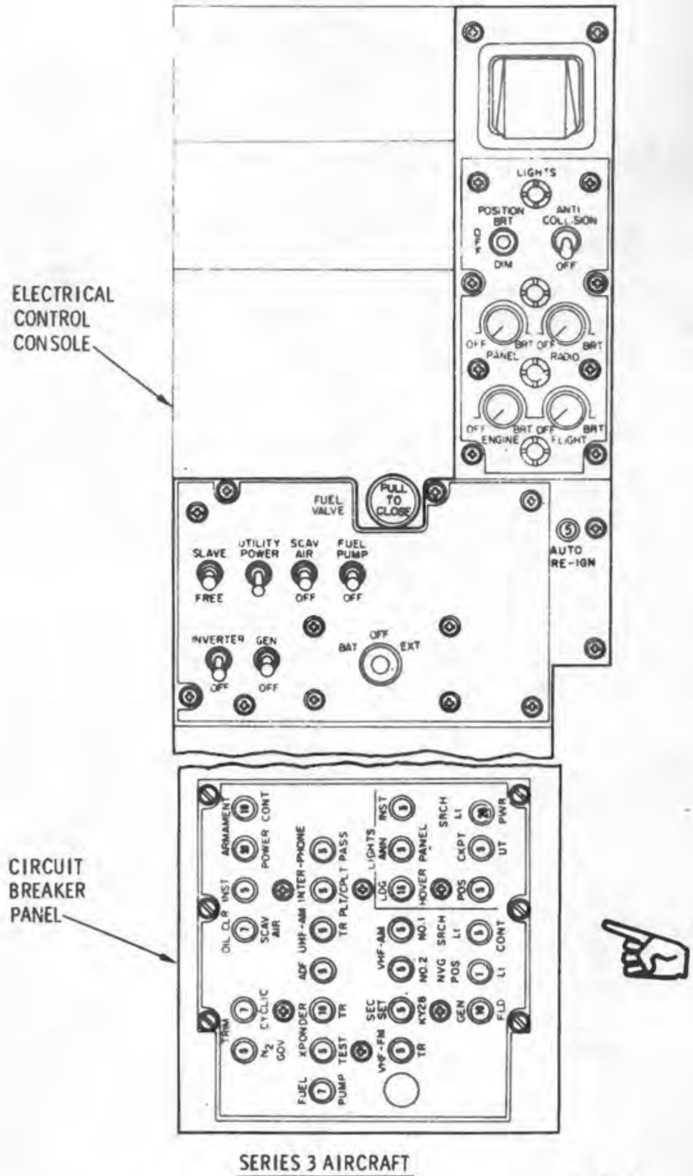


SERIES 1 AND 2 AIRCRAFT

10-009-1

Figure 2-20. Electrical Control Console and Circuit Breaker Panel. (sheet 1 of 2)

★U. S. GOVERNMENT PRINTING OFFICE: 1978--765096/627



SERIES 3 AIRCRAFT

10-009-2

Figure 2-20. Electrical Control Console and Circuit Breaker Panel. (sheet 2 of 2)

SECTION XII — AUXILIARY POWER UNIT

(Not Applicable)

SECTION XIII — LIGHTING

2-64. Lighting Equipment.

The aircraft lighting equipment consists of exterior and interior lighting systems described in paragraphs 2-65 and 2-66.

2-65. Exterior Lighting System.

The aircraft exterior lighting system consists of standard position (navigation) lights, NVG position, anticollision lights, a landing/hover light, and an IR searchlight.

a. Position Lights. The side position lights (6 and 20, fig. 2-1) are located on the fuselage, immediately aft of the cabin doors (right side green, left side red), and the white tail light (15) is mounted on the trailing edge of the horizontal stabilizer. Power for operation of the lights is provided by the POS LT (or POS light) push-to-reset circuit breaker on the circuit breaker panel, and lamp intensity and operation is controlled by the POS LT-BRT-DIM-OFF (or POSITION BRT-OFF-DIM) switch on the electrical control console (fig. 2-20).

b. NVG Position Lights. Five IR position lights (NVG position lights) are mounted on the aircraft (30, fig. 2-1). Two lower NVG position are mounted just above the side position lights. Two upper NVG position lights are mounted on both sides of the engine fairing assembly. One aft NVG position light is located right of the standard tail position light. Power for operation of the NVG position lights is provided by the NVG POS LTS circuit breaker (fig. 2-20). Operation of the NVG position lights is controlled by a five-position rotary switch, NVG POS LTS, (fig. 2-12) mounted on the lower right side of the instrument panel. In position 1, the lights are at minimum intensity, in position BRT, the lights are at maximum intensity.

c. Anticollision Lights. Two anticollision lights (17 and 21, fig. 2-1) are provided, one mounted on the top surface of the engine air inlet fairing, and the other on the bottom of the fuselage beneath the cockpit. Both lights are housed under red lens covers and consist of standard bayonet base type lamps installed in lamp bracket sockets. Different types of flasher units can be installed; as a result, it is normal for the lights to either flash at the same time or alternately. Power for the anticollision lights is controlled by the ANTICOLLISION-OFF (or ANTICOLLISION) switch-type circuit breaker on the electrical console (fig. 2-20).

d. Landing Light. A single landing/hover light (25, fig. 2-1) is mounted on the aircraft centerline, recessed flush with the lower surface of the canopy. On certain aircraft the light is ground adjustable and has a vertical range of 15 to 30 degrees below the centerline of the aircraft. On aircraft equipped with a nonadjustable landing light, the landing light is preset at a fixed angle downward from level. The landing light is controlled by the LDG LT thumb switch (9, fig. 2-13) on the pilots collective stick. Power for the landing/hover light is provided through a relay by the HOVER LT (or LDG-HOVER) push-to-reset circuit breaker on the circuit breaker panel (fig. 2-20).

e. IR Searchlight. An IR searchlight is mounted on the right underside of the aircraft (31, fig. 2-1). Power for operation of the IR searchlight is provided by the SRCH LT PWR and SRCH LT CONT circuit breakers. Operation of the IR searchlight is controlled by two switches on the pilot's collective (fig. 2-13). The 3-position switch labeled, ON-OFF-STOW, controls illumination and retraction. The 4-position switch SRCH LGT, labeled L-R-FWD-AFT, provides extension, 360° rotation, and retraction of the IR searchlight.

NOTE

Light will automatically extinguish when light rotates 90° right or left of center, if extended less than 30°.

2-66. Interior Lighting System.

The NVG-compatible interior lighting system for the instrument panel, electrical console panel, circuit breaker panel and magnetic compass is switch and rheostat controlled. An NVG-compatible utility light is also provided. Power for the interior lighting system (except the utility, warning and caution lights) is provided by the INST LT circuit breaker (fig. 2-20). Warning and caution light operation is described in SECTION III, IV, VII, and XI. A power supply diagram is provided as figure 2-19.

a. Instrument Lighting. The flight instrument, engine instruments and clock lighting is provided by NVG-compatible eyebrow lights and postlights (fig. 2-12). The flight and engine instrument groups are individually controlled by power rheostats (fig. 2-20) on the electrical control console. Instrument lighting intensity can be controlled by rotation of the ENGINE-OFF-BRT and FLIGHT-OFF-BRT control knobs.

b. Panel Lights. The electrical control console, circuit breaker panel, armament control panel and communication and navigation control units are equipped with recessed blue plastic lamps (panel lights) which illuminate the surface of the control panels. Panel light intensity can be controlled by rotating the SW PANEL-OFF-BRT and RADIO-OFF-BRT rheostat knobs (fig. 2-20).

c. Utility Light and Floodlight. Supplementary NVG-compatible cockpit lighting is provided by a utility light and a floodlight. The utility light is attached to a flexible gooseneck extension mounted on the tunnel between the pilot and copilot seats (fig. 2-6). The flexible gooseneck holds the utility light in the position selected by the pilot or copilot. The utility light extension cord allows removal of the utility light from the gooseneck for manual use. The light is equipped with a self-contained rheostat and has a rheostat override pushbutton that provides full lamp output regardless of knob setting. Power for the utility is provided by the INST LT, WARNING LT or CKPT-UT circuit breaker. An NVG-compatible floodlight is mounted on the left side of the glareshield (fig. 2-12). Floodlight intensity can be controlled by rotating the RADIO-OFF-BRT control. The floodlight is powered by the INST LT circuit breaker (fig. 2-20).

d. NVG-Compatible Filters. NVG-compatible filters are mounted next to the warning, caution and armament lights (fig. 2-12). The filters are positioned closed for NVG flight only.

WARNING

NVG-compatible flip filters are to remain in the open position (unfiltered) during day flight and night flight without night vision goggles.

SECTION XIV — FLIGHT INSTRUMENTS

2-67. Flight Instruments — General.

Except for the magnetic compass and **free** air temperature thermometer, all instruments (fig. 2-12) are located on the instrument panel and are illuminated by individual instrument lights. The magnetic compass and **free** air temperature thermometer are mounted on the airframe structure, above and forward of the instrument panel. A separate lighting source, such as the utility light, is needed for observation of the **free** air temperature thermometer during night operations, but the magnetic compass contains its own light. Instrument lighting and light controls are described in section XII. Range markings are illustrated in chapter 5.

a. Pitot-Static System. The main components of the pitot-static system are the pitot tube (1, fig. 2-1) routed through the lower front of the canopy windshield, a static pressure tube bonded to the static pressure port in the rear face of the engine air inlet aft fairing, and the pitot-static operated instruments located in the instrument panel. The pitot tube incorporates an electric pitot-heater for improved effectiveness during cold or inclement weather operation.

b. Pitot Heat Switch. The pitot heat switch (fig. 2-12) is a switch/circuit-breaker type mounted at the left side of the instrument panel. The switch is marked PITOT HEAT-OFF.

c. Altimeter. The altimeter (fig. 2-12) is mounted in the instrument panel and presents aircraft altitude in feet above sea level. Static pressure for operation is derived from the static pressure port described in *a* above. The altimeter adjustment knob permits simultaneous adjustment of the dial pointers, reference setting marks and barometric scale to provide for changes in atmospheric pressure.

d. Airspeed Indicator. The airspeed indicator (fig. 2-12) is mounted in the instrument panel and indicates the aircraft's airspeed in knots. The indicator operates from the differential pressure between the pitot tube and the static source. The pitot tube permits the airspeed indicator to function in forward flight only; it does not indicate rearward or sideward movement.

e. Attitude and Slip Indicator. The attitude and slip indicator (fig. 2-12) is mounted in the upper right section of the instrument panel and indicates the aircraft flight attitude with respect to the earth's horizon. It is operated by a gyro driven by 115-volt, alternating-current, 400-cycle, electrical power supplied by a static inverter. A horizontal reference bar in the center of the instrument represents the lateral axis of the aircraft. This bar can be adjusted for different pilot viewing positions (parallax effects) or flight attitude variations by turning the pitch reference adjustment knob at the bottom of the instrument face. The pitch trim range is plus or minus 6 degrees vertically. Operating limits of the instrument are 360 degrees in azimuth, 360 degrees in roll, and 50 degrees of upward or downward pitch. The slip indicator is located directly beneath the attitude gyro face. It consists of a ball-in-race which shows the direction of slip or skid.

f. Homing, Heading, and Bearing Indicator. The homing, heading, and bearing indicator (fig. 2-12) is located in the right center of the instrument panel and is used for heading, bearing, and direction-finding information. For more detailed information, refer to chapter 3.

g. Magnetic Compass. A magnetic compass (5, fig-2-6) is mounted on the windshield center-post directly in front of the instrument panel and is used as a standby compass. The compass calibration card is mounted at the right side of the magnetic compass frame.

NOTE

If the attitude indicator is inoperative, the magnetic compass may be unreliable.

h. Free Air Temperature Thermometer. **The free air temperature thermometer (6, fig. 2-6), located in the windshield near the windshield centerpost, is direct-reading, bulb-type, and is graduated in degrees celsius.**

i. Clock. A manually wound, 8-day clock (fig. 2-12), located in the lower right of the instrument panel, is equipped with a sweep second hand in addition to hour and minute hands. A winding and setting knob is provided at the lower left edge of the instrument, and the upper right edge of the instrument provides a stop button that controls an elapsed-time, stop-watch mechanism.

2-67.1 AAU-32/A ALTITUDE ENCODER/PNEUMATIC ALTIMETER.

a. *Description.* The AAU-32/A pneumatic counter-drum-pointer altimeter is a self-contained unit which consists of a precision pressure altimeter combined with an altitude encoder (figure 2-20.1). The display indicates and the encoder transmits, simultaneously, pressure altitude reporting. Altitude is displayed on the altimeter by a 10,000 foot counter, a 1000 ft. counter and a 100 ft. drum. A single pointer indicates hundreds of feet on a circular scale, with 50' center markings. Below an altitude of 10,000 ft. a diagonal warning symbol will appear on the 10,000 ft. counter. A barometric pressure setting knob is provided to insert the desired altimeter setting in inches of Hg. A DC powered vibrator operates inside the altimeter whenever aircraft power is on. If DC power to the altitude encoder is lost, a warning flag placarded CODE OFF will appear in the upper left portion of the instrument face indicating that the altitude encoder is inoperative and that the system is not reporting altitude to ground stations. The CODE OFF flag monitors only the encoder function of the altimeter. It does not indicate transponder condition. The AIMS altitude reporting function may be inoperative without the AAU-32/A CODE OFF flag showing, in case of transponder failure or improper control settings.

Figure 2-20.1 AAU-32/A altitude encoder/pneumatic altimeter

It is also possible to get a "good" MODE C test on the transponder control with the CODE OFF flag showing. Display of the CODE OFF flag only indicates an encoder power failure or a CODE OFF flag failure. In this event, check that DC power is available and that the circuit breakers are in. If the flag is still visible, radio contact should be made with a ground radar site to determine whether the AIMS altitude reporting function is operative, and the remainder of the flight should be conducted accordingly.

b. *Operation.*

(1) Normal operation. The AIMS Altimeter circuit breaker should be in prior to flight. The Mode C Switch (M-C) on the transponder control should be switched to "on" for altitude reporting during flight. The AAU-32/A altimeter indicates pneumatic altitude reference to the barometric pressure level as selected by the pilot. At ambient pressure, altimeters should agree within ±70 feet of the field elevation when the proper barometric pressure setting is set in the altimeter. If there is an error of greater than ±70 feet, do not use the altimeter for IFR flight. A red flag marked CODE OFF is located in the upper left portion of the altimeter's face. In order to supply Mode C information to the IFF transponder, the CODE OFF flag must not be visible. A vibrator, powered by the DC essential bus, is contained in the altimeter and requires a minimum of one minute warmup prior to checking or setting the altimeter.

(2) Abnormal operation.

(a) If the altimeters internal vibrator becomes inoperative due to internal failure or DC power failure, the pointer and drum may momentarily hang up when passing from "9" through "0" (climbing) or from "0" through "9" (descending). This hang-up will cause lag, the magnitude of which will depend on the vertical velocity of the aircraft and the friction in the altimeter. Pilots should be especially watchful for this type failure when the minimum approach altitude lies within the "8" — "1" part of the scale (800-1100, 1800-2100, etc.).

(b) If the "CODE OFF" flag is visible, the DC power is not available, the circuit breaker is not in, or there is an internal altimeter encoder failure.

(c) If the altimeter indicator does not correspond within 70 feet of the field elevation (with proper local barometric setting) the altimeter needs rezeroing or there has been an internal failure.

(d) If the baroset knob binds or sticks, abnormal force should not be used to make the setting as this may cause internal gear failure resulting in altitude errors. Settings can sometimes be made by backing off and turning at a slower rate.

2-68. Master Caution Light (Series 3 Aircraft).

The MASTER CAUTION light (fig. 2-12) is a rectangular indicator light/switch located below the instrument panel hood. The MASTER CAUTION light flashing circuit is energized at the same time any caution light is activated by a fault signal. Pressing the MASTER CAUTION light/switch resets (turns off) the flashing MASTER CAUTION light. A caution light will remain lighted, as long as a fault signal is present. If a fault signal is not present all lights will extinguish.

Section XV — SERVICING, PARKING, MOORING

2-69. Servicing.

Servicing information and procedures for the various systems or components are covered in the following paragraphs 2-70 through 2-74. Servicing points for fuel, engine oil, main transmission oil, and tail rotor transmission oil are illustrated in figure 2-21. Fuel, lubricants, specifications, and component capacities are given in table 2-3.

a. Fuel Types. Fuels are classified as Army Standard, Alternate, or Emergency, as follows:

(1) Army standard fuels. The Army standard fuel is JP-4.

(2) *Alternate fuels.* These are fuels which can be used continuously when Army Standard fuel is not available, without reduction of power output.

(3) Emergency fuels. The only authorized emergency fuel is aviation gasoline MIL-G-5572 without TRICRESYL PHOSPHATE (TCP). Its use is subject to the specific time limit in Chapter 5.

b. Use of Fuels. There is no special limitation on the use of Army Standard fuel, but certain limitations are imposed when Alternate or Emergency fuels are used. For the purpose of recording, fuel mixtures shall be identified as to the major component of the mixture, except when the mixture contains leaded gasoline. A fuel mixture which contains over 10 percent leaded gasoline shall be recorded as all leaded gasoline. The use of emergency fuel will be recorded in the FAULTS/REMARKS column of DA Form 2408-13, Aircraft Maintenance and Inspection Record, noting the type of fuel, additives, and duration of operation.

Table 2-3. Fuel, Lubricants, Specifications and Capacities

System	Specification	Grade	Capacity
Fuel	Primary MIL-T-5624 or Alternate MIL-T-5624 (Note 1)	JP-4 or JP-5	54.7 US gal
	Emergency MIL-G-5572 (without TCP) (Note 1)		
Engine Oil	MIL-L-23699 (temperature limited -19°F to 118°F) Notes 2 and 3		
	MIL-L-7808 (temperature limited -64°F to 118°F) Notes 2 and 3		
Main Transmission Oil	MIL-L-23699 (temperature limited -19°F to 118°F) Note 3)		
	MIL-L-7808 (temperature limited -64°F to 118°F) Note 3)		
Tail Rotor Transmission Oil	MIL-L-23699 (temperature limited -19°F to 118°F) Note 2 and 3		
	MIL-L-7808 (temperrture limited -64°F to 118°F) Note 3)		

CAUTION

Lubrication oil made to MIL-7808 by Shell Oil Company under their part number 307, qualification number 7D-1 shall NOT be used in OH-6A engine or aircraft systems. It contains additives which are harmful to seals in the systems.

Notes:

1. Refer to Chapter 5 for operating limitations.
2. When oil is mixed or changed from one type to another, enter on DA Form 2408-13.
3. When free air temperature range is -3.9°C (+28°F) and above, MIL-L-23699 is recommended. When free air temperature is -17.8°C (0°F) and below, MIL-L-7808 is recommended. When MIL-L-23699 is not available, MIL-L-7808 is recommended. For operation between -17.8°C (0°F) and -3.9°C (+28°F) either oil is recommended.
4. Refer to TB 55-9150-200-25 for additional information on fuels and oils.

NOTE

Fuels having the same NATO code number are interchangeable. Jet fuels conforming to Specification ASTM D-1655 may be used when MIL-T-5624 fuels are not available. This usually occurs during cross country flights where aircraft using NATO F-44 (JP-5) are refueled with NATO F-40 (JP-4) or Commercial ASTM Type B fuels. Whenever this condition occurs, the engine operating characteristics may change in that lower operating temperature, slower acceleration, lower engine speed, easier starting, and shorter range may be experienced. The reverse is true when changing from F-40 (JP-4) fuel to F-44 (JP-5) or Commercial ASTM Type A-1 fuels. Specific gravity adjustments in fuel controls and flow dividers shall be set for the type of fuel used. Most commercial turbine engines will operate satisfactorily on either kerosene or JP-4 type fuel. However, the difference in specific gravity may possibly require fuel control adjustments; if so, the recommendations of the manufacturers of the engine and airframe are to be followed.

(1) *Army standard fuel.* JP-4 (MIL-T-5624) (NATO Code No. F-40) is designated as Army Standard fuel for aircraft turbine engines and is the primary fuel to be used in this aircraft. Commercial Jet B fuels should be used when JP-4 is not available.

(2) *Alternate fuel.* JP-5 (MIL-T-5624) (NATO Code No. F-44) is designated as alternate fuel for this aircraft. Commercial Jet A or Jet A-1 should be used when JP-5 is not available. Operating limitations are imposed on the engine and aircraft when alternate fuels are used. (Refer to Fuel Operation Limits, chapter 5.)

NOTE

The use of kerosene fuels (JP-5-type) in turbine engines dictates the need for observance of special precautions. Both ground starts and air restarts at low temperature may be more difficult due to low vapor pressure.

(3) *Emergency fuel.* Aviation gasoline (MIL-G-5572) may be used only when aircraft turbine engine fuels are not available. Operating limitations are imposed on the engine when emergency fuels are used. (Refer to Fuel Operation Limits, chapter 5.)

c. Mixing of Fuels. When changing from one type of authorized fuel to another, for example JP-4 to JP-5, it is not necessary to drain the aircraft fuel system before adding the new fuel.

2-70. Fuel System Servicing.

The fuel system has two fuel cells that are interconnected for simultaneous flow and venting. (Refer to section IV for a complete description of the fuel system). A closed circuit fuel receiver is provided, and the regular gravity filler is equipped with a spring-loaded-to-close flapper valve in the filler neck. The CR fuel system may be filled either through the gravity filler or the closed circuit fuel receiver (fig. 2-21).

NOTE

Refuel with correct fuel (para 2-29 and tables 2-3 and 2-4) as soon after landing as possible to prevent moisture condensation and keep the aircraft as heavy as possible in case of winds.

a. Closed Circuit System Fueling. For refueling using the closed circuit system, proceed as follows:

(1) Remove the closed circuit fuel receiver cap located below the right cabin door sill.

(2) Refuel aircraft using equipment with compatible hose connections. The closed circuit fuel receiver opens only when there is sufficient delivered fuel pressure to unseat the internal fueling valve.

NOTE

The fuel cells will fill in approximately 1 minute, depending on delivery pressure, and the receiver will automatically shut off the fuel flow when the cells are full. Fuel sloshing, as the cells reach capacity, may cause momentary on-off cycling of the fuel delivery system.

(3) Reinstall filler cap. Be sure that the cap retention cable is coiled and positioned inside the receiver well so that no interference with the locking mechanism and sealing ring occurs when the cap is installed.

(4) On aircraft with closed circuit refueling provisions, two adjacent drain valves (left and right fuel cells) are located on the fuselage underside. The valves are spring-loaded in the closed position.

b. Gravity System Fueling. For refueling using the gravity system, proceed as follows:

(1) Remove the gravity system filler cap, located aft of the right cabin door. If the aircraft is equipped with a crash-resistant (CR) fuel system, pull the filler cap attaching cable and hook it into a notched tab to hold open the flapper valve in the filler neck.

(2) Refuel aircraft.

(3) Reinstall filler cap.

(4) Drain valves are located on the fuselage underside and in the engine compartment. (Armored

Table 2-3. Fuel, Lubricants, Specifications and Capacities

System	Specification	Grade	Capacity
Fuel	Primary MIL-T-5624 or Alternate MIL-T-5624 Note 1	JP-4 or JP-5	54.7 US gal TOTAL 54.0 Useable
	Emergency MIL-G-5572 (without TCP) Note 1		
Engine Oil	MIL-L-23699 (temperature limited -19°F to 118°F) Notes 1 and 2		
	MIL-L-7808 (temperature limited -64°F to 118°F) Notes 1 and 2		
Main Transmission Oil	MIL-L-23699 (temperature limited -19°F to 118°F) Note 2		
	MIL-L-7808 (temperature limited -64°F to 118°F) Note 2		
Tail Rotor Transmission Oil	MIL-L-23699 (temperature limited -19°F to 118°F) Note 1 and 2		
	MIL-L-7808 (temperature limited -64°F to 118°F) Note 2		

CAUTION

Lubrication oil made to MIL-7808 by Shell Oil Company under their part number 307, qualification number 7D-1 shall NOT be used in OH-6A engine or aircraft systems. It contains additives which are harmful to seals in the systems.

Notes:

1. When oil is mixed or changed from one type to another, enter on DA Form 2408-13.
2. When free air temperature range is -3.9°C (+28°F) and above, MIL-L-23699 is recommended. When free air temperature is -17.8°C (0°F) and below, MIL-L-7808 is recommended. When MIL-L-23699 is not available, MIL-L-7808 is recommended. For operation between -17.8°C (0°F) and -3.9°C (+28°F) either oil is recommended.
3. Refer to TB 55-9150-200-25 for additional information on fuels and oils.

NOTE

Fuels having the same NATO code number are interchangeable. Jet fuels conforming to Specification ASTM D-1655 may be used when MIL-T-5624 fuels are not available. This usually occurs during cross country flights where aircraft using NATO F-44 (JP-5) are refueled with NATO F-40 (JP-4) or Commercial ASTM Type B fuels. Whenever this condition occurs, the engine operating characteristics may change in that lower operating temperature, slower acceleration, lower engine speed, easier starting, and shorter range may be experienced. The reverse is true when changing from F-40 (JP-4) fuel to F-44 (JP-5) or Commercial ASTM Type A-1 fuels. Specific gravity adjustments in fuel controls and flow dividers shall be set for the type of fuel used. Most commercial turbine engines will operate satisfactorily on either kerosene or JP-4 type fuel. However, the difference in specific gravity may possibly require fuel control adjustments; if so, the recommendations of the manufacturers of the engine and airframe are to be followed.

(1) *Army standard fuel.* JP-4 (MIL-T-5624) (NATO Code No. F-40) is designated as Army Standard fuel for aircraft turbine engines and is the primary fuel to be used in this aircraft. Commercial Jet B fuels should be used when JP-4 is not available.

(2) *Alternate fuel.* JP-5 (MIL-T-5624) (NATO Code No. F-44) is designated as alternate fuel for this aircraft. Commercial Jet A or Jet A-1 should be used when JP-5 is not available. Operating limitations are imposed on the engine and aircraft when alternate fuels are used. (Refer to Fuel Operation Limits, chapter 5.)

NOTE

The use of kerosene fuels (JP-5-type) in turbine engines dictates the need for observance of special precautions. Both ground starts and air restarts at low temperature may be more difficult due to low vapor pressure.

(3) *Emergency fuel.* Aviation gasoline (MIL-G-5572) may be used only when aircraft turbine engine fuels are not available. Operating limitations are imposed on the engine when emergency fuels are used. (Refer to Fuel Operation Limits, chapter 5.)

c. Mixing of Fuels. When changing from one type of authorized fuel to another, for example JP-4 to JP-5, it is not necessary to drain the aircraft fuel system before adding the new fuel.

2-70. Fuel System Servicing.

The fuel system has two fuel cells that are interconnected for simultaneous flow and venting. (Refer to section IV for a complete description of the fuel system). A closed circuit fuel receiver is provided, and the regular gravity filler is equipped with a spring-loaded-to-close flapper valve in the filler neck. The CR fuel system may be filled either through the gravity filler or the closed circuit fuel receiver (fig. 2-21).

NOTE

Refuel with correct fuel (para 2-29 and tables 2-3 and 2-4) as soon after landing as possible to prevent moisture condensation and keep the aircraft as heavy as possible in case of winds.

a. Closed Circuit System Fueling. For refueling using the closed circuit system, proceed as follows:

(1) Remove the closed circuit fuel receiver cap located below the right cabin door sill.

(2) Refuel aircraft using equipment with compatible hose connections. The closed circuit fuel receiver opens only when there is sufficient delivered fuel pressure to unseat the internal fueling valve.

NOTE

The fuel cells will fill in approximately 1 minute, depending on delivery pressure, and the receiver will automatically shut off the fuel flow when the cells are full. Fuel sloshing, as the cells reach capacity, may cause momentary on-off cycling of the fuel delivery system.

(3) Reinstall filler cap. Be sure that the cap retention cable is coiled and positioned inside the receiver well so that no interference with the locking mechanism and sealing ring occurs when the cap is installed.

(4) On aircraft with closed circuit refueling provisions, two adjacent drain valves (left and right fuel cells) are located on the fuselage underside. The valves are spring-loaded in the closed position.

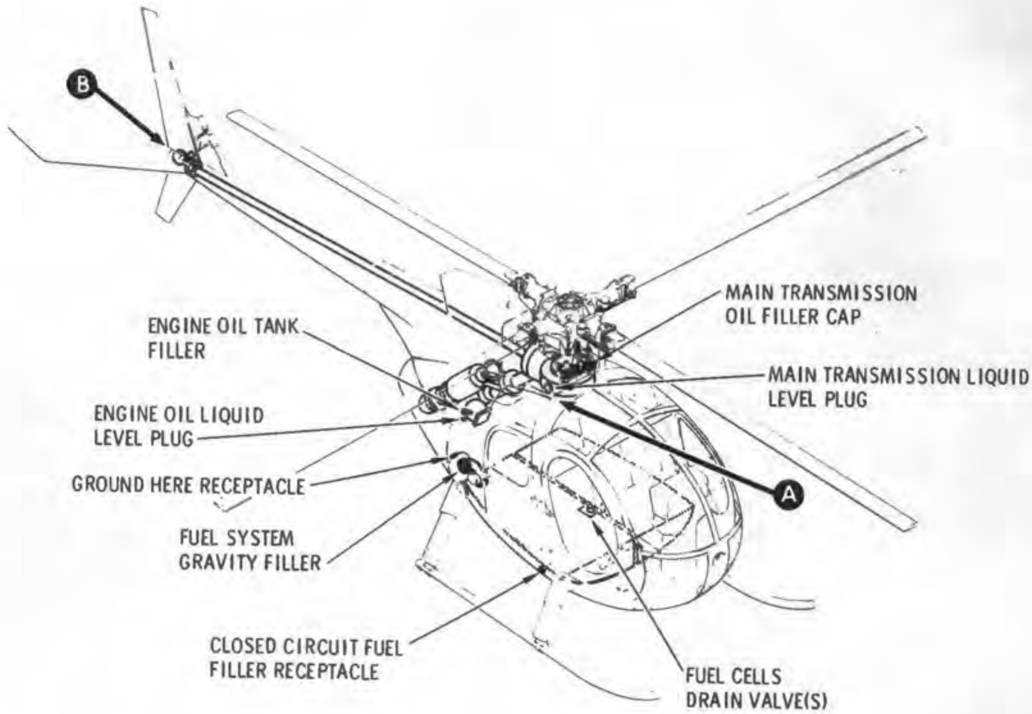
b. Gravity System Fueling. For refueling using the gravity system, proceed as follows:

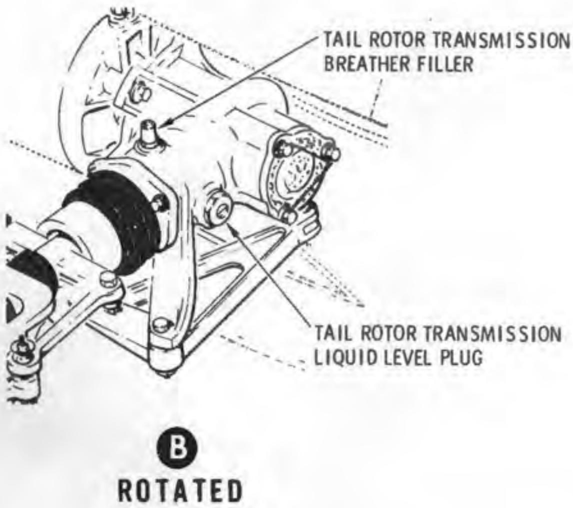
(1) Remove the gravity system filler cap, located aft of the right cabin door. Pull the filler cap attaching cable and hook it into a notched tab to hold open the flapper valve in the filler neck.

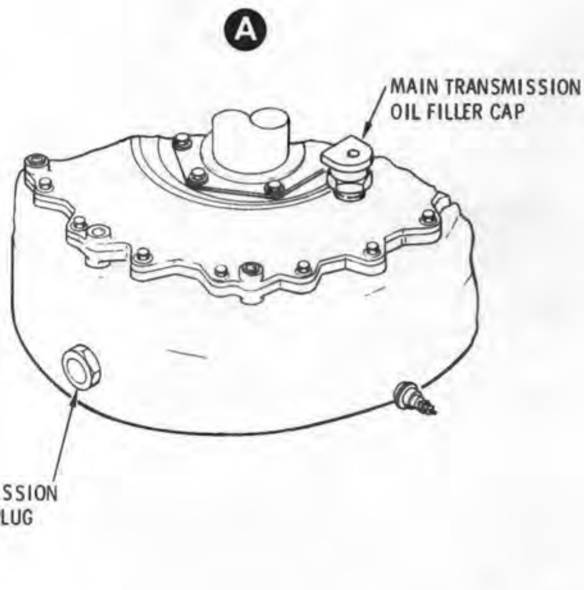
(2) Refuel aircraft.

(3) Reinstall filler cap.

(4) Drain valves are located on the fuselage underside and in the engine compartment. (Armored







10-012F

Figure 2-21. Servicing Diagram.

Table 2-4. Approved Fuels

Source	Primary or Standard Fuel	Alternate Fuel	
US Military Fuel	**JP-4 (MIL-T-5624)**	**JP-5 (MIL-T-5624)**	
Commercial Fuel (ASTM-D-1655)	*JET B*	*JET A*	*JET A-1* NATO F-34
American Oil Co.	American JP-4	American Type A	
Atlantic Richfield	Aerojet B	Aerojet A	Aerojet A-1
Richfield Div		Richfield A	Richfield A-1
B.P. Trading	B.P.A.T.G.		B.P.A.T.K.
Caltex Petroleum Corp.	Caltex Jet B		Caltex Jet A-1
Cities Service Co.		CITGO A	
Continental Oil Co.	Conoco JP-4	Conoco Jet-50	Conoco Jet-60
Gulf Oil	Gulf Jet B	Gulf Jet A	Gulf Jet A-1
EXXON Co, USA	EXXON Turbo Fuel B	EXXON A	EXXON A-1
Mobil Oil	Mobil Jet B	Mobil Jet A	Mobil Jet A-1
Phillips Petroleum	Philjet JP-4	Philjet A-50	
Shell Oil	Aeroshell JP-4	Aeroshell 640	Aeroshell 650
Sinclair		Superjet A	Superjet A-1
Standard Oil Co.		Jet A Kerosine	Jet A-1 Kerosine
Chevron	Chevron B	Chevron A-50	Chevron A-1
Texaco	Texaco Avjet B	Avjet A	Avjet A-1
Union Oil	Union JP-4	76 Turbine Fuel	
Foreign Fuel	*NATO F-40* (Wide cut type)	*NATO F-44* (High flash type)	
Belgium	BA-PF-2B		
Canada	3GP-22F	3-6P-24e	
Denmark	JP-4 MIL-T-5624		
France	Air 3407A		
Germany (West)	VTL-9130-006	UTL-9130-007/UTL 9130-010	
Greece	JP-4 MIL-T-5624		
Italy	AA-M-C-1421	AMC-143	
Netherlands	JP-4 MIL-T-5624	D. Eng RD 2493	
Norway	JP-4 MIL-T-5624		
Portugal	JP-4 MIL-T-5624		
Turkey	JP-4 MIL-T-5624		
United Kingdom (Britain)	D. Eng RD 2454	D. Eng RD 2498	

NOTE:

Anti-icing and Biocidal Additive for Commercial Turbine Engine Fuel–The fuel system icing inhibitor shall conform to MIL-I-27686. The additive provides anti-icing protection and also functions as a biocide to kill microbial growths in aircraft fuel systems. Icing inhibitor conforming to MIL-I-27686 shall be added to commercial fuel, not containing an icing inhibitor, during refueling operations, regardless of ambient temperatures. Refueling operations shall be accomplished in accordance with accepted commercial procedures. Commercial product "PRIST" conforms to MIL-I-27686.

aircraft have only the main fuel cell drain valves.) The valves are spring-loaded in the closed position.

NOTE

Settling time for AVGAS is 15 minutes per foot of tank depth and one hour per foot depth for jet (JP) fuels. Allow the fuel to settle for the prescribed period before any fuel samples are taken.

2-70.1 Rapid Refueling.

a. Before Rapid Refueling (Rotors turning).

Throttle — Idle.

WARNING

In case of aircraft fire, observe fire emergency procedures in Chapter 9. DO NOT attempt to fly the aircraft. RAPID hot refueling shall only be accomplished using closed circuit refueling system.

b. During Rapid refueling:

(1) Pilot will remain at the controls during refueling.

(2) A crew member, if available, should observe the refueling operation (performed by authorized refueling personnel) and stand fire guard as required.

(3) Passengers shall remain clear of the aircraft during the refueling operation.

(4) NO SMOKING during refueling operations.

(5) Refuel refer to paragraph 2-70.

c. After rapid refueling. The pilot shall be advised by the refueling crew that fuel cap(s) are secure and ground cables have been removed.

2-71. Engine Oil System Servicing.

The engine oil filler cap is located on the right side of the fuselage, just aft of the right cabin door (fig. 2-21). A liquid level sight plug for checking the oil level in the tank is visible through a transparent window near the filler. Replenish with correct oil (table 2-3) until the level reaches full (midpoint) on the sight plug. Make certain that the tank filler cap is securely tightened immediately after servicing.

2-72. Main Transmission Servicing.

The main transmission oil filler cap is located at the forward center on top of the main transmission (fig. 2-21). The main transmission liquid level sight plug is located on the right side of the main transmission, and is visible from just inside the right cabin door. Replenish with correct oil (table 2-3) until the oil level reaches the full mark on the plug. Check that spring-loaded filler cap is closed after servicing.

2-73. Tail Rotor Transmission Servicing.

The tail rotor transmission is serviced through the breather-filler (fig. 2-21) on the transmission. A liquid level sight plug is located on the rear face of the transmission, approximately vertical center. Replenish with correct oil (table 2-3) until the oil level reaches the full mark (midpoint) on the plug.

2-74. Canopy and Windshield Cleaning.

The transparent cabin enclosure and door panels should be carefully cleaned with clear water and a moist chamois or paper cleaning towel. Grease or oil spots should be removed with a paper cleaning towel moistened with kerosene or an approved plastic cleaning agent.

CAUTION

Do not use any form of volatile solvents; they may soften or destroy the plastic surface. Do not use dry cloths for plastic cleaning, they generate static electricity charges that attract abrasive particles and scratch the plastic surface.

2-75. Ground Handling.

Provisions for ground handling the OH-6A aircraft consist of a pair of ground handling wheels. The wheels may be stowed in the aircraft cargo area during ferry flights, or they may be removed and stored on the ground, depending upon anticipated needs. For ground movement of the aircraft, the ground handling wheels are installed on the skid runners near the aircraft center of gravity. Once the ground handling wheels are installed, the aircraft may be moved by hand, or towed using a vehicle.

2-76. Ground Handling Wheels.

For installation or removal of ground handling wheels, proceed as in step *a* or *b*, as applicable.

a. Ground Handling Wheels Installation. Perform the following steps to install the wheels at their ground handling position.

(1) Position ground handling wheel assembly over the skid tube fittings.

(2) With the ground handling wheels in the retracted position, align and engage the skid fittings.

(3) Install jack handle in the wheel assembly socket, install lock pin, and rotate handle downward to lower the wheels and raise the aircraft.

Figure 2-22 Deleted.

All data and figure on page 2-44 has been deleted.

WARNING

Hold downward pressure on jack handle until extend lock snaps into locked position.

(4) Check that the extend lock is engaged, release downward pressure and remove jack handle.

(5) Install second ground handling wheel assembly on the other skid tube.

WARNING

Do not fly the aircraft when ground handling wheels are installed.

b. Ground Handling Wheels Removal. Remove ground handling wheels as follows.

(1) Install jack handle in the wheel assembly socket, and install lock pin. Apply a downward pressure on jack handle and manually release the extend lock.

WARNING

Keep a firm grip on jack handle and keep all parts of body clear of jack handle path of movement.

(2) Apply an upward pressure; then rotate jack handle to raise the wheels and lower the aircraft.

(3) Remove ground handling wheel assembly from each skid fitting.

2-77. Moving the Aircraft.

Once the ground handling wheels are installed, the aircraft may be towed either manually or by a vehicle.

a. Manual Towing. If the aircraft is to be moved by hand, balance at the tailboom and push from the rear fuselage.

b. Vehicle Towing. If the aircraft is to be vehicle towed, proceed as in the following steps.

CAUTION

The aircraft must be towed at a slow speed, not exceeding 5 mph, except under extreme emergency conditions. Do not allow the front end of the skid tubes to drag on the ground. Avoid sudden stops and starts, and short turns which could cause the aircraft to turn over. Allow the inside wheel to rotate (not pivot) while aircraft is being towed. The proper minimum turning radius is approximately 20 feet.

(1) Lower the tailboom slightly.

(2) Position and secure a suitable tow bar at the front end fittings of the ground handling wheel assemblies.

2-78. Parking the Aircraft.

Aircraft parking shall be in accordance with local directives and the following procedures.

CAUTION

To prevent rotor damage from blade flapping, (drop stop pounding) as a result of air turbulence from other aircraft landing, taking off, or taxiing, or sudden wind gusts, rotor blades should be secured whenever the aircraft is parked. Take up slack to tethers but do not exert bending loads on blades.

a. Locate aircraft slightly more than rotor span from nearby objects, and on level surface if possible.

b. Remove ground handling wheels and allow aircraft to rest on skid runners.

c. Position main rotor blades at 45-degree angle to the fuselage centerline.

d. Install blade socks on all blades, and secure.

e. Install pitot tube cover.

f. Install exhaust stack covers (aircraft with upward exhaust stacks).

g. Install engine air inlet plugs.

h. If available at parking stand, attach static ground wire to GROUND HERE fitting on aft fuselage right side.

i. Ensure that all switches are off, and external power is disconnected.

j. Apply cyclic friction to lock the cyclic stick so that the friction control knob is positioned on the lateral stop guide at center of slot, and one-third from rear of longitudinal slot.

k. Securely latch all four cabin doors.

l. If turbulent weather conditions are expected, fill fuel tank to capacity, and moor aircraft as directed in paragraph 2-79.

2-79. Mooring the Aircraft.

The aircraft shall be securely moored during any extended inactive periods and whenever turbulent weather conditions are expected. Accomplish mooring in accordance with TM 55-1520-214-23.

Figure 2-23 Deleted.

All data and figure on page 2-46 has been deleted.

CHAPTER 3

AVIONICS

SECTION I — COMMUNICATIONS

3-1. General.

This chapter covers the avionics equipment configuration installed in Army OH-6A aircraft. It includes a brief description of the avionics equipment, its technical characteristics, capabilities, and locations. This chapter also contains complete operating instructions for all avionics equipment installed in the aircraft. Figures 3-1 and 3-2 show locations of all the associated instruments, control units and switches that are accessible to the pilot and copilot during flight. Antenna locations are shown in figure 2-1.

3-2. Electronic Equipment Configuration.

The OH-6A aircraft can be equipped with different avionics configurations. The basic avionics equipment for a configuration may vary according to geographic location (theater of operation); therefore, equipment having installation provisions may or may not be currently installed. All installed basic avionics equipment and the alternate basic equipment having wiring provisions, are covered in the following paragraphs. A list of common name assignments for the communication and navigation equipment covered in this chapter are listed in table 3-1. The aircraft series identification (para 1-13) is also indicated.

3-3. Power Supply for Avionics Equipment.

Power for the aircraft avionics equipment is supplied from the aircraft 28 vdc bus. Protective circuit breakers are provided for each avionics system. The automatic direction finder equipment operates on 115v, 400 Hz as power supplied by a static inverter (para 2-62).

3-4. Controls and Circuit Breaker Panels.

Controls and circuit breakers for the avionics equipment are located on the electrical control console and circuit breaker panels (fig. 3-1 and 3-2). Circuit breakers will automatically disconnect power on any system that is overloaded and must be reset by pushing the circuit breaker button inward.

3-5. Caution Lights.

Aircraft equipped with the transponder set are provided with an IFF caution light which illuminates when the aircraft is being interrogated. This light is located on the lower right portion of the instrument panel (fig. 3-2).

3-6. Microphones and Headset Jacks.

The pilots and copilots microphone and headset jacks are clipped to the forward side of the control tunnel between the pilots seats at about shoulder height. The passengers microphone and headset switch-jack is a type that may be clipped to the clothing. It is normally stowed in a small bracket on the upper right side of the control tunnel.

3-7. Microphone Switches.

All aircraft have the following microphone switches: one on the pilots and one on the copilots cyclic stick grip, one copilots foot switch on the floor at the left of the console for use when the copilots stick is not installed, and one switch-jack in the passenger's microphone/headset cord. On aircraft with an intercom control (C-6533/ARC) installed in the cabin, an additional passenger's foot switch cable assembly is located on the right side of the cabin floor. In this configuration the passenger has full transmit capability. On aircraft with a passengers intercom control, the copilot's intercom control (C-1611D/AIC) must be positioned at INT for passenger transmit operation on intercom.

3-8. Emergency Operation.

The uhf radio set is equipped with a guard receiver to provide for reception of emergency transmissions on a fixed frequency of 243.0 MHz. The vhf radio set is equipped with a guard receiver to provide for reception of emergency transmissions on a fixed frequency of 121.5 MHz. If the aircraft has an AN/ARC-115A vhf radio set installed, the function selector switch on the VHF AM COMM panel can be placed in the EMER position which automatically tunes the vhf main receiver and transmitter to the 121.5 MHz emergency frequency.

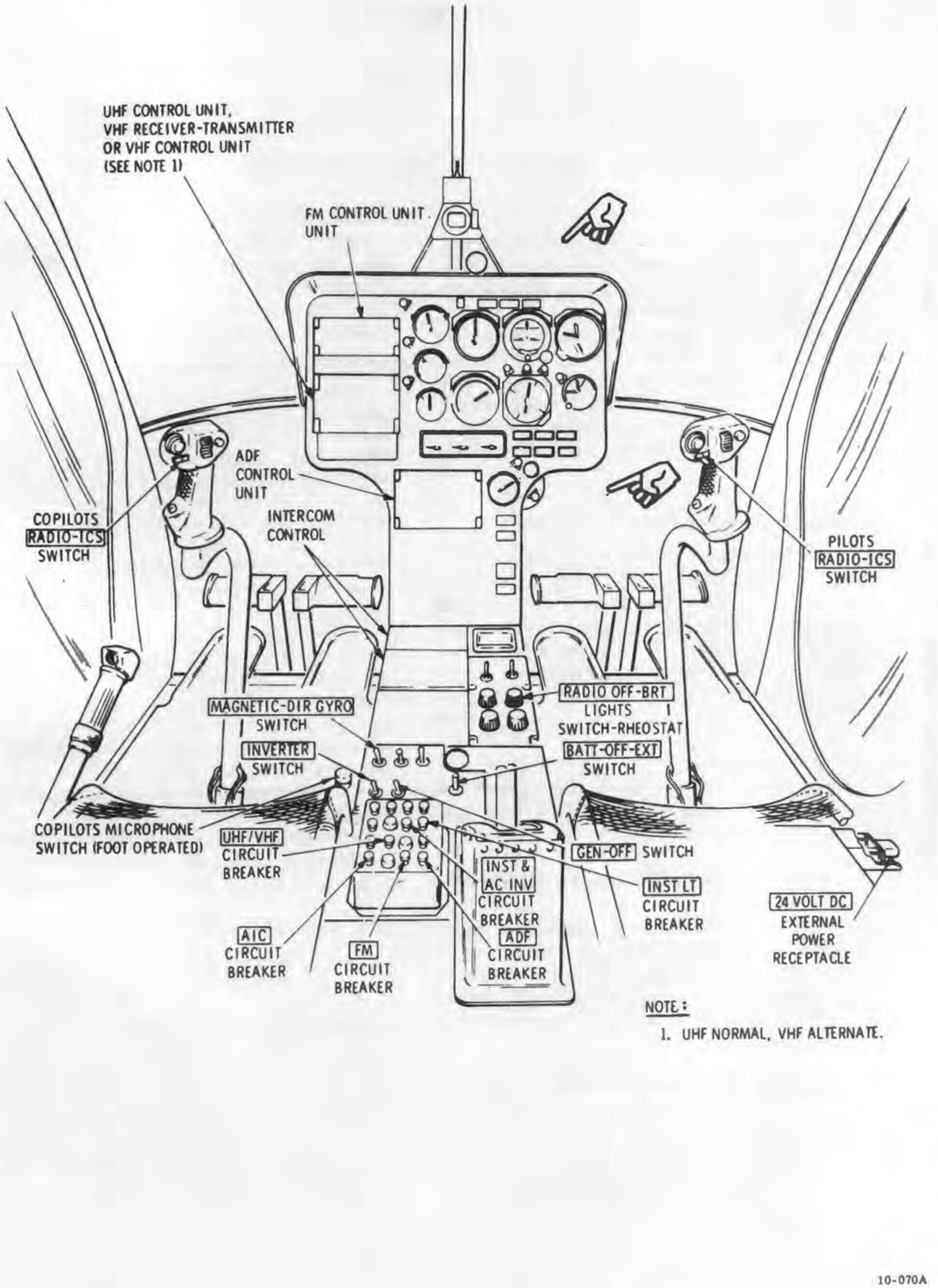


Figure 3-1. Avionics Equipment and controls, Series 1 and 2 Aircraft.

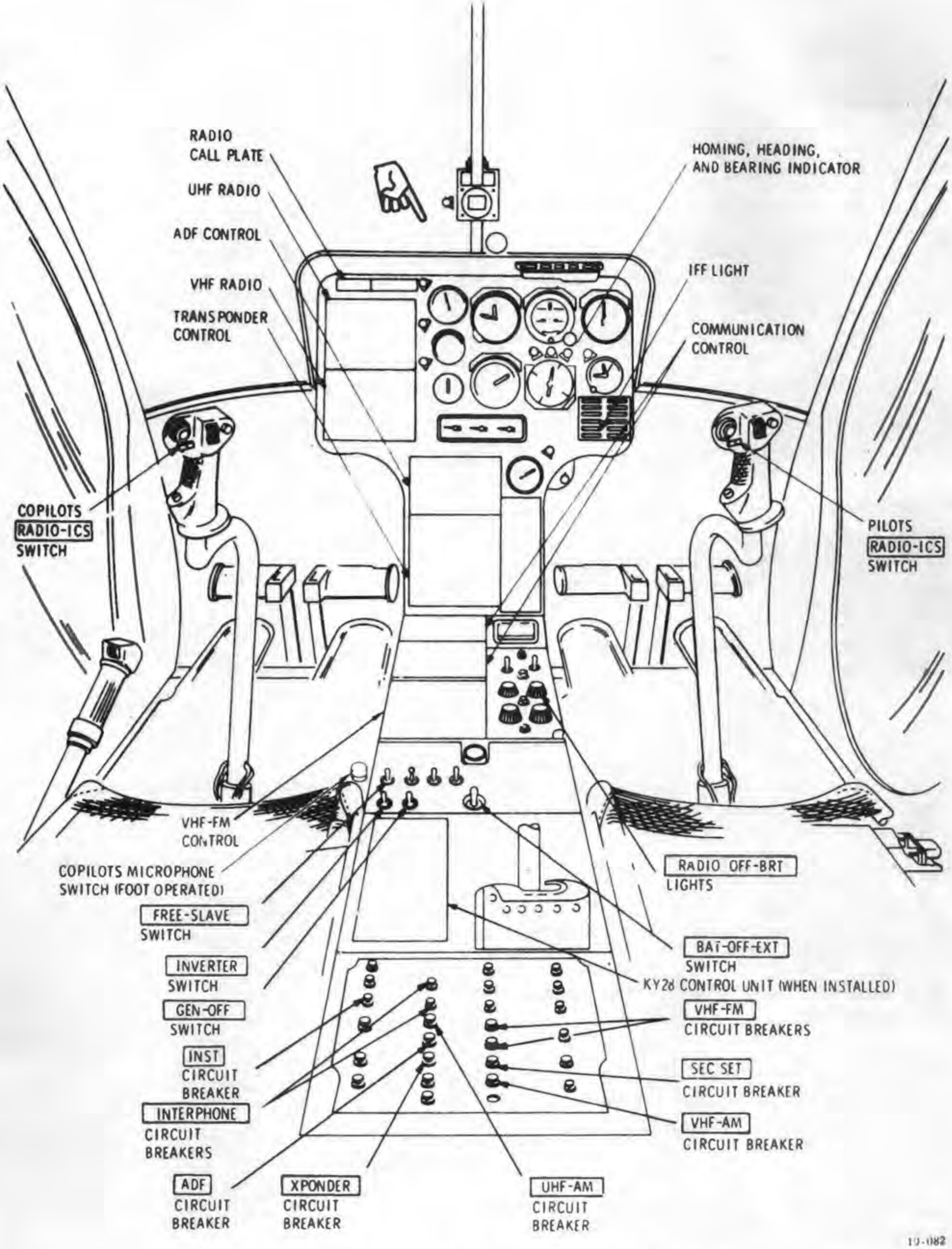


Figure 3-2. Avionics Equipment and Controls, Series 3 Aircraft.

Table 3-1. Nomenclature and Common Names

Nomenclature	Common names	Series
Radio Set AN/ARC-51BX	UHF radio set (AN/ARC-51 BX)	
Radio Set AN/ARC-116	UHF radio set (AN/ARC-116)	
Radio Set AN/ARC-115	VHF radio set (AN/ARC-115)	
Radio Set AN/ARC-111	VHF radio set (AN/ARC-111)	
Radio Set AN/ARC-54	FM radio set (AN/ARC-54)	
Radio Set AN/ARC-114	FM radio set (AN/ARC-114)	
Direction Finder Set AN/ARN-89	Direction finder set (AN/ARN-89)	
Direction Finder Set AN/ARN-83	Direction finder set (AN/ARN-83)	
Gyromagnetic Compass Set AN/ASN-43	Gyromagnetic compass set	
Heading–Radio Bearing Indicator ID-1351/A	Homing, heading, and bearing indicator	
Communication System Control C-6533/ARC	Intercom control (C-6533/ARC)	
Intercommunication Set Control C-1611D/AIC	Intercom control (C-1611D/AIC)	
Transponder Set AN/APX-72	Transponder set (AN/APX-72)	
Communications Security Set TSEC/KY-28	Communication security set (TSEC/KY-28)	
Computer KIT-1A/TSEC	Computer (KIT-1A/TSEC)	
Transponder Set (AN/APX-100)	**Transponder Set (AN/APX-100)**	

3-9. Description.

A description of communications equipment is given in paragraphs 3-10 through 3-53, **along with** technical characteristics, controls and functions, and operating procedures.

3-10. UHF Radio Set (AN/ARC-51BX or AN/ARC-116).

The uhf radio set (fig. 3-3 and 3-4) provides two-way voice communication within the military tactical uhf band on any of 3,500 selected frequencies. A guard receiver is incorporated within the uhf radio set for monitoring the 243 MHz emergency uhf channel. The AN/ARC-51BX also provides 20 preset channels not found on the AN/ARC-116.

3-11. UHF Radio Set AN/ARC-51BX.

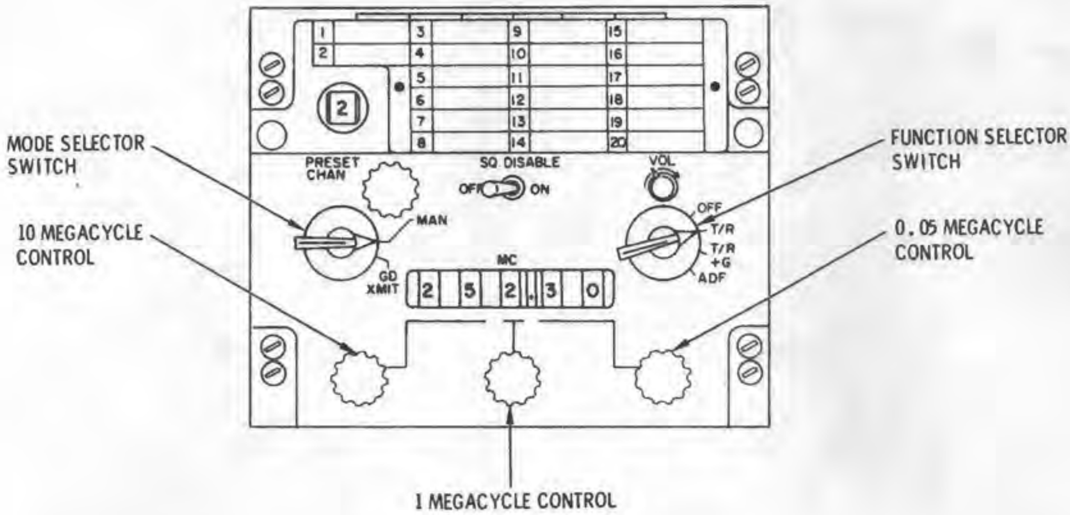
Technical characteristics, controls and function, and operating procedures for the uhf radio set AN/ARC-51BX are given in paragraphs 3-12 through 3-14.

3-12. Technical Characteristics, UHF Radio Set AN/ARC-51BX.

Channel (C-1611D/AIC)	2
Frequency range	225.00 to 399.95 MHz
Type of emission	Amplitude modulation
Type of transmission	Voice
Range	Line of sight

3-13. Controls and Function (fig. 3-3), UHF Radio Set AN/ARC-51BX.

CONTROLS	FUNCTION
Function select switch	Applies power to the uhf radio set and selects type of operation. In the OFF position power is removed from the uhf radio set. In the T/R position, power is applied to the uhf radio set, which permits transmission and reception with guard receiver inoperative. In the T/R-G position, power is applied to the uhf radio set, which permits transmission and reception with guard receiver operative. The ADF function (switch position) is not used in the aircraft.
VOL control	Controls the level of audio applied to the headset.
SQ DISABLE switch	In the ON position, the squelch is disabled. In the OFF position, the squelch is operative.
Mode selector	Determines the manner in which frequencies are selected. In the PRESET CHAN position, it permits the selection of one of 20 preset channel controls. In the MAN position it permits frequency selection by means of the megacycle controls. In the GD XMIT position, the receiver/transmitter automatically tunes to the guard channel frequency.
PRESET CHAN control	Controls the selection of any one of the 20 preset channels.
10-megacycle control	Selects the 10-megacycle digits (first two numbers) of the desired frequency.
1-megacycle control	Selects the 1-megacycle digit (third number) of the desired frequency.
0.05-megacycle control	Selects the 0.05-megacycle digits (fourth and fifth numbers) of the desired frequency.



10-071

Figure 3-3. Uhf Control Unit AN/ARC-51BX.

3-14. Operating Procedures, UHF Radio Set AN/ARC-51BX.

a. To turn set on and receive:

(1) UHF/VHF (fig. 3-1) circuit breaker – ON (pushed in)

(2) AIC (fig. 3-1) circuit breaker – ON (pushed in)

(3) Function selector switch (fig. 3-3) – T/R – G position

(4) Mode selector (fig. 3-3) – PRESET CHAN position

(5) RECEIVERS 2 switch (fig. 3-9) – ON position

(6) PRESET CHAN switch (fig. 3-3) – adjust for desired channel

(7) SQ DISABLE switch – ON position

(8) VOL control (fig. 3-3) – adjust for comfortable level

b. To transmit:

(1) Transmit intercom selector switch (fig. 3-11) – No. 2 position

(2) Microphone switch (fig. 3-1) – depress and speak into microphone

c. To turn set off:

(1) Function selector switch (fig. 3-3) – OFF position

(2) RECEIVERS 2 switch (fig. 3-11) – OFF position

(3) Transmit intercom selector switch (fig. 3-11) – INT position

3-15. UHF Radio Set AN/ARC-116.

Technical characteristics, controls and function, and operating procedures for the uhf radio set AN/ARC-116 are given in paragraphs 3-16 through 3-18.

3-16. Technical Characteristics, UHF Radio Set AN/ARC-116.

Channel (C-6533/ARC)	2
Frequency range	225.0 to 399.9 MHz
Type of emission	Amplitude modulation
Type of transmission	Voice
Range	Line of sight

NOTE

As determined by radio set serial number the following channels of the AN/ARC-116 Radio Set are degraded and unusable as communications frequencies:

Serial Number 1 thru 136

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

Serial Number 137 and subsequent

1. 274.65 MHz
2. 300.00
3. 366.20

3-17. Controls and Function (fig. 3-4), UHF Radio Set AN/ARC-116.

CONTROLS	FUNCTION
MEGACYCLES indicator	Indicates frequency to which main receiver/transmitter is tuned.
100- and 10-megacycles control (rotary)	Tunes the main receiver/transmitter in 100-megacycle and 10-megacycle steps as indicated by the first two digits of the MEGACYCLES indicator. (Guard receiver is fixed tuned.)
1-megacycle control (rotary)	Tunes the main receiver/transmitter in 1-megacycle steps as indicated by the third digit of the MEGACYCLES indicator. (Guard receiver is fixed tuned.)
Kilocycle control (rotary)	Tunes the main receiver/transmitter in 100-kilocycle and 50-kilocycle steps as indicated by the last two digits of the MEGACYCLES indicator. (Guard receiver is fixed tuned.)
RCVR TEST pushbutton	When pressed, injects a noise signal into the main receiver to provide an audible indication of proper receiver performance.
Function selector switch (five-position rotary)	Determines the operating mode of the radio set as follows:

Switch Position	Function
OFF	Removes power from uhf radio set; uhf radio set is inoperative.
T/R	Provides for uhf radio set operation as a transceiver on main channels indicated on MEGACYCLES indicator. (Guard receiver is inoperative.)
T/R GUARD	Same as T/R above plus reception of guard channel.
D/F	Not used on this aircraft.
RETRAN	Not used on this aircraft.

CONTROLS	FUNCTION
AUDIO control	Adjusts the uhf radio set audio output level.

3-18. Operating Procedures, UHF Radio Set AN/ARC-116.

a. To turn set on and receive:

(1) UHF-AM (fig. 3-2) circuit breaker – ON (pushed in)

(2) INTERPHONE (fig. 3-2) circuit breaker – ON (pushed in)

(3) RECEIVERS 2 switch (fig. **3-12) — ON position**

(4) VOL control (fig. **3-12) — adjust to comfortable level**

(5) Function selector switch (fig. 3-4) – T/R GUARD position

b. To transmit:

(1) Transmit intercom selector switch (fig. **3-12)** – No. 2 position

(2) Microphone switch (fig. 3-2) – depress and speak into microphone

c. To turn set off:

(1) Function selector switch (fig. 3-4) – OFF position

(2) RECEIVERS 2 switch (fig. **3-12) — OFF** position

(3) Transmit intercom selector switch (fig. **3-12)** – ICS position

3-19. VHF Radio Set (AN/ARC-111, AN/ARC-115, or AN/ARC-115A).

The vhf radio set (fig. 3-5 and 3-6) provides two-way voice communication within the military tactical vhf band. The AN/ARC-111 provides communication on any of 360 channels in the 118 through 135.95 **MHz band. The AN/ARC-115 or AN/ARC-115A provides communication on 1,360 channels in the 116 through 149.975 MHz band and monitors the 121.5 MHz emergency vhf channel.**

3-20. VHF Radio Set AN/ARC-111.

Technical characteristics, controls and function, and operating procedures for the vhf radio set AN/ARC-111 are given in paragraphs 3-21 through 3-23.

3-21. Technical Characteristics, VHF Radio Set AN/ARC-111.

Channel (C-1611D/AIC)	3
Frequency range	118.00 to 135.95 MHz
Type of emission	Amplitude modulation
Type of transmission	Voice
Range	Line of sight up to approximately 85 miles

3-22. Controls and Function (fig. 3-5), VHF Radio Set AN/ARC-111.

CONTROLS	FUNCTION
OFF-PWR switch	Energizes the vhf radio set (AN/ARC-111) in the PWR position; removes power in the OFF position.
VOLUME control	Controls the gain of the receiver.

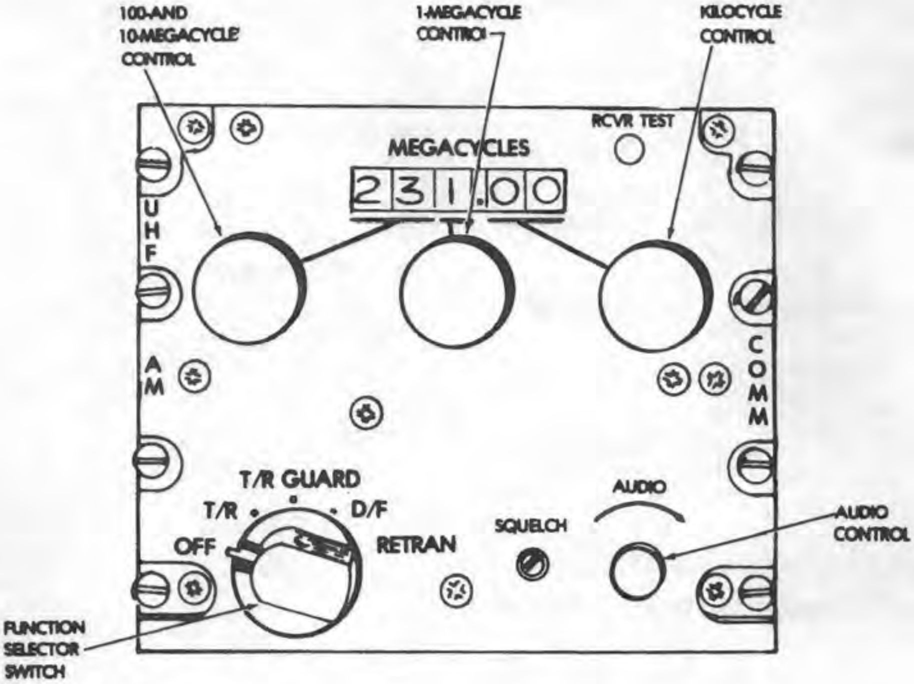


Figure 3-4. Radio Set AN/ARC-116 Front Panel.

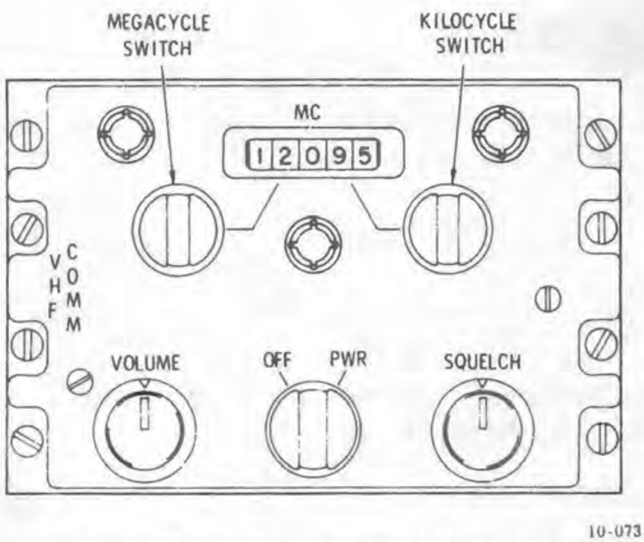


Figure 3-5. Vhf Radio Set AN/ARC-111.

CONTROLS (CONT)	FUNCTION (CONT)
SQUELCH control.	Varies level at which the carrier signal or noise opens the squelch circuits.
Megacycle switch	Changes frequency in 1-megacycle steps between 118 and 135 megacycles.
Kilocycle switch	Changes frequency in 50-kilocycle steps from 0.00 to 0.95 megacycles.

3-23. Operating Procedures, VHF Radio Set AN/ARC-111.

a. To turn set on and receive:

(1) UHF/VHF (fig. 3-1) circuit breaker – ON (pushed in)

(2) AIC (fig. 3-1) circuit breaker – ON (pushed in)

(3) OFF-PWR switch (fig. 3-5) – PWR position

(4) Frequency selectors (fig. 3-5). – adjust to desired frequency

(5) VOL control (fig. 3-11) — adjust to comfortable level

(6) VOLUME control (fig. 3-5) — turn to comfortable level

(7) RECEIVERS 3 switch (fig. 3-11) — ON position

(8) SQUELCH control (fig. 3-5) — as desired

b. To transmit:

(1) Frequency selectors (fig. 3-5) — adjust to desired frequency

(2) Transmit intercom selector switch (fig. 3-11) — INT position

(3) Microphone switch (fig. 3-1) — Depress and speak into microphone

c. To turn set off:

(1) OFF-PWR switch (fig. 3-5) — OFF position

(2) RECEIVERS 3 switch (fig. 3-11) — OFF position

(3) Transmit intercom switch (fig. 3-11) — INT position

3-24. VHF Radio Set AN/ARC-115 or AN/ARC-115A.

Technical characteristics, controls and function, and operating procedures for the vhf radio set AN/ARC-115 or AN/ARC115A are given in paragraphs 3-25 through 3-27.

3-25. Technical Characteristics, VHF Radio Set AN/ARC 115 or AN/ARC-115A.

Channel (C-6533/ARC).	3
Frequency range	116.000 to 149.975 MHz
Type of emission	Amplitude modulation
Type of transmission	Voice
Range	Line of sight up to approximately 85 miles

3-26. Controls and Functions (fig. 3-6 and 3-6.1), VHF Radio Set AN/ARC-115 or AN/ARC-115A.

CONTROLS	FUNCTION
MEGACYCLES indicator	Indicates frequency to which vhf radio set is tuned.
Megacycle control (rotary)	Tunes the main receiver/transmitter in 100-megacycle, 10-megacycle, and 1-megacycle, steps as indicated by the first three digits of the MEGACYCLES indicator. (Guard receiver is fixed-tuned.)
Kilocycle control (rotary)	Tunes the main receiver/transmitter in 100-kilocycle and 25-kilocycle steps as indicated by the last three digits of the MEGACYCLES indicator. (Guard receiver is fixed-tuned.)

CONTROLS (CONT)	FUNCTION (CONT)	
RCVR TEST pushbutton	When pressed, injects a noise signal into the main receiver to provide an audible indication of proper receiver performance.	
Function selector switch (five-position AN/ARC-115 or six-position AN/ARC-115A rotary)	Determines the operating mode of the radio set as follows:	
	Switch Position	Function
	OFF	Removes power from vhf radio set; set is inoperative.
	T/R	Provides for vhf radio set operation as a transceiver on main channels indicated on MEGACYCLES indicator. (Guard receiver is inoperative.)
	T/R GUARD	Same as T/R above plus reception of guard channel.
	D/F	Not used on this aircraft.
	RETRAN	Not used on this aircraft.
	EMER	**On the AN/ARC-115A only, disables the multichannel received and enables transmit and receive on the guard (EMER) frequency.**
AUDIO control	Adjusts the vhf radio set audio output level.	
SQUELCH switch	**Enables and disables main receiver squelch.**	

3-27. Operating Procedures, VHF Radio Set AN/ARC-115 or AN/ARC-115A.

a. To turn set on and receive:

(1) UHF/VHF (fig. 3-2) circuit breaker — ON (pushed in)

(2) INTERPHONE (fig. 3-2) circuit breaker — ON (pushed in)

(3) Function selector switch (fig. 3-6) — T/R GUARD position

(4) Frequency selectors (fig. 3-6) — adjust to desired frequency

(5) VOL control (fig. 3-12) — **adjust to comfortable level**

(6) AUDIO control (fig. 3-7) – turn to comfortable level

(7) RECEIVERS 3 switch (fig. 3-12) — **ON position**

(8) SQUELCH switch for AN/ARC-115A (fig. 3-6.1) as desired.

b. To transmit:

(1) Frequency selectors (fig. 3-6) – adjust to desired frequency

(2) Transmit intercom selector switch (fig. 3-12) – ICS position

(3) Microphone switch (fig. 3-2) – depress and speak into microphone

c. To turn set off:

(1) Function selector switch (fig. 3-6) – OFF position

(2) RECEIVERS 3 switch (fig. 3-10) – OFF position

(3) Selector switch (fig. 3-10) – ICS position

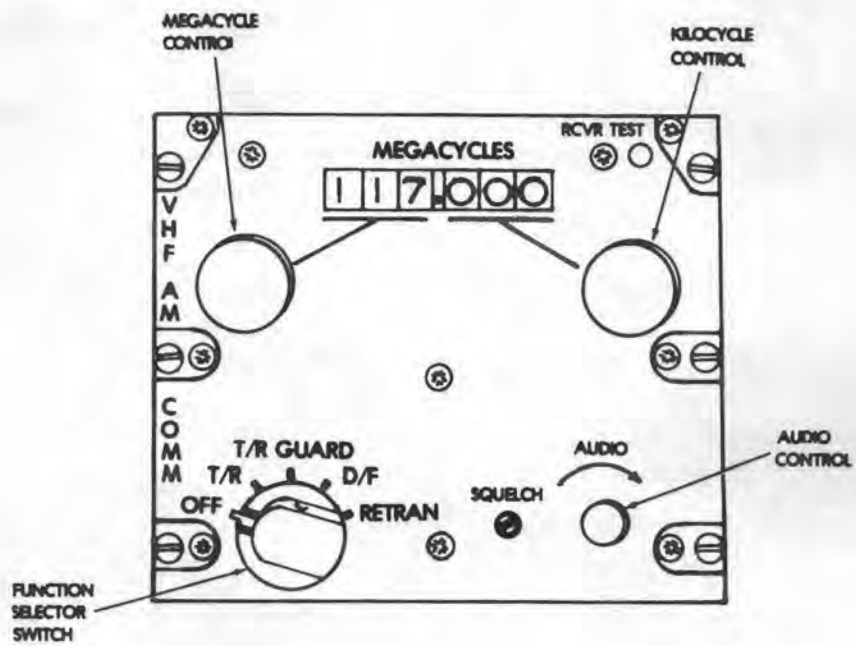


Figure 3-6. Vhf Radio Set AN/ARC-115 Front Panel.

3-28. UHF/VHF Antenna.

The uhf/vhf antenna, a part of the aft section of the engine air inlet fairing (fig. 2-1), is connected to a uhf/vhf matching unit which allows transmission or reception of either the installed uhf or vhf radio set over a common coaxial lead-in cable.

3-29. FM Radio Set (AN/ARC-54 or AN/ARC-114 or AN/ARC-114A)

The fm radio set (fig. 3-7 and 3-8) provides two-way voice communication within the military tactical fm band (vhf). A homing capability is available when used with the ID-1351/A (para 3-62). The AN/ARC-54 provides communication on any of 800 channels. **The AN/ARC-114 or AN/ARC-114A provides communication on any of 920 channels and monitoring of the 40.5 MHz emergency fm channel. A second fm radio set (AN/ARC-114 or AN/ARC-114A) may be installed which provides a retransmission capability by the first set via the second set to a distant station.**

3-30. FM Radio Set AN/ARC-54.

Technical characteristics, controls and function, and operating procedures for the fm radio set AN/ARC-54 are given in paragraphs 3-31 through 3-33.

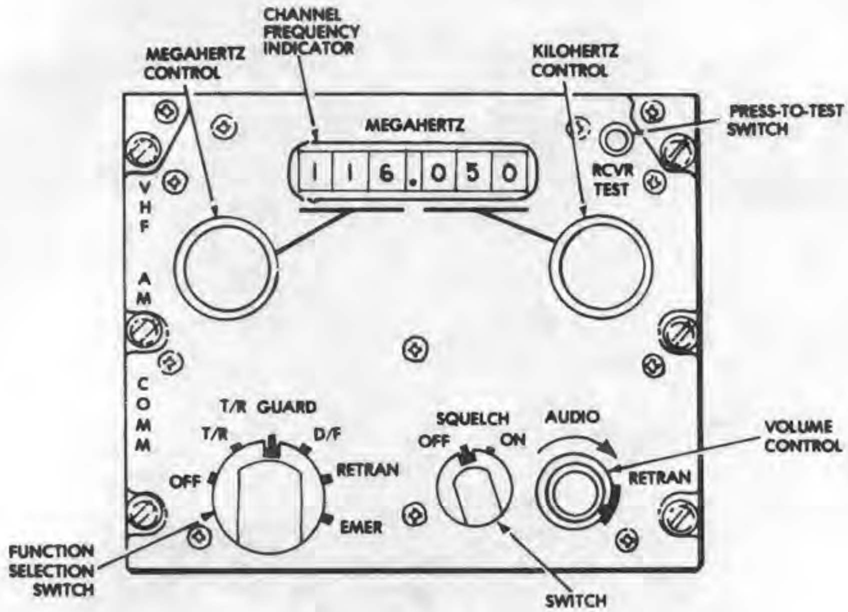


Figure 3-7. VHF Radio Set AN/ARC-115A Front Panel

3-31. Technical Characteristics, FM Radio Set AN/ARC-54.

Channel (C-1611D/AIC)	1
Frequency range	30.00 to 69.95 MHz
Type of emission	Frequency modulation
Type of transmission	Voice
Range	Line of sight up to 80 miles

3-32. Controls and Function (fig. 3-7), FM Radio Set AN/ARC-54.

CONTROLS	FUNCTION
Mode Control	The mode control (a four-position rotary switch) applies power to the fm radio set and selects the desired mode of operation. In the OFF position power is turned off. In the PTT (push-to-talk) position, power is applied to the fm radio set which operates in the normal communication mode. (Aircraft transmit switch must be depressed to transmit.) The RETRAN (retransmit) position is not utilized. In the HOME position power is applied to the homing circuits in the fm radio set which supply signals to activate the homing, heading, and bearing indicator (ID-1351/A) for operation as a homing facility.
VOL control	The volume control is used to adjust the audio output level of the fm radio set.
SQUELCH control	The SQUELCH control (a three-position rotary switch) is used to select the desired squelch mode. In the DIS (disable) position the squelch circuits are disabled. In the CARR (carrier) position the squelch circuits operate normally. In the TONE position squelch operation is disabled only on selected signals (signals containing a 150 Hz tone modulation).
Whole-megacycle frequency control	Selects the whole-megacycle digits of the desired frequency.
Decimal-megacycle frequency control	Selects the decimal-megacycle digits of the desired frequency.

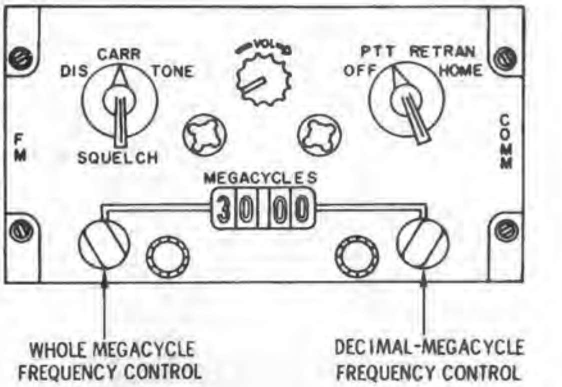


Figure 3-8. Fm Control Unit AN/ARC-54.

3-33. Operating Procedures, FM Radio Set AN/ARC-54.

a. To turn set on and receive:

(1) FM (fig. 3-1) circuit breaker – ON (pushed in)

(2) AIC (fig. 3-1) circuit breaker – ON (pushed in)

(3) Mode control (fig. 3-7) – PTT position

(4) Frequency selectors (fig. 3-7) – adjust to desired frequency

(5) VOL control (fig. 3-9) – adjust to comfortable level

(6) VOL control (fig. 3-7) – ON, turn to comfortable level

(7) RECEIVERS 1 switch (fig. 3-9) – ON position

(8) SQUELCH control (fig. 3-7) – as desired

b. To transmit:

(1) Frequency selectors (fig. 3-7) – adjust to desired frequency

(2) Transmit intercom selector switch (fig. 3-9) – No. 1 position

(3) Microphone switch (fig. 3-1) – depress and speak into microphone

c. To retransmit with second fm set installed:

(1) Function selector switches, No. 1 and No. 2 fm sets – RETRAN

(2) Frequency selector, No. 1 fm – select desired frequency

(3) Frequency selector, No. 2 fm – select desired frequency different from No. 1 fm

NOTE

Transmissions received on either fm set are automatically retransmitted on the other fm set. Transmissions from the aircraft on either fm set are retransmitted on the other fm set.

d. To turn set off:

(1) Mode control (fig. 3-7) – OFF position

(2) RECEIVERS 1 switch (fig. 3-9) – OFF position

(3) Transmit intercom selector switch (fig. 3-9) – INT position

3-34. FM Radio Set AN/ARC-114 or AN/ARC-114A.

Technical characteristics, controls and function, and operating procedures for the fm radio set AN/ARC-114 or AN/ARC-114A are given in paragraphs 3-35 through 3-37.

3-35. Technical Characteristics, FM Radio Set AN/ARC-114 or AN/ARC-114A.

Channel (C-6533/ARC).	1
Frequency range	30.00 to 75.95 MHz
Type of emission	Frequency modulation
Type of transmission	Voice
Range	Line of sight to 80 miles

3-36. Controls and Function (fig. 3-9 and 3-10), FM Radio Set AN/ARC-114 or AN/ARC-114A.

NOTE

If a second fm radio set is installed in the aircraft, the controls and their functions are the same as the No. 1 set unless otherwise indicated below.

CONTROLS	FUNCTION
Megacycle control	Tunes the main receiver/transmitter in 10-megacycle and 1-megacycle steps as indicated by the first two digits of the MEGACYCLES indicator.
Kilocycle control	Tunes the main receiver/transmitter in 100-kilocycle and 50-kilocycle steps as indicated by the last two digits of the MEGACYCLES indicator.

CONTROLS (CONT)	FUNCTION (CONT)
Function selector Switch	Determines the operating mode of the fm radio set as follows: Switch Position — Function OFF — Removes power from fm radio set; fm radio set is inoperative. T/R — Provides for fm radio set operation as a transceiver on main channels indicated on MEGACYCLES indicator. (Guard receiver is inoperative.) T/R GUARD — Same as T/R above plus reception of guard channel. HOMING — Provides power to the homing circuits in the fm radio set which supply signals to activate the homing, heading and bearing indicator (ID-1351/A) for operation as a homing facility. If a second fm set is installed, its HOMING mode is inoperative. May also be operated as a transceiver on main channels indicated on MEGACYCLES indicator. RETRAN — Provides for retransmit operation via a second installed fm radio set. For retransmission operation both fm radio sets must be in RETRAN position. May also be operated as a transceiver on main channels indicated on MEGACYCLES indicator.
AUDIO control	Adjusts the fm radio set audio output level.
SQUELCH switch	**For the AN/ARC-114A only, enables or disables receiver squelch as follows:** **Switch Position — Function** **NOISE — Squelch operates on preset carrier/noise threshold.** **OFF — Squelch disabled** **TONE/X — Tone or climax controlled squelch.**

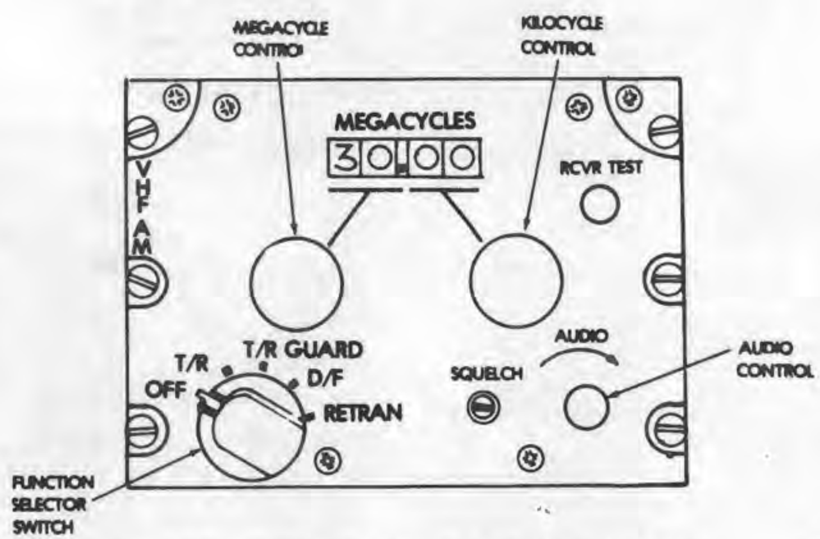


Figure 3-9. Fm Radio Set AN/ARC-114 Front Panel.

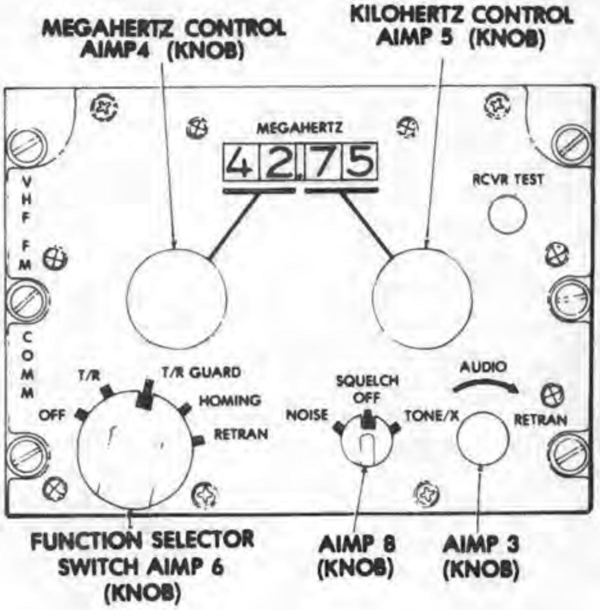


Figure 3-10. FM Radio Set AN/ARC - 114A Front Panel

3-37. Operating Procedures, FM Radio Set AN/ARC-114 or AN/ARC-114A.

a. To turn set on and receive:

(1) VHF-FM (fig. 3-2) circuit breaker – ON (pushed in)

(2) INTERPHONE (fig. 3-2) circuit breaker – ON (pushed in)

(3) Function selector switch (fig. 3-9) – T/R GUARD

(4) Frequency selectors (fig. 3-9) – adjust to desired frequency

(5) VOL control (fig. 3-12) – adjust to comfortable level

(6) AUDIO control (fig. 3-9) – ON, turn to comfortable level

(7) RECEIVERS 1 switch (fig. 3-12) – ON position

(8) SQUELCH switch for AN/ARC-114A (fig. 3-10) as desired.

b. To transmit:

(1) Frequency selectors (fig. 3-9) – adjust to desired frequency

(2) Selector switch (fig. 3-12) – No. 1 position

(3) Microphone switch (fig. 3-2) – depress and speak into microphone

c. To retransmit with second fm set installed:

(1) Function selector switches No. 1 and No. 2 fm sets – RETRAN

(2) Frequency selector, No. 1 fm – select desired frequency

(3) Frequency selector, No. 2 fm – select desired frequency different from No. 1 fm

NOTE

Transmissions received on either fm set are automatically retransmitted on the other fm set. Transmissions from the aircraft on either fm set are retransmitted on the other fm set.

d. To turn set off:

(1) Function selector switch (fig. 3-9) – OFF position

(2) RECEIVERS 1 switch (fig. 3-12) – OFF position

(3) Selector switch (fig. 3-12) – ICS position

3-38. FM Antennas.

The primary (No. 1) fm radio set antennas (fig. 2-1) are located in the cockpit. The No. 1 communications antenna is an integral part of the canopy center structure; the fm homing antenna is a foil-type antenna cemented to the inside of the canopy. The secondary (No. 2) fm radio set installed in some aircraft has a communications whip antenna located on the underside of the tailboom. The No. 2 fm set does not have a homing antenna.

3-39. Intercommunication System (C-1611D/AIC or C-6533/ARC).

The intercom control (C-1611D/AIC or C-6533/ARC) (fig. 3-11 and 3-12) provides an intercommunication capability between two or three crewmember stations, each having a communication control. It also provides a means by which the communication control operator may select and control associated radio equipment for voice transmission and reception. Additional audio circuits may also be constantly monitored. The intercom controls also provide for selection of radio and navigation systems as well as intercommunication. Controls for multiple and parallel operation are provided. They consist of the pilot and copilot intercom controls, pilot and copilot microphone switches, cabin microphone switch, a passenger foot switch, and the copilot foot switch. The pilot and copilot intercom controls are identical and are operated as described in paragraphs 3-41 and 3-44. The pilot and copilot microphone switches are located on the cyclic stick grips and are used for radio transmission or intercom (except hot mike operation). One cabin microphone switch is contained in the cabin headset switch-jack, and a second is located in the passenger foot switch. The switch-jack audio and mike circuits parallel the copilot audio and mike circuits. On series 3 aircraft, a third intercom control (C-6533/ARC) is installed in the cabin for passenger use. The copilot foot switch is provided for use when the copilot cyclic stick is stowed.

3-40. Intercom Control C-1611D/AIC.

Controls and function, and operating procedures for the intercom control C-1611D/AIC are given in paragraphs 3-41 and 3-42.

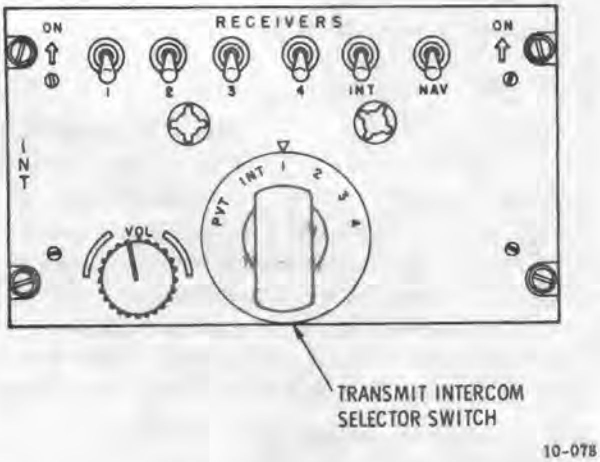


Figure 3-11. Intercom Control C-1611D/AIC.

3-41. Controls and Function (fig. 3-11), Intercom Control C-1611D/AIC.

CONTROLS	FUNCTION
Transmit-intercom selector-switch	The PVT position provides hot mike operation. In the INT position the headset microphone is connected to the intercom system for voice communications. In position No. 1 the headset-microphone is connected to the fm radio set for voice communications and intercom. In position No. 2 the headset microphone is connected to the uhf radio set for voice communication and intercom. In position No. 3 the headset-microphone is connected to the vhf radio set for voice communications and intercom. The No. 4 position is not used.
VOL control	Controls the audio level of the intercom and radio receivers.
RECEIVER 1 switch	In the ON position (forward) the fm radio set output is connected to the transmit-intercom selector switch.
RECEIVER 2 switch	In the ON position (forward) the uhf radio set output is connected to the transmit-intercom selector switch.
RECEIVER 3 switch	In the ON position (forward) the vhf radio set (AN/ARC-111 or AN/ARC-115) output is connected to the transmit-intercom selector switch.
RECEIVER 4 switch	Not used.
RECEIVER INT switch	In the ON position (forward) the intercom system is connected to the transmit-intercom selector switch.
RECEIVER NAV switch	In the ON position (forward) the direction finder set (AN/ARN-89 or AN/ARN-83) output is connected to the headset-microphone.

3-42. Operating Procedures, Intercom Control C-1611D/AIC.

a. To turn set on and receive:

(1) AIC circuit breaker (fig. 3-1) — ON (pushed in)

(2) RECEIVERS INT switch (fig. 3-11) — ON

(3) VOL control (fig. 3-11) — adjust to comfortable level

b. To transmit: Depress microphone switch (fig. 3-1) and speak into microphone

c. To turn set off: Place RECEIVER INT switch (fig. 3-11) to OFF.

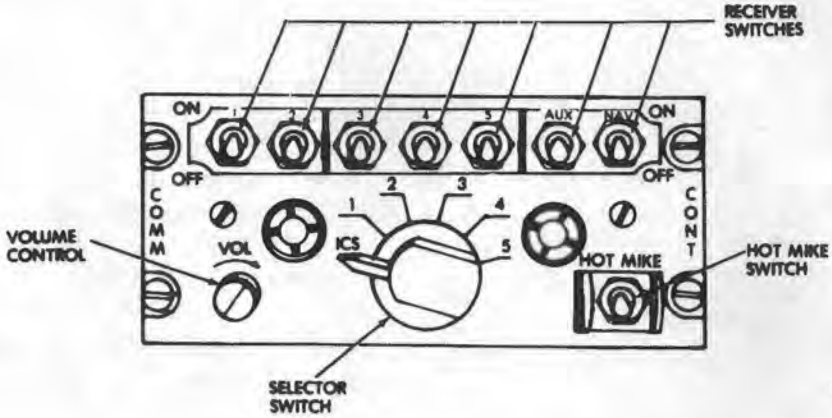


Figure 3-12. Communications Control Unit C-6533/ARC.

3-43. Intercom Control C-6533/ARC.

Controls and function, and operating procedures for the intercom control C-6533/ARC are given in paragraphs 3-44 and 3-45.

3-44. Controls and Function (fig. 3-12), Intercom Control C-6533/ARC.

CONTROLS	FUNCTION
Receiver Toggle Switches:	In ON Position:
Switch 1	Connects receiver 1 (fm No. 1) audio input line to headset.
Switch 2	Connects receiver 2 (uhf) audio input line to headset.
Switch 3	Connects receiver 3 (vhf) audio input line to headset.
Switch 4	No connection.
Switch 5	Connects receiver 5 (fm No. 2) audio input line to headset.
AUX receiver switch	No connection.
NAV receiver switch	Connects navigation receiver (adf) audio input line to headset.
VOL control	Adjusts headset volume level. Provides talk facilities when the external talk switch is operated.

CONTROLS (CONT)	FUNCTION (CONT)	
Selector switch (six-position rotary):	Switch Position	Function
	ICS	Enables interphone operation when the external push-to-talk intercom switch is operated.
	1	Enables transmitter 1 (fm No. 1) operation when RADIO push-to-talk switch is operated.
	2	Enables transmitter 2 (uhf) operation when RADIO push-to-talk switch is operated.
	3	Enables transmitter 3 (vhf) operation when RADIO push-to-talk switch is operated.
	4	No connection.
	5	Enables transmitter 5 (fm No. 2) operation when RADIO push-to-talk switch is operated.
HOT MIKE toggle switch	In HOT MIKE position permits hand-free intercommunication on the interphone line.	

3-45. Operating Procedures, Intercom Control C-6533/ARC.

a. To turn set on and receive:

(1) INTERPHONE circuit breaker (fig. 3-2) — ON (pushed in)

(2) AUX switch (fig. 3-12) — ON position.

(3) VOL control (fig. 3-12) — adjust to comfortable level

b. To transmit: Depress microphone switch (fig. 3-2) and speak into microphone

c. To turn set off: Place AUX switch (fig. 3-12) to OFF

3-46. Secure-Voice Encoder/Decoder — TSEC/KY-28.

3-47. Description — Secure-Voice Encoder/Decoder.

The secure-voice encoder/decoder (TSEC/KY-28), secure-voice control-indicator (C-8157/ARC), and audio threshold device are used in conjunction with the FM radio set to provide secure, two-way voice communications. The encoder portion of the secure-voice encoder/decoder translates the microphone audio to coded voice for application to the FM radio transmitter. Secure audio signal from the FM radio receiver is applied to the secure-voice encoder/decoder for translation for clear-voice audio.

NOTE

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

The TSEC/KY-28 computer is installed in the avionics compartment and controlled by the C-8157/ARC control-indicator installed in the lower console (figure 3-7). When the KY-28 system is operated in the CIPHER mode, the TSEC/KY-28 computer and the audio threshold device become an integral part of the secure two-way communication. The computer encodes/decodes the communications. (The audio threshold device serves to ensure adequate audio cross-talk isolation in the helicopter intercommunication system by muting the secure radio (No. 1 AN/ARC-114) sidetone and received audio at the ICS station keying a non-secure communication radio; i.e., with the KY-28 system in the CIPHER mode and the pilot communicating on the secure (No. 1) AN/ARC-114, the pilot's radio sidetone will be present at the other ICS stations; however, if either of the other stations keys a non-secure radio (AN/ARC-115, AN/ARC-116 or No. 2 AN/ARC-114) the secure radio sidetone will be muted from the ICS station keying the non-secure radio.)

3-48. Controls and Functions — Secure-Voice Encoder/Decoder.

Refer to figure 3-13.

3-49. Operating Procedures — Secure-Voice Encoder/Decoder.

Normal operation will exist without the TSEC/KY-28 and the C-8157/ARC being installed in the helicopter; however, two operating modes are available when the TSEC/KY-28 and control indicator C-8157/ARC are installed in the helicopter, PLAIN mode for unciphered radio transmission or reception and CIPHERED mode for ciphered radio transmission or reception. Both modes may be operated with or without retransmission units. Refer to the following to operate the equipment in any particular mode.

a. Preliminary Operating Procedure.

(1) Set the Control C-8157/ARC POWER ON switch to ON.

CAUTION

The power on switch must be in the on position, regardless of the mode of operation, whenever the C-8157/ARC is installed in the aircraft.

(2) Apply power to the FM radio set No. 1.

(3) When power is initially applied, an automatic alarm procedure is initiated.

(a) A constant tone is heard in the headset and after approximately two seconds the constant tone will change to an interrupter tone.

(b) To clear the interrupted tone, depress and release the push-to-talk switch, the interrupted tone will no longer be heard, and the circuit will be in a standby condition ready for either transmission or reception.

CAUTION

No traffic will be passed if the interrupted tone is still heard after depressing and releasing the push-to-talk switch.

(4) Set control unit function switch for desired type of operation (*b* and *c* below).

b. Plain Mode.

(1) Set the control indicator C-8157/ARC POWER ON switch to ON.

(2) Set the PLAIN-CIPHER switch to PLAIN (indicated by blue light).

(3) Set the Re-X-REG switch to REG, except when operating with retransmission units; at which time switch will be placed in the RE-X position.

(4) Press the press-to-talk switch and speak into the microphone to transmit. Release the press-to-talk switch for reception.

c. Cipher Mode.

NOTE

A locking plate may be installed and must be removed in order to operate PLAIN/CIPHER switch.

(1) Set the PLAIN/CIPHER switch to CIPHER (indicated by a blue light).

(2) Place the Re-X-REG switch to REG except when operating with retransmission units, at which time the switch will be placed in RE-X position.

(3) To transmit, press the press-to-talk switch. DO NOT TALK. In approximately one-half second, a beep will be heard. This indicates the receiving station is now capable of receiving your message. Transmission can now commence.

NOTE

Only one TSEC/KY-28 can transmit on a given frequency. Always listen before attempting to transmit to assure that no one else is transmitting.

(4) When transmission is completed, release the press-to-talk switch. This will return equipment to the standby condition.

(5) To receive, it is necessary for another station to send a signal first. Upon receipt of a signal, the cipher equipment will be switch automatically to the receive condition, which will be indicated by a short beep heard in the headset. Reception will then be possible. Upon loss of the signal, the cipher equipment will be automatically returned to the standby condition.

3-50. Secure-Voice Control-Indicator — C-8157/ARC.

3-51. Description — Secure-Voice Control-Indicator.

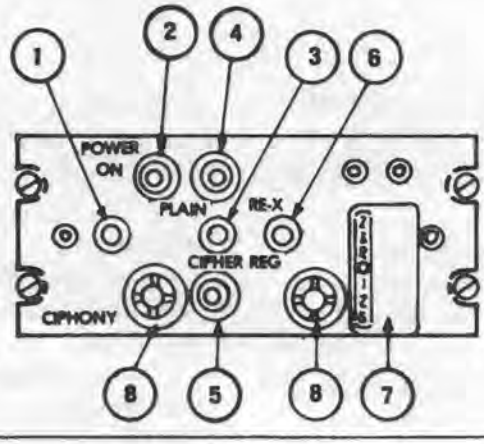
The secure-voice control-indicator C-8157/ARC controls the voice security equipment used with the VHF/FM radio set to provide secure two-way communications. The control-indicator is mounted near the rear of the pilot's right console.

3-52. Controls and Functions — Secure-Voice Control-Indicator.

Refer to figure 3-13.

3-53. Operating Procedures — Secure-Voice Control-Indicator.

Refer to paragraph 3-49.



CONTROL/INDICATOR	FUNCTION
1. POWER ON Switch (Two-Position Circuit Breaker)	Connects power to the associated TSEC/KY-28 cipher equipment in the ON (forward) position, and disconnects OFF (aft) position. NOTE: Switch must be in the ON (forward) position for operation in the PLAIN or CIPHER mode.
2. POWER ON Blue Indicator (With Dimmer Switch)	Lights when the associated POWER ON switch is placed in the ON (forward) position.
3. PLAIN-CIPHER Switch (Two-Position Locking Toggle)	In the PLAIN position, permits normal (unciphered) communications on the associated AN/ARC-114. In the CIPHER position, permits ciphered communications on the associated radio set.
4. PLAIN (Blue) Indicator (With Dimmer Switch)	Lights when the associated PLAIN-CIPHER switch is in the PLAIN position.
5. CIPHER (Blue) Indicator (With Dimmer Switch)	Lights when the associated PLAIN-CIPHER switch is in the CIPHER position.
6. RE-X-REG Switch (Two-Position Locking Toggle)	In the RE-X position, permits ciphered communications through a retransmission unit (at a distant location). In the REG position, permits normal ciphered communications or clear text.
7. ZEROIZE Switch (Two-Position Locking Toggle, Under Spring-Loaded Cover)	Normally in OFF (aft) position. Placed in ON (forward) position during emergency situations to neutralize and make inoperative the associated TSEC/KY-28 cipher equipment. NOTE: Do not place the ZEROIZE switch on the ON (forward) position unless a crash or capture is imminent.
8. Panel Lights	Illuminate the control-indicator (controlled by aircraft panel lights).

Figure 3-13. C-8157/ARC Control-Indicator.

SECTION II — NAVIGATION

3-54. General.

The navigation system includes a direction finder set, a gyromagnetic compass set, and a heading-radio bearing indicator. Table 3-1 gives a listing of navigation equipment installed in the various aircraft. Power supply for the navigation equipment is discussed in paragraph 3-3. Antennas are shown in figure 2-1.

3-55. Emergency Operation.

In the event of a generator failure, turn off the generator switch and all nonessential avionics equipment to prevent excessive drain from the battery. Refer to chapter 9 for a listing of non-essential equipment.

3-56. Description.

A description of the navigation equipment along with technical characteristics, controls and functions, and operating procedures are given in paragraphs 3-49 through 3-62. Figures 3-1 and 3-2 show location of all associated instruments, control units, and switches that are available to the pilot and copilot during flight.

3-57. Direction Finder Set (AN/ARN-83 or AN/ARN-89).

The direction finder set (fig. 3-14 and 3-15) may be operated manually or automatically to provide homing or direction finding information in conjunction with the ID-1351/A (para 3-70). The direction finder set utilizes signals transmitted by standard am broadcasting stations.

3-58. Direction Finder Set AN/ARN-83.

Technical characteristics, controls and functions, and operating procedures for the direction finder set AN/ARN-83 are given in paragraphs 3-59 through 3-61.

3-59. Technical Characteristics, Direction Finder Set AN/ARN-83.

Channel (C-1611D/AIC)	NAV
Frequency range	190 to 1750 kHz
Type of reception	Amplitude modulation
Range	Long range

3-60. Controls and Function (fig. 3-14), Direction Finder Set AN/ARN-83.

CONTROLS	FUNCTION
Function switch (OFF, ADF, ANT, LOOP)	Energizes, deenergizes and selects the operating mode. In the OFF position deenergizes the direction finder set. In the ADF, ANT, and LOOP positions energizes the direction finder set in addition to selecting type of operation. The ADF position selects automatic operation with loop and sense antennas to permit operation for homing or automatic direction finding. In the ANT position permits radio station reception for radio range navigation, or for use as a radio broadcast receiver. The LOOP position, used in conjunction with LOOP switch, permits aural null homing and manual direction finding.
GAIN control	Permits adjusting audio output to headsets.
LOOP switch	**When function switch is set to LOOP position: LOOP switch enables manual rotation of adf fixed loop antenna electromagnetic field, and steering indicator 360 degrees left or right for manual direction finding, or when using aural null for homing to a radio station.**

Switch Position	Action
Center position	Removes manual direction finding mode.
First position L (left) or R (right) of center	**Slow speed position permits rotation of steering indicator 360 degrees left or right.**
Second position L (left) or R (right) of center	**Fast speed position permits rotation of steering indicator 90 degrees left or right.**

NOTE

Returning LOOP switch to center position stops rotation of bearing indicator pointer at any desired position.

CONTROLS (CONT)	FUNCTION (CONT)
Range switch	Selects one of three frequency ranges; 190-400 kilocycle, 400-850 **kilohertz, or 850-1750 kilohertz.**
TUNE	Permits tuning receiver frequency within range selected by range switch.
BFO-OFF switch	Turns beat frequency oscillator (BFO) on in BFO position for reception of continuous wave (cw) signals to aid in tuning; turns off bfo in OFF position.

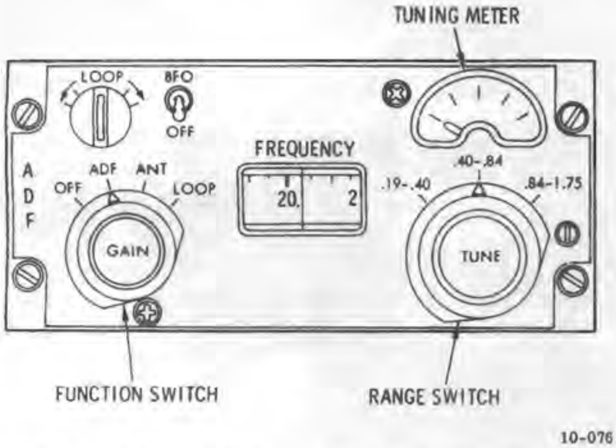


Figure 3-14. Adf Control Unit AN/ARN-83.

3-61. Operating Procedures, Direction Finder Set AN/ARN-83.

a. To turn set on:

(1) ADF circuit breaker (fig. 3-1) – ON (pushed in)

(2) RECEIVERS NAV switch (fig. **3-11) — ON** position

(3) GAIN control (fig. **3-14) — ON (turn to mid** position)

(4) Function switch (fig. **3-14) — ANT position**

b. To operate as a low-frequency radio-range and broadcast receiver:

(1) Function switch (fig. **3-14) — ANT position**

(2) TUNE control (fig. **3-14) — select desired** band

(3) BFO-OFF switch (fig. **3-14) — BFO position**

(4) If the station is transmitting cw signals, leave the switches as set in step (3) above; if the station is transmitting am, move the BFO-OFF switch (fig. **3-14) to the OFF position** after tuning

(5) TUNE control – tune to desired station

(6) GAIN control (fig. **3-14) — turn to desired** level

c. To operate as an automatic direction finder:

(1) Function switch (fig. **3-14) — ADF position**

(2) TUNE control (fig. **3-14) — select desired** station

(3) Tuning meter – tune for maximum deflection

(4) GAIN control (fig. **3-14) — adjust to desired** level

NOTE

The steering indicator will show the relative bearing of the received station from the aircraft heading.

d. To operate as a manual direction finder:

(1) Function switch (fig. 3-11) – LOOP position

(2) TUNE control (fig. 3-11) – select desired station

(3) GAIN control (fig. 3-11) – adjust to desired level

NOTE

The steering indicator will show the relative bearing of the received station from the aircraft heading.

(4) BFO-OFF switch (fig. **3-14) — BFO position**

(5) TUNE control – slowly turn to the right then to the left to obtain the zero beat. A slight whistle will be heard in the headset when tuned off station. When the station is properly tuned, a null will exist.

(6) LOOP switch (fig. **3-14) — operate to obtain** an aural null. When an aural null is obtained, **the steering indicator will point to the relative bearing.**

(7) BFO-OFF switch – OFF position

e. To turn set off:

(1) Function switch (fig. **3-14) — OFF position**

(2) RECEIVERS NAV switch (fig. **3-11) — OFF** position

3-62. Direction Finder Set AN/ARN-89.

Technical characteristics, controls and functions, and operating procedures for the direction finder set **AN/ARN-89 are given in paragraphs 3-63 through 3-65.**

3-63. Technical Characteristics, Direction Finder Set AN/ARN-89.

Channel (C-6533/ARC).	NAV
Frequency range	100 to 3000 kHz
Type of reception	Amplitude modulation or constant carrier
Range	Long range

3-64. Controls and Function (fig. 3-15). Direction Finder Set AN/ARN-89.

CONTROL	FUNCTION	
Mode selector switch (four-position, rotary)	Determines the operating mode of the adf as follows:	
	Switch Position	Function
	OFF	Removes power from adf; adf is inoperative.
	COMP	Provides for adf operation as an automatic direction finder.
	ANT	Provides for adf operation as an am radio receiver.
	LOOP	Provides for adf operation as a manual direction finder using the loop antenna only.
LOOP L-R control (potentiometer, spring return to center)	Provides for manual positioning of the loop antenna when adf is operating in the manual direction finding mode.	
AUDIO control	Adjusts audio signal output level as follows:	
	Switch Position	Function
	COMP	Audio output gain control
	ANT	Rf gain control
	LOOP	Rf gain control
Coarse tune control knob	Tunes the receiver in 100-kilocycle steps as indicated by the first two digits of the KILOCYCLES indicator.	
Fine tune control knob	Provides selection of the 10-kilocycle digits (continuous tuning) as indicated by the last two digits of the KILOCYCLES indicator.	
TUNE indicator	Provides indication of relative signal strength while tuning radio receiver to specific radio signal.	
KILOCYCLES indicator	Indicates operating frequency to which radio receiver is tuned.	
CW-VOICE-TEST switch (three position toggle, spring-loaded away from TEST position)	Switch Position	Function
	CW (COMP mode)	Enables tone oscillator to provide an audible tone for tuning to a cw station.
	CW (ANT or LOOP mode)	Enables beat frequency oscillator to permit tuning to a cw station.
	VOICE	Permits adf to operate as an am receiver.
	TEST	Provides slewing of goniometer through 180° to provide a check on the receiver in COMP mode. Inoperative in LOOP and ANT modes.

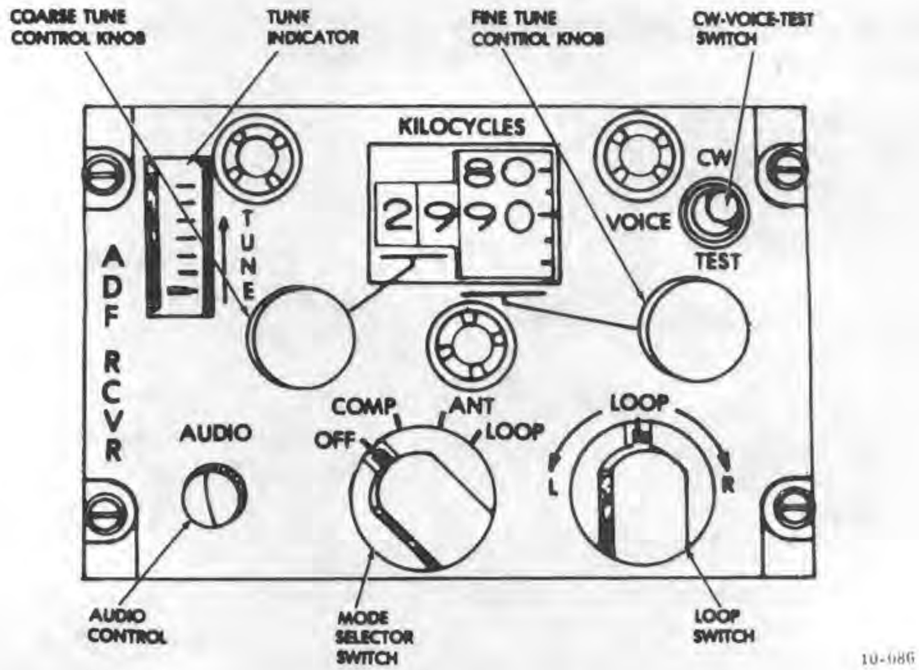


Figure 3-15. Adf Control Unit AN/ARN-89.

3-65. Operating Procedures, Direction Finder Set AN/ARN-89.

a. To turn set on:

(1) ADF circuit breaker (fig. 3-2) – ON (pushed in)

(2) NAV switch (fig. **3-12) — ON position.**

(3) AUDIO control (fig. **3-15) — ON (turn to** mid position)

(4) Mode selector switch (fig. **3-15) — ANT position**

b. To operate as a low-frequency radio-range and broadcast receiver:

(1) Mode selector switch (fig. **3-15) — ANT position**

(2) TUNE control (fig. **3-15) — select the desired** band

(3) VOICE-TEST-CW switch (fig. **3-15) — CW** position to aid tuning

(4) If the station is transmitting cw signals, leave the switches as set in step (3) above; if the station is transmitting am, move the VOICE-CW-TEST switch to the VOICE position after tuning.

(5) TUNE control – tune to desired station

(6) AUDIO control (fig. **3-15) — turn to desired** level

c. To operate as an automatic direction finder:

(1) Mode selector (fig. **3-15) — COMP position**

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

(3) AUDIO control – adjust

(4) TUNE indicator – select. Tune for maximum up deflection of needle.

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

(6) Observe ADF bearing pointer (fig. **3-16) in**dications

d. To operate as a manual direction finder:

(1) Mode selector switch (fig. **3-15) — LOOP** position

(2) AUDIO control (fig.**3-15) — adjust to desired** level

NOTE

The steering indicator will show the relative bearing of the received station from the aircraft heading.

(3) CW-VOICE-TEST switch (fig. **3-15) — CW** position

(4) LOOP switch (fig. **3-15) — move left and** right as required to obtain an aural null. When an aural null is obtained, the **steering indicator will point to the relative bearing.**

e. To turn set off:

(1) Mode selector switch (fig. 3-15) — **OFF** position

(2) NAV switch (fig. 3-12) — **OFF position**

3-66. Gyromagnetic Compass Set AN/ASN-43.

The gyromagnetic compass set provides the pilot with accurate heading information and can be operated at any latitude and at any altitude up to the aircraft's performance ceiling. It is referenced to a free directional gyro heading when operated in the DG (FREE) mode (free gyro), or slaved to the earth's magnetic field when operated in the MAG (SLAVE) mode (magnetically slaved). A switch is provided for selection of either magnetically slaved or free gyro operation. The gyro provides heading information in the form of a synchronous output to the homing, heading and bearing indicator. The heading reference facility consists of an induction compass transmitter, a magnetic flux compensator, a MAGNETIC-DIR GYRO or FREE-SLAVE switch, and the heading display of the homing, heading, and bearing indicator. Technical characteristics and operating procedures for the gyromagnetic compass set AN/ASN-43 are given **in paragraphs 3-67 and 3-68.**

3-67. Technical Characteristics, Gyromagnetic Compass Set AN/ASN-43.

Type of gyro	Free directional (DG or FREE) or magnetically slaved (MAG or SLAVE)
Type of output	Synchronous
Limitations	None in any latitude to aircraft ceiling

3-68. Operating Procedures (fig. 3-16), Gyromagnetic Compass Set AN/ASN-43.

The operating procedures for the gyromagnetic compass set consist of verifying the selected mode of operation (MAG-DG or SLAVE-FREE), turning the compass set on (which also supplies power to the heading portion of the homing, heading, and bearing indicator), synchronization of the compass set if operating in the free gyro (DG) mode, in-flight operation, **and turning the compass set off. DG (FREE) operation is recommended when flying in latitudes higher than 70 degrees (North or South). Also, when in the DF (FREE) mode, the directional gyro must be set for local latitude. The MAGNETIC-DIR GYRO switch (fig. 3-1) or FREE-SLAVE switch (fig. 3-2) is located at the upper left corner of the edgelighted switch panel on the electrical console assembly, in the pilot's compartment. The LATITUDE knob and the LATITUDE N-S (Northern and Southern hemisphere) switch are located on the directional gyro. Access to these two controls is obtained by removing the left foot support fairing in the passenger-cargo compartment; the controls are not accessible from the pilot's compartment and must be set prior to flight.**

a. To turn the set on and synchronize: (MAG or SLAVE mode) or set heading (DG or FREE mode):

(1) INST & AC INV circuit breaker (fig. 3-1) or INST circuit breaker (fig. 3-2) — ON (pushed in).

(2) **INVERTER switch (fig. 3-1 or 3-2) — INVERTER. When power is turned on, the compass power warning flag (fig. 3-16) should disappear from sight.**

(3) MAGNETIC-DIR GYRO switch (fig. 3-1) or FREE-SLAVE switch (fig. 3-2) — Desired mode as applicable.

(4) Compass system synchronizer knob (fig. 3-16) when in the MAG (SLAVE) mode — Turn in the direction indicated by the annunciator until the annunciator is centered. Synchronization exists when the magnetic heading on the scale dial agrees with a known magnetic heading.

(5) Compass system synchronizer knob (fig. 3-16) when in DG (FREE) mode — Rotate to set the scale dial to a known heading reference. The annunciator should move to the center position and then not change (annunciator is deenergized in the DG or FREE mode).

b. Inflight operation: During normal MAG (SLAVE) mode operation, the annunciator will oscillate slightly about the center position; however, during certain aircraft maneuvers the directional gyro may become unsynchronized as indicated by the annunciator moving off center. When this occurs, the slaving circuits in the compass set will slowly remove errors and resynchronize the system. If faster synchronization is desired, turn the synchronizer knob until the annunciator is centered again.

c. To turn set off: INVERTER switch (3-1 or 3-2) **— OFF position. When power is turned off, the compass power warning flight (fig. 3-16) should appear.**

3-69. Homing, Heading, and Bearing Indicator ID-1351/A.

The homing, heading and bearing indicator (fig. 3-16) receives signals from and operates with the fm receiver/transmitter, the adf receiver and the directional gyro simultaneously or individually. One manual control is provided for synchronizing the gyromagnetic compass set during free gyro (DG or FREE) operation. The homing, heading, and bearing indicator is actuated by the equipment with which it is operating. Controls and function for the homing, heading, and bearing indicator ID-1351/A are given in paragraph 3-70.

3-70. Controls and Function (fig. 3-16), Homing, Heading, and Bearing Indicator ID-1351/A.

CONTROL OR INDICATOR	FUNCTION
Compass annunciator	Shows a dot (●) or cross (+) to indicate misalignment (nonsynchronization) of the gyro-magnetic compass set.
ADF radio bearing pointer	Indicates the bearing of an adf radio signal.
Compass heading card (scale dial)	Rotates under the major index reference mark to indicate the aircraft heading.
Compass system synchronizing knob	The synchronizing knob is manually rotated to null annunciator and synchronize (electrically and mechanically align) the gyromagnetic compass set.
FM homing warning indicator	During the absence of an fm radio receiver homing signal, or when the fm homing signal, is extremely weak, the fm warning indicator shows red.
Steering indicator	Moves left or right to indicate any deviation from the approach path to the fm radio transmitter.
Station passage indicator	Rises and falls to indicate passage over a fm radio transmitter.
Compass power warning flag	Indicates loss of power to the gyromagnetic compass set.
Major index	The major (fixed) index provides a reference mark for the scale dial.

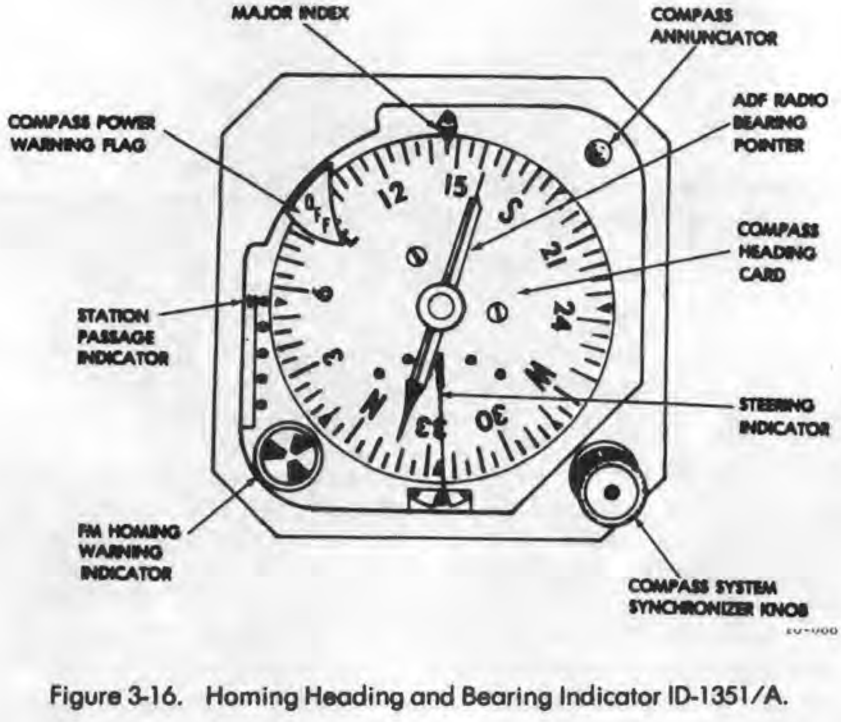


Figure 3-16. Homing Heading and Bearing Indicator ID-1351/A.

SECTION III — TRANSPONDER AND RADAR

3-71. Transponder Set AN/APX-72.

The Transponder Set (AN/APX-72) provides automatic radar identification of aircraft or surface vessels to all suitably equipped challenging aircraft, surface ships, or ground facilities within the operational range of the system. The system receives, decodes, and responds to the characteristic interrogations of operational modes 1, 2, 3/A, C, and 4 (fig. 3-14). The receiver operates at a frequency of 1030 MHz and the transmitter operates at a frequency of 1090 MHz. Specially coded identification of position (IP) and emergency signals may be transmitted to interrogating stations when conditions warrant.

3-72. Technical Characteristics, Transponder Set AN/APX-72.

Receiver frequency	1030 ±0.5 MHz
Transmitter frequency	1090 ±0.5 MHz
Power output	500 watts ±3 db
Range	Line of sight
Pressurization	5 psig at sea level

3-73. Transponder Set Control Unit C-6280(P)/APX.

The transponder set control unit (fig. 3-17) controls the IFF receiver-transmitter, determines the modes and categories of operation, and selects the mode code settings except for mode 2.

Five independent coding modes are available to the operator. 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 must be pre-set before flight. Mode 3/A provides 4,096 possible codes any one of which may be selected in flight. Mode 4, which is connected to an external computer, can be selected to display any one of many classified operational codes for security identification.

The receiver-transmitter can be operated in any one of the following categories selected on the control unit.

a. Low (sensitivity) operation.

b. Normal (sensitivity) operation.

c. Identification of position (IDENT-MIC).

d. Emergency.

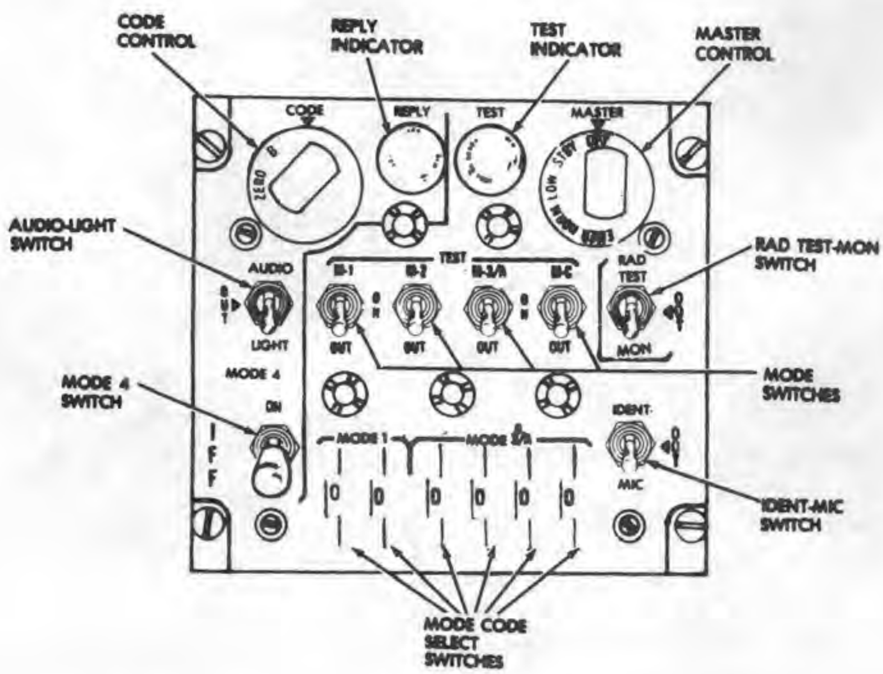


Figure 3-17. Transponder Set Control Unit (C-6280(P)/APX).

3-74. Controls and Function (fig. 3-17), Transponder Set Control Unit C-6280(P)/APX.

CONTROL POSITION	FUNCTION
MASTER control:	
OFF	Turns set off.
STBY	Places set in warmup (standby) condition.
LOW	Applies power to operate set, but at reduced receiver sensitivity.
NORM	Applies power to operate set at normal receiver sensitivity.
EMER	Transmits emergency reply signals to mode 1, 2, or 3/A interrogations regardless of mode control settings.
IDENT-MIC switch	
IDENT	When momentarily actuated (switch has spring-loaded return) intiates identification of position reply for approximately 25 seconds.
OUT	Prevents triggering of identification of position reply.
MIC	Not used.
M-1 switch:	
ON	Enables the set to reply to mode 1 interrogations.
OUT	Disables the reply to mode 1 interrogations.
TEST	Enables the set to locally interrogate in mode 1.
M-2 switch:	
ON	Enables the set to reply to mode 2 interrogations.
OUT	Disables the reply to mode 2 interrogations.
TEST	Enables the set to locally interrogate in mode 2.
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	Enables the set to locally interrogate in mode 3/A

CONTROL POSITION (CONT	FUNCTION (CONT)
M-C switch:	
ON	Enables the set to reply to mode C interrogations.
OUT	Disables the reply to mode C interrogations.
TEST	Enables the set to locally interrogate in mode C.
MODE 1 code select switches	Selects and indicates the mode 1 two-digit reply code number.
MODE 3/A code select switches	Selects and indicates the mode 3/A four-digit reply code number.
TEST indicator	Lights to indicate that the set is properly responding to a mode 1, 2, 3A, or C interrogation or to indicate a satisfactory test result when the M-1, M-2, M-3/A, or M-C switch is placed in the TEST position.
MODE 4 switch:	
ON	Enables the set to reply to mode 4 interrogations.
OUT	Disables the reply to mode 4 interrogations.
CODE control	Holds, zeroizes, or changes MODE 4 code.
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.
REPLY indicator	Lights when valid mode 4 replies are present, or when depressed.
RAD TEST/MON switch:	
RAD TEST	Enables the set and computer to respond to special interrogation test modes generated by ramp test equipment.

CONTROL POSITION (CONT	FUNCTION (CONT)
OUT	Disables RAD TEST or MON functions.
MON	Enables the TEST indicator to illuminate when set responds to mode 1, 2, 3/A, or C interrogations.

3-75. Operating Procedures, Transponder Set AN/APX-72.

a. To turn set on and operate in normal mode:

(1) XPONDER circuit breaker (fig. 3-2) – ON (pushed in)

(2) MASTER switch (fig. 3-17) — STBY for 1 minute (2 minutes in extremely cold weather), and then to LOW or NORM depending on signal strength

(3) M-1, M-2, M-3/A, M-C switches (fig. 5-17) – ON (up) position, and MODE 4 switch (fig. 3-17) — ON unless operational requirements indicate a specific mode to be used

(4) AUDIO-LIGHT switch (fig. 3-17) — OUT

(5) RAD TEST-MON switch (fig. 3-17) — OUT

(6) IDENT-MIC switch (fig. 3-17) — OUT

(7) MODE 1 and MODE 3/A switches (fig. 3-17) — Set to operational code required

b. To operate in the identification of position (I/P) mode:

(1) IDENT-MIC switch (fig. 3-17) — IDENT and release. (This will transmit the I/P signal for approximately 30 seconds to all stations on mode 1, 2 and 3/A.)

(2) Repeat this operation as required.

c. To operate in the emergency mode:

(1) MASTER switch (fig. 3-17) — EMER (switch must be pulled out to set to this position).

(2) When emergency condition is over, return MASTER switch - NORM.

d. To turn set off:

(1) MASTER switch (fig. 3-17) — OFF.

(2) IDENT-MIC switch (fig. 3-17) — OUT.

(3) M-1, M-2, M-3/A, M-C switches (fig. 3-17) — OUT position, and MODE 4 switch (fig. 3-17) — Down position.

(4) AUDIO-LIGHT switch (fig. 3-17) — OUT.

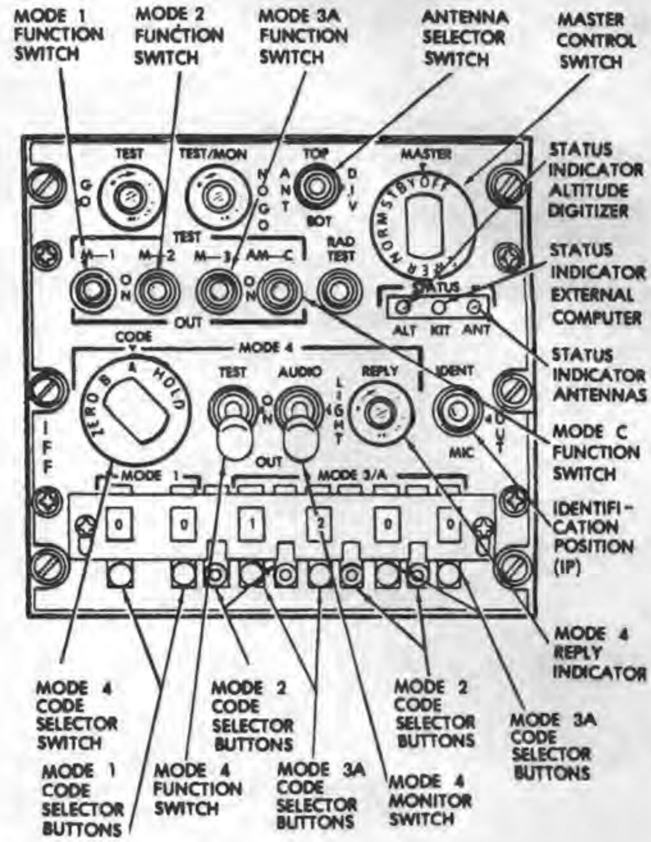


Figure 3-18. Control Panel RT-1296/APX-100(V)

3-75.1 Transponder AN/APX-100(V) 1 (IFF).

The transponder set (Figure 3-18) provides automatic radar identification of the helicopter to all suitably equipped challenging aircraft and surface or ground facilities within the operating range of the system. AN/APX-100(V) receives, decodes, and responds to the characteristic interrogations of operational modes 1, 2, 3/A, C, and 4. Specially coded identification of position (IP) and emergency signals may be transmitted to interrogating stations when conditions warrant. The transceiver can be operated in any one of four master modes, each of which may be selected by the operator at the control panel. Five independent coding modes are available to the operator. The first three modes may be used independently or in combination. Mode 1 provides 32 possible code combinations, any one of which may be selected in flight. Mode 2 provides 4096 possible code combinations, but only one is available and is normally preset before takeoff. Mode 3/A provides 4096 possible codes any one of which may be selected in flight. Mode C will indicate pressure altitude of the helicopter when interrogated. Mode 4 is an external computer mode and can be selected to provide any one of many classified operational codes for security identification.

3-76. Antenna.

A blade type antenna is installed on the fuselage underside, (Figure 2-1). It receives signals of interrogating stations and transmits reply signals.

3-77. Controls and Functions.

All operating and mode code select switches for transceiver operation are on Control Panel RT-1296/APX-100(V) (Figure 3-18).

CONTROL/ INDICATOR	FUNCTION
TEST GO	Indicates successful BIT.
TEST/MON NO GO	Indicates unit malfunction.
ANT	Selects antenna(s) to be used.
MASTER/OFF/STBY/ NORM/EMER	Selects operating condition.
M-1 TEST/ON/OUT	Determines whether Mode 1 is on, off, or in BIT operation.
M-2 TEST/ON/OUT	Determines whether Mode 2 is on, off, or in BIT operation.
M-3/A TEST/ON/OUT	Determines whether Mode 3/A is on, off, or in BIT operation.
M-C TEST/ON/OUT	Determines whether Mode C is on, off, or in BIT operation.
RAD TEST/OUT	Enables TEST mode.

3-78. Operating Procedures — Secure-Voice Control-Indicator.

Refer to paragraph 3-71.

CHAPTER 4

MISSION EQUIPMENT

SECTION I — MISSION AVIONICS
(Not applicable)

SECTION II — ARMAMENT

4-1. Armament Provisions.

The aircraft is equipped with complete cabling and installation provisions for the M27 armament subsystem. The system mode control panel is installed in the instrument panel. Attachment fittings (hard points) for the armament subsystem are provided in the cabin floor and on the outboard edge at the top of the forward canted bulkhead. A gun sight support fitting is provided on the canted bulkhead left side inboard edge. A recessed outlet containing an electrical connector receptacle is provided in the lower left corner of the cabin side of the canted bulkhead. When armament is installed, the kit electrical control cabling is connected to the outboard receptacle marked ARMAMENT CONN. When armament and cabling are removed, the electrical receptacle should be covered with the chain-attached dust cap. The left cabin door incorporates a small removable armament door at the bottom edge so that installation of the subsystem will allow flight operations with the cabin door installed. Power for the electrical control system and reflex sight is provided by the ARM (or ARMAMENT CONT) circuit breaker and for the armament subsystem by the ARM (or ARMAMENT POWER) circuit breaker. Both circuit breakers are located in the circuit breaker panel (fig. 2-20).

4-2. M27 Armament Subsystem.

The M27 armament subsystem (fig. 4-1), is used on the left side of the OH-6A aircraft, and consists of an M134 machine gun, a mount assembly, a ram air duct assembly, and an XM70E1 reflex sight. Refer to table 4-1 for tabulation of M27 armament subsystem data.

a. M134 Machine Gun Assembly. The M134 machine gun assembly (fig. 4-2) consists of a 7.62 millimeter M134 machine gun, a delinking feeder, and an electric gun drive assembly.

b. Mount Assembly. The mount assembly contains a motor and sensor assembly, a control box, and an ammunition container.

c. Ram Air Duct Assembly. The ram air duct assembly mounts on the machine gun link ejection chute, and provides breech cooling.

d. XM70E1 Helicopter Reflex Sight. The XM70E1 helicopter reflex sight assembly is described in the following subparagraphs. See figure 4-3.

(1) *Plunger Assembly and Detent.* The plunger assembly (fig. 4-3) is located on the end of the sight operating arm, and 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.

(2) *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 height adjustment and permits 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.

(3) *Elevation Control Assembly Knob.* This adjustment knob is used to set the sight for a pre-selected (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 XM8 armament subsystem and should be locked out of position when the M27 subsystem is being used.

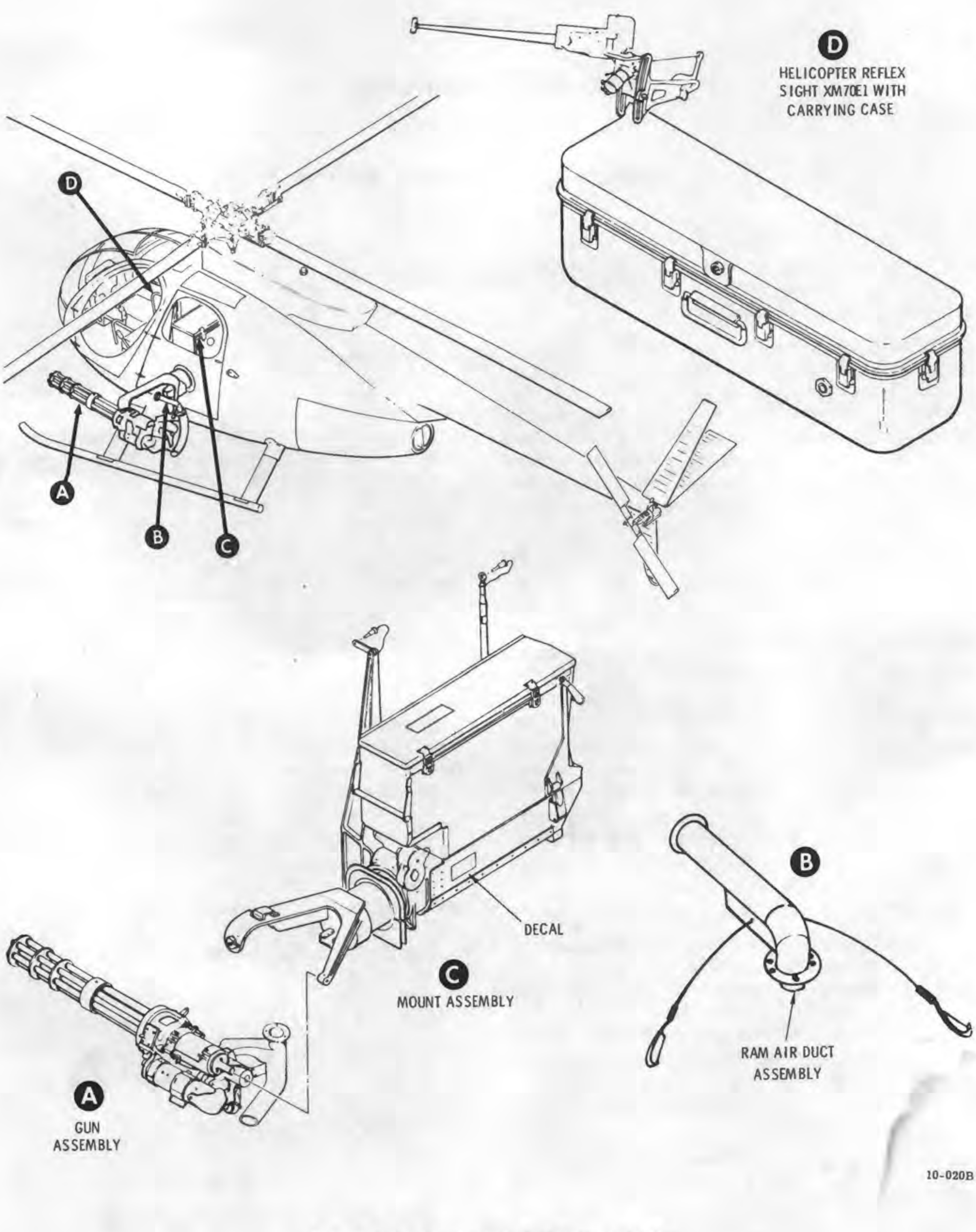


Figure 4-1. Armament Subsystem M27.

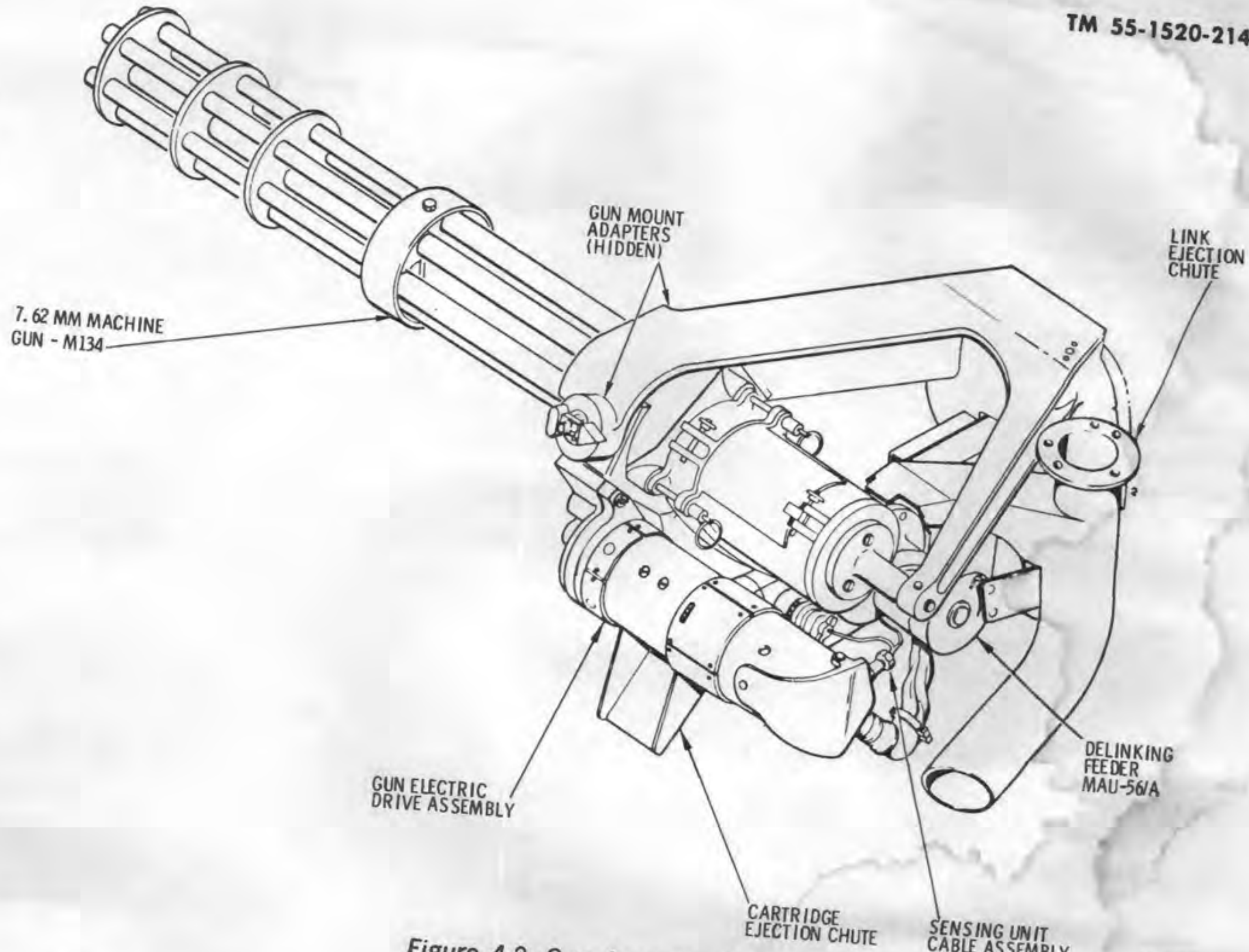


Figure 4-2. Gun Assembly M27.

10-022B

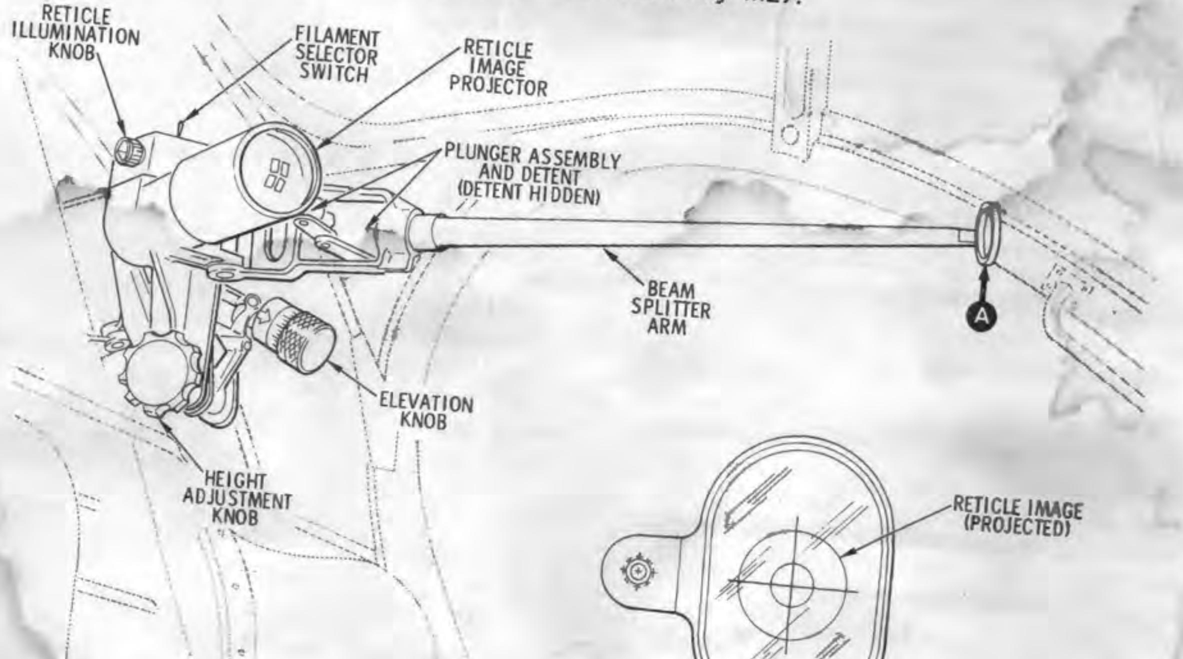


Figure 4-3. Reflex Sight XM70E1.

10-023

(4) *Filament Selector Switch.* The filament selector switch receives electrical power from the ARM (or ARMAMENT CONT) 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 is on and the reticle pattern is illuminated. The forward switch position is normally used. The rear position (spare filament) should only be used after failure of the normal or primary filament.

(5) *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.

NOTE

Check the adapter, located between the beamsplitter and beamsplitter arm, to be sure it is turned correctly for the OH-6A aircraft.

4-3. Tabulated Data, M27 Armament Subsystem.

Tabulated data for the M27 armament subsystem is presented in table 4-1.

4-4. Armament Control System.

The control system consists of trigger and elevation/depression switches on the pilot and copilot cyclic stick grips (fig. 2-14) and an ARMAMENT SYSTEM MODE control panel located in the instrument panel (fig. 4-4). The control panel contains a three-position SYSTEM MODE MASTER switch, warning lights marked GUN NOT CLEARED, ARMED, and AMMO LO(W), and a two position toggle switch that mechanically locks in the SAFE position. The functions 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 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. The system mode master switch provides control of the gun subsystem firing circuits as described in the following subparagraphs.

(1) OFF disconnects the ARMED-SAFE switch circuit and gun subsystem firing control circuits from the ARM (or ARMAMENT CONT) circuit breaker.

WARNING

Placing the SYSTEM MODE MASTER switch in the FIRE TO CLEAR position does not clear the gun; it is also necessary to fire a 1-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 that AMMUNITION REMAINS IN THE DELINKING FEEDER after each gun clearing operation and THE GUN WILL FIRE AGAIN IF THE TRIGGER IS DEPRESSED.

(2) FIRE TO CLEAR connects the armament subsystem firing control circuits so that the gun motor will continue to operate for an additional 0.2 second after the trigger is released (gun loading solenoid deenergized), thereby firing remaining rounds in the gun chambers and ejecting live rounds from the feeder. (Refer to above Warning.) Deenergizing is caused by trigger release or the automatic 3-second burst limiter if the trigger is not released within 3 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, clearing bursts should be fired at the LOW rate whenever possible.

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

(3) 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 sight reticle lamp remains illuminated at all times.

Table 4-1. Tabulated Data M27

1.	Armament Subsytem	
	Ammunition capacity	2000 rd
	Elevation limits:	
	Elevation	177.7 mils (+10 deg)
	Depression	426.28 mils (-24 deg)
	Azimuth control	maneuver aircraft
2.	Machine gun, M134	
	Caliber	7.62 mm
	Cooling	air
	Rate of fire:	
	Low	2000 spm
	High	4000 spm
	Feed	M13 type, linked belt
	Muzzle velocity	2800 fps
	Rotation of barrels	counterclockwise, viewed from breech end
3.	Drive Assembly	
	Type	electric motor, dual speed
	Speed control	electronic switch
4.	Helicopter Reflex Sight, XM70E1	
	Length (with mount)	36 in.
	Width (extended)	10 in.
	Width (stowed)	14 in.
	Height	9 in.
	Weight (with mount)	4.8 lb
	Type	collimated, illuminated reticle
	Projection lamp	dual filament
	Reticle:	
	Line width	1 mil
	Outer circle diameter	60 mils
	Inner circle diameter	30 mils
	Optical characteristics:	
	Clear aperture	0.94 × 1.4 in. (beamsplitter)
	Objective EFL	4.0 in. nominal
5.	Subsystem Electrical Characteristics	
	Nominal operating voltage	28 vdc
	Drive motor (steady state)	40 amp (slow rate max) 75 amp (fast rate max)
	Sight lamp	0.68 amp (each filament)
	Operable temperature range	-53.9°C to +73.9°C **(-64°F to +164°F)**
6.	Ammunition Authorized*	
	7.62 millimeter ball cartridge M59 (NATO)	
	7.62 millimeter ball cartridge M80 (NATO)	
	7.62 Millimeter tracer cartridge M62 (NATO)	
	7.62 millimeter armor piercing cartridge M61 (NATO)	
	7.62 millimeter dummy cartridge M172 (inert loaded)	

*CAUTION: Do not use fluted case dummy cartridges.

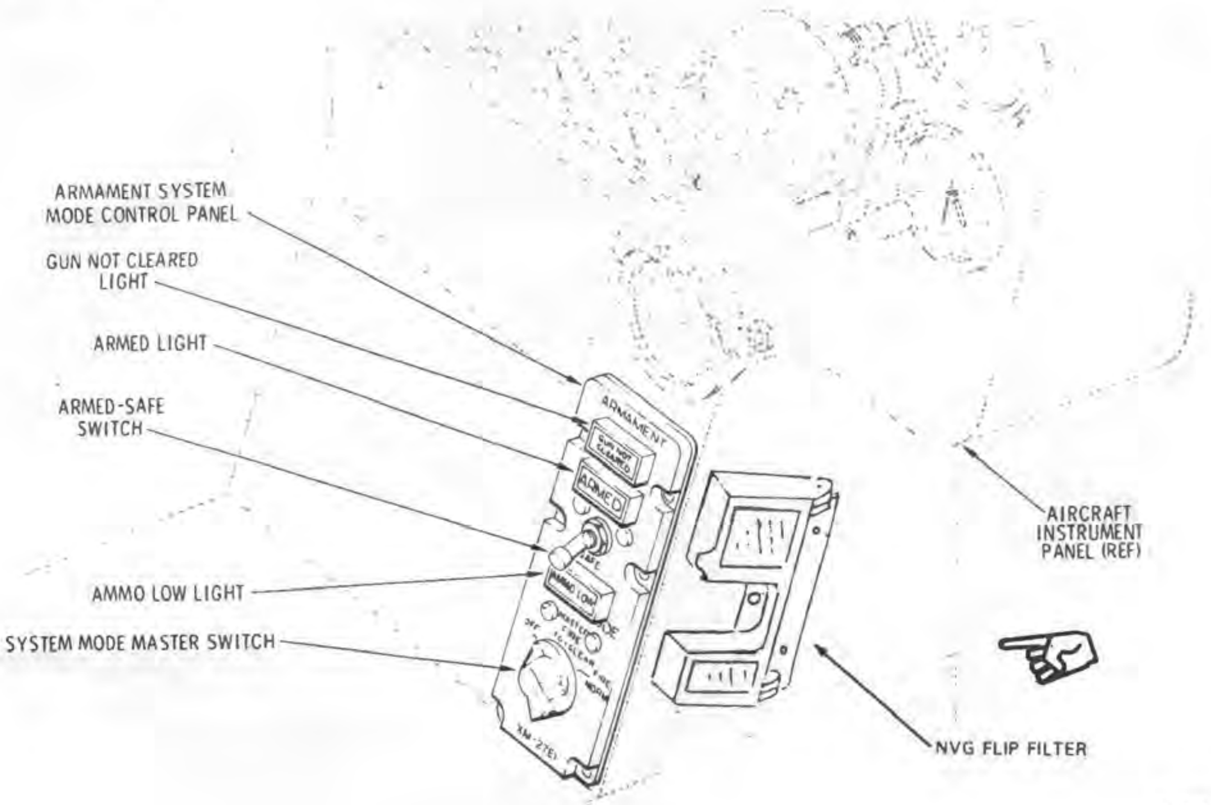


Figure 4-4. Armament Control Panel.

WARNING

When the gun is not cleared, ANY ROTATION OF THE GUN BARRELS WILL CAUSE THE GUN TO FIRE.

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.

b. ARMED-SAFE Switch. The armed-safe switch connects or disconnects (depending on ARMED or SAFE position) the cyclic stick grip trigger switch from the system mode master switch and arm circuit breaker as described in the following subparagraphs.

(1) SAFE position disconnects the cyclic grip trigger switch circuits from the SYSTEM MODE MASTER switch and ARM (or ARMAMENT CONT) 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 illuminates 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.

c. 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 (*b*, above). The AMMO LO(W) light is illuminated when the ammunition supply is running low – approximately 400 rounds remaining, or 6 seconds of fire at the high rate. The AMMO LO(W) light is actuated by a microswitch in the low ammunition switch assembly located on the gun mount assembly. The switch is operated by a switch depressor mounted on the ammunition sensor and leveler located inside the ammunition container.

WARNING

Do not depress armament subsystem trigger and PRESS-TO-TEST button simultaneously; weapon may fire.

d. Cyclic Grip Trigger Switches. The cyclic grip trigger switches (fig. 2-14) are located at the front of each grip. The switch, protected by a trigger guard, is a (spring-return-to-off) trigger switch which closes first one circuit and then another when pressed by the forefinger. A detent, reached just after the first contact is closed, makes it necessary to apply about 5 pounds of extra pressure to close the second contact. The trigger guard is spring loaded and must be moved out of the way for operation of the trigger switch. The cyclic grip trigger switches energize the gun drive motor as described in the following subparagraphs.

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

NOTE

On aircraft serial numbers 65-12916 through 65-13003 and 66-7775 through 66-7853 the subsystem shall be operated only in the high rate of fire until such time that the horizontal stabilizer has been modified per MWO 55-1520-214-30/6. 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

At freezing temperatures, the gun should be fired at the high rate only.

e. Cyclic Grip Elevation/Depression Switches. With the ARM (or ARMAMENT CONT) circuit breaker on, the elevation/depression switches (fig.2-14) 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 24 degrees from level; pressing the switch downward elevates the pod 10 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 limits can be determined when movement of sight has stopped in either depression or elevation.

4-5. Bullet Trap Assembly.

The bullet trap assembly (fig. 4-5) is a special tool used to prevent injury to personnel or damage to material through accidental firing of machine gun M134. It is a steel cylinder, closed at one end, which contains a deflector designed to contain and dissipate the energy of a bullet inadvertently fired. The bullet trap assembly fits over the gun barrels and is secured in place by two quick-release pins.

4-6. Armament Preflight Checks.

Accomplish armament preflight checks in accordance with paragraphs 4-7 through 4-10.

4-6.1 Before Exterior Check.

1. BATT-OFF-EXT power selector switch — OFF.
2. GEN switch — OFF.
3. SYSTEM MODE MASTER switch — OFF.
4. ARMED-SAFE switch — SAFE.
5. Warning lights out.

4-6.2 LOADING SEQUENCE.

1. Fold ammunition belt into ammunition container assembly and work it through ammunition chutes to the delinking feeder.
2. Install bullet trap assembly.
3. Remove safing sector and housing cover of gun.
4. Feed ammunition into delinking feeder by working through open top of ammunition chutes.
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.
7. Close and latch ammunition container assembly cover.
8. Remove bullet trap assembly.

4-7. EXTERIOR CHECK.

1. Gun — installed and secure.
2. Bullet trap assembly — installed and pinned.

WARNING

CLEAR gun while standing behind the gun, facing forward, and make sure there are no personnel in front of gun.

3. Rotate barrels clockwise one barrel position (opposite direction of rotation).
4. Remove safing sector and housing cover.
5. Rotate barrels counterclockwise to visually check each chamber and remove any cartridges.
6. Remove bullet trap assembly.
7. Electrical connections — check for security and general condition.

8. Clearing guide – check freedom of movement.
9. Chuting – check for secure attachment.
10. Gun mount – check that front mount lock handle is in locked position and rear mount is secure.
11. Delinker feeder – check timing by pressing both timing pins.
12. Ammunition container – loaded, ammunition belt engaged in delinking feeder.
13. Gun elevation – depressed below door sill.

4-8. 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.

4-9. Before Engine Start.

1. ARM (or ARMAMENT POWER) and ARM (or ARMAMENT CONT) circuit breakers – depressed.
2. SYSTEM MODE MASTER switch – OFF.
3. ARMED-SAFE switch – SAFE.
4. BATT-OFF-EXT power selector switch – BATT.
5. Sight filament selector switch – rear position (spare filament).
6. SYSTEM MODE MASTER switch – FIRE NORM.

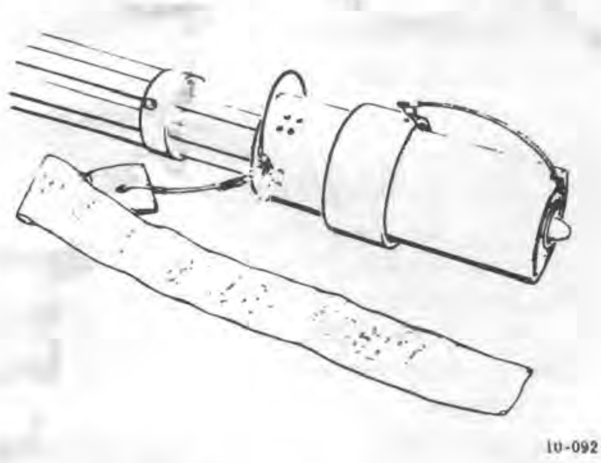


Figure 4-5. Bullet Trap Assembly Installed on Gun Barrels.

WARNING

Make sure that ARMED-SAFE switch is in 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 position (primary filament). Check that reticle is still visible.
10. SYSTEM MODE MASTER switch – OFF.
11. Elevation/depression switch – check for full travel of gun.
12. Sight elevation control knob – set to expected target range.

NOTE

The yellow range markings are intended for use with the XM8 armament subsystem and should be locked out of position when the M27 subsystem is installed.

13. Reflex sight – move to stowed position if desired.

4-9.1. Before Take-Off.

1. **SYSTEM MODE MASTER system – OFF.**
2. **ARMED-SAFE switch – SAFE.**

4-10. Inflight Operation.

Accomplish armament inflight operation checks in accordance with paragraphs 4-11 through 4-13.

4-11. BEFORE FIRING.

1. Reflex sight – position for use.

CAUTION

Do not attempt to fire the M134 machine gun if bullet trap assembly was not removed before flight. Gun will be damaged.

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 the possibility of ammunition "cookoff" and gun jamming.

4. Reticle illumination knob – reset intensity if required.
5. ARMED-SAFE switch – ARMED.
6. Gun elevation/depression switch – as required.

WARNING

The M134 Machine Gun on various armament subsystems have firing burst limiting controls varying gun on time from three to six seconds. Burst of fire, or intermittent burst lasting six seconds in duration shall be succeeded by the following cooling period:

HOVER or SITTING: Six second burst followed by two minute cooling period.

NORMAL FLIGHT: Six second burst followed by a one minute cooling period.

WARNING

Firing should be accomplished in short bursts as controlled by the 3-second burst limiter. If combat emergency required expending a full complement of ammunition (2000 rounds) by continuous recycling 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.

4-12. FIRING.

1. Aircraft – maneuver as required to position reticle pattern on target.

WARNING

Noise levels created during weapons firing can cause possible damage to hearing unless suitable ear protection is worn. The SPH-4 helmet with the Gentex earphones will provide suitable protection.

2. Trigger switch – lift guard and depress to low or high firing rate as desired.

4-13. 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 high 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 LO(W) 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.

4-14. After Landing.

1. GUN NOT CLEARED light – OFF.
2. ARMED-SAFE switch – SAFE.
3. ARMED light – OFF.
4. SYSTEM MODE MASTER switch – OFF.
5. Reflex sight – stowed position.

4-15. Deleted.

4-16. BEFORE CONNECTING EXTERNAL POWER.

1. BATT-OFF-EXT power selector switch – OFF.
2. GEN switch – OFF.

4-17. Deleted.

4-18. Loading Instructions.

Accomplish an armament loading cockpit check and loading sequence as given in paragraphs 4-19 and 4-20.

4-19. Deleted.

4-20. Deleted.

4-21. Deleted.

4-22. Engine Shutdown.

1. BATT-OFF-EXT power selector switch - OFF.
2. GEN switch - OFF.
3. SYSTEM MODE MASTER switch - OFF.
4. ARMED-SAFE switch - SAFE.
5. Warning lights out.

4-23. UNLOADING SEQUENCE.

1. Install bullet trap assembly.

WARNING

A firing pin may be cocked and ready to be released. After installing bullet trap assembly and before proceeding, rotate barrels slightly clockwise (opposite firing direction) to prevent firing.

2. Remove safing sector and housing cover.
3. Release ammunition chute from delinking feeder and remove one cartridge from the linked ammunition.
4. Manually rotate barrels counterclockwise, viewed from the breech end (firing direction), *until remaining* cartridges are cleared from the gun and delinking feeder.
5. Open cover on ammunition container assembly and pull the linked cartridges from chutes and into the ammunition container if required.
6. Remove bullet trap assembly.

4-24. Ammunition.

For a listing of authorized ammunition, refer to table 4-1.

4-25. Destruction of Materiel.

Ordinarily the armament should be destroyed in conjunction with the destruction of the aircraft.

4-26. ARMAMENT

If gun fails to fire, proceed as follows:

1. ARMT PWR and ARMT circuit breakers — IN.
2. MASTER switch — FIRE NORM.
3. ARMED—SAFE switch — ARMED.
4. Trigger switch — Lift guard and press. If gun fails to fire, release trigger switch.
5. MASTER switch — FIRE TO CLEAR.
6. Trigger switch — Lift guard and press. Press trigger to both low— and high—rate position. If gun fails to fire, release trigger switch.
7. ARMED—SAFE switch — SAFE.
8. MASTER switch — OFF.
9. ARMT PWR and ARMT circuit breakers — OUT.

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.

If runaway gun, proceed as follows:

1. ARMED—SAFE switch — SAFE.
2. MASTER switch — OFF.
3. ARMT PWR and ARMT circuit breakers — OUT.

CHAPTER 5
OPERATING LIMITS AND RESTRICTIONS

SECTION I - GENERAL

5-1. Purpose.

This chapter identifies or refers to all important operating limits and restrictions that shall be observed during ground and flight operations.

5-2. General.

The operating limitations set forth in this chapter are the direct results of design analysis, tests, and operating experiences. Compliance with these limits will allow the pilot to safely perform the assigned missions and to derive maximum utility from the aircraft. Limits concerning maneuvers, weight, and center of gravity limitations are also covered in this chapter.

5-3. Exceeding Operational Limits.

Any time an operational limit is exceeded an appropriate entry shall be made on DA Form 2408-13. Entry shall state what limit or limits were exceeded, range, time above limits and any additional data that would aid maintenance personnel in the inspection that may be required.

5-4. Minimum Crew Requirements

The minimum crew requirement consists of only the pilot, whose station is at the right side of the aircraft. Additional crewmembers as required will be added at the discretion of the commander, in accordance with pertinent Department of the Army regulations.

SECTION II - SYSTEM LIMITS

5-5. Instrument Markings.

a. Instrument Marking Color Codes. Operating limitations and ranges are indicated by colored radial lines and arcs on either the dial face or cover glass of engine and flight instruments. See figure 5-1 sheets 1 and 2. Red dial markings indicated the limit above or below which continued operation is likely to cause damage or shorten life. The green instrument markings indicate the safe or normal range of operation. The yellow instrument markings indicate the range where special attention should be given to the operation covered by the instrument. Operation is permissible in the yellow range but should be avoided or minimized.

b. Instrument Glass Alignment Marks. Instruments which have color markings attached to the cover glass (instead of dial face) also have short vertical white alignment marks extending from the edge of the glass onto the fixed bezel of the instrument. These cover glass slippage marks appear as a single vertical line when the cover glass color markings properly align with the numbers and graduations on the dial face: however, the slippage marks appear as separate (displaced) radial lines when a cover glass has rotated. The pilot should periodically verify proper alignment of the slippage marks to ensure that the color markings correctly portray the operating limitations.

5-6. Rotor Limitations.

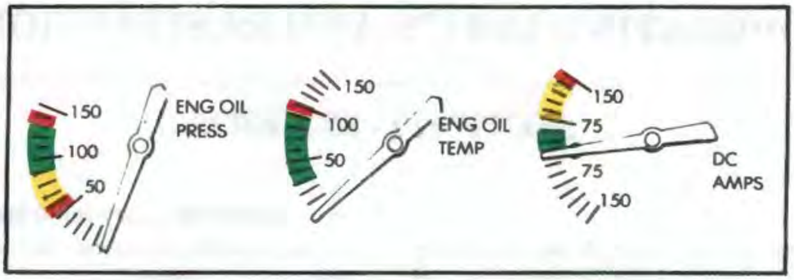
Helicopter can be started in a maximum wind velocity of 40 knots and a maximum gust speed of 20 knots. When winds approach these limits the aircraft should be headed into the wind.

5-7. Engine Starting Speed Limitations

The following engine N1 speeds must be attained before the throttle is opened during engine starting.

TEMP	N1 RPM
-54°C to -18°C (-66°F to 0°F)	12%
-18°C to +7°C (-0°F to +45°F)	13%
+7°C to +54°C (+45°F to 132°F)	15%

INSTRUMENT PACK SUBASSEMBLY (TYPICAL)



ENGINE OIL TEMPERATURE

- (Green) 30º C TO 107º C NORMAL
- (Red) 107º C MAXIMUM

ENGINE OIL PRESSURE

- (Red) 50 PSI MINIMUM FOR FLIGHT
- (Yellow) 50 TO 90 PSI CAUTIONARY OPERATION (BELOW 78% N1)
- (Green) 90 TO 130 PSI NORMAL OPERATION
- (Red) 130 PSI MAXIMUM

NOTE: DURING COLD WEATHER STARTS MAXIMUM MAY GO TO 150 PSI. ENGINE MUST REMAIN AT IDLE UNTIL NORMAL RANGE IS ATTAINED.

DC AMMETER

- (Green) 0-60 AMP NORMAL OPERATION
- (Yellow) 60-150 AMP CAUTIONARY OPERATION
- (Red) 150 AMP MAXIMUM

TURBINE OUTLET TEMPERATURE

- (Green) 385º TO 693º C NORMAL OPERATION (CONTINUOUS)
- (Yellow) 693º TO 749º C CAUTIONARY OPERATION (5 MIN LIMIT)
- (Red) 749º C MAXIMUM
- (Red dot) 843º C 6-SECOND MAXIMUM TRANSIENT LIMIT

STARTING:

0° TO 749° NORMAL
749°C TO 927°C 10-SECOND TRANSIENT
927°C MAXIMUM

TORQUE

- (Green) 0 TO 70 PSI NORMAL OPERATION (CONTINUOUS)
- (Yellow) 70 TO 80 PSI CAUTIONARY OPERATION (5 MIN LIMIT)
- (Red) 80 PSI MAXIMUM

NOTE: 80 TO 109 PSI 10-SECOND TRANSIENT WITH NO MORE THAN 3 SECONDS BETWEEN 90 TO 109 PSI.

Figure 5-1. Instrument Markings. (sheet 1 of 2)

ROTOR RPM

- 400 RPM MINIMUM FOR FLIGHT
- **400-465 RPM AUTHORIZED ONLY FOR POWER OFF OPERATIONS AT 2400 lb. GROSS WEIGHT OR LESS.**
- 465-514 RPM NORMAL OPERATION
- 514 RPM MAXIMUM

N2 TACHOMETER

- 100% RPM MINIMUM FOR FLIGHT
- 100% TO 103% NORMAL OPERATION
- 104% MAXIMUM
- **104% TO 110% 15-SECOND MAXIMUM**

N1 TACHOMETER

- 59% RPM MINIMUM (NOTE)
- 59% TO 104% RPM NORMAL OPERATION (NOTE)
- **105% 15-SECOND TRANSIENT**

NOTE:
59% RPM MINIMUM WHEN ENGINE IS NOT LOADED; EXAMPLE, AUTO-ROTATION. 62% RPM MINIMUM WHEN ENGINE IS DRIVING THE ROTOR.

AIRSPEED INDICATOR

- 121 KNOTS VNE

NOTE:
THIS FIGURE DEPICTS INSTRUMENT MARKINGS. REFER TO FIGURE 5-3 FOR AIRSPEED LIMITS.

G Y R

10-026-2B

Figure 5-1. Instrument Markings. (Sheet 2 of 2).

SECTION III — POWER LIMITS

5-8. Fuel Operation Limits.

a. Electrical Fuel Pump Operation. The fuel boost switch must be in Fuel Boost Position whenever:

(1) The aircraft is operated on emergency fuel.

(2) The operation altitude exceeds 15,000 ft. MSL.

(3) The ambient air temeprature exceeds 40°C (104F).

b. Standard Fuel. No restrictions are imposed when JP-4 fuel is used.

c. Alternate Fuel. JP-5, JP-8, Jet A and Jet A-1 are restricted to an ambient temperature range of -18°C to +52°C (0°F to +128°F). A deceleration check must be performed prior to the first flight of each day. If autorotations are to be performed, a deceleration check shall be done prior to each flight.

NOTE

Engine starting difficulites may be encountered if alternate fuels are used at ambient temperatures below +5°C (39°F).

d. Emergency Fuel. Aviation Gasoline (MIL-G-5572) without Tricresyl Phosphate (TCP) is the only authorized emergency fuel. The following restrictions apply when emergency fuel is used.

(1) The FUEL BOOST switch must be in the FUEL BOOST position when emergency fuel is used.

(2) The helicopter shall not be flown when emergency fuel has been used for a total accumulated time of 6 hours. Entry on remarks section of DA Form 2408-13 is required for each time emergency fuel is used.

(3) The helicopter shall not be flown when emergency fuel has been used for a total accumulated time of 6 hours. Entry on remarks section of DA Form 2408-13 is required for each time emergency fuel is used.

(4) Practice autorotation is prohibited using emergency fuel.

5-9. Starter limits.

a. Starter Engage Time. If rise in TOT does not occur in the first 20 seconds, starter engage time is limited to the following:

EXTERNAL POWER	BATTERY 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 rise in TOT occurs in the first 20 seconds, starter engage time is limited to the following:

EXTERNAL/BATTERY POWER
1 Minute ON
1 Minute OFF
1 Minute ON
1 Minute OFF
1 Minute ON
30 Minutes OFF

5-9.1 Engine Starting Limitations.

During the start, if N1 does not reach 58 percent in a total time of 45 seconds, close the throttle, and continue to press start with the throttle closed until TOT indication reads less than 200°C. At FAT of 10°C and below, allowable total starting time is increased to 60 seconds. Starter engage times do not apply. If engine fails to start on third attempt, abort start and make an entry on DA Form 2408-13. The starter engage time limits in para 5-9a and b do not apply should abort start procedures become necessary.

SECTION IV — LOADING LIMITS

5-10. Center of Gravity Limitations.

Center of gravity limits for the aircraft to which this manual applies and instructions for computation of the center of gravity are contained in Chapter 6.

5-11. Weight Limitation.

The maximum gross weight of the aircraft is 2550 pounds.

5-12. Floor Loading Limits.

Do not exceed with maximum floor loading capacity of 115 pounds per square foot in the cabin. Refer to Section VI - for addition information on Cargo Loading.

SECTION V — AIRSPEED LIMITS

5-13. Airspeed Operating Limits.

See figure 5-3 to determine the never exceed velocity (vne) as a function of weight, altitude, and temperature. The pilot is to record the maximum airspeed attained, and its duration, in the aircraft records whenever the vne value of figure 5-3 is exceeded. Refer to section VIII for airspeeds to be avoided during low altitude operation.

5-14. Airspeed Operating Limits Charts.

Referring to figure 5-3, note that a free air temperature scale and pressure altitude scale are provided in the upper grid, and a weight scale and indicated airspeed scale on the lower grid. Using the observed free air temperature and altitude obtained from the aircraft instruments and the calculated aircraft weight, enter the chart as directed in the chart example. Determine maximum airspeed at the left side of the lower grid.

5-15. Airspeed Limits for Doors Removed.

The following airspeed limitations are provided for those instances in which operational requirements necessitate operating the aircraft with a specific combination of pilot and/or cargo doors removed.

a. Cockpit doors OFF, Cabin doors ON is not an authorized configuration for any flight conditions.

b. Before entering high speed flight, ensure that all door ventilator cutouts are positioned up, aft, or down (in the 120-degree arc). Door damage and vibrations could occur if vent cutouts face the airstream.

5-16. Airspeed Limits, Sideward and Rearward Flight.

Sideward and rearward flight speeds are limited by the aircraft directional controllability. In right sideward flight directional control becomes marginal above 20 knots. Because the airspeed indicator does not register sideward or rearward speeds, they must be estimated. As a general guide, sideward and rearward flight should be limited to a moderate walking speed. Do not allow speed to increase to the point that directional control approaches the pedal travel limit.

G

AIRSPEED OPERATING LIMITS

470 ROTOR RPM

LEVEL FLIGHT

AIRSPEED OPERATING LIMITS OH-6A T63-A-5A/-700

EXAMPLE

WANTED

INDICATED AIRSPEED

KNOWN

PRESSURE ALTITUDE = 4000 FEET

FAT = 0°C

GROSS WEIGHT = 2400 LB

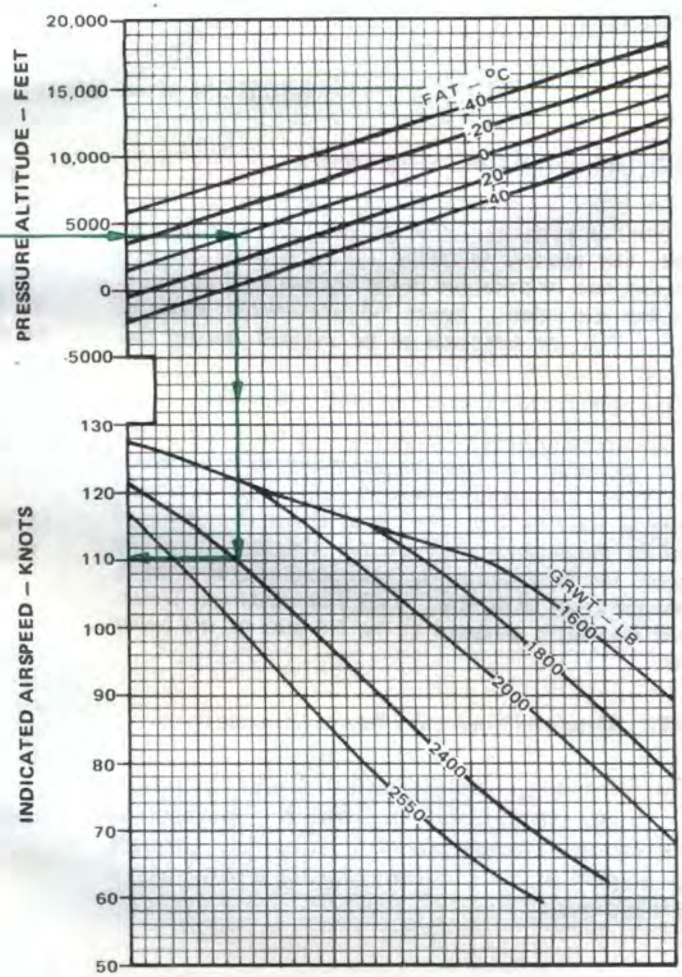
METHOD

ENTER PRESSURE ALTITUDE HERE

MOVE RIGHT TO FAT = 0°C

MOVE DOWN TO GROSS WEIGHT = 2400 LB

MOVE LEFT, READ INDICATED AIRSPEED = 110 KNOTS



DATA BASIS: DERIVED FROM FLIGHT TEST

G

Figure 5-3. Airspeed Operating Limits Chart

10-138

SECTION VI — MANEUVERING LIMITS

5-17. Maneuvering Limits.

a. Maneuvers resulting in highly accelerated banks or dives can cause a temporary uncovering of the transmission oil pressure pump inlet and a momentary loss of transmission oil pressure. Loss of pressure for 5 seconds or less is not considered detrimental to the transmission operation. This will be indicated by illumination of the XMSN OIL PRESS caution light.

b. "Aerobatic flight is prohibited." Aerobatic flight is defined to be any intentional maneuver involving an abrupt change in the aircraft's attitude, an abnormal attitude pitch angle greater than ± 30° or roll angles greater than 60° or abnormal acceleration not necessary for normal flight.

c. **Uncoordinated maneuvers shall not be performed when fuel quantity is 40 pounds or less, or when the fuel low caution light is illuminated.**

5-17.1 Maximum Gross Weight For Practice Autorotations.

Practice touchdown autorotations are prohibited above 2220 pounds gross weight.

SECTION VII — ENVIRONMENTAL RESTRICTIONS

5-18 Environmental Restrictions.

This section contains environmental restrictions for the OH-6A aircraft as given in paragraphs *a* through *d*. This section is not to be confused with normal procedures under adverse environmental conditions as given in chapter 8, section IV.

a. Ambient Air Temperature Restrictions. Engine operations below -54°C (-65°F) FAT are not authorized. Flight during ambient air temperatures above 32°C (90°F) must be accomplished with the standard (open front) engine air inlet fairing (fig. 2-11) installed. Cold weather (closed front) inlet fairing usage is restricted to ambient air temperatures of 32°C (90°F) or less.

b. Flight Restrictions in Falling or Blowing Snow or Icing Conditions. Intentional flight under icing conditions is prohibited. Unless equipped with a snow ingestion/cold weather kit (para 2-24), the OH-6A aircraft is restricted from flight in falling or blowing snow. Prior to any flight after the aircraft has been exposed to icing conditions, the following inspection must be performed.

(1) Ensure that the air inlet is clear of any snow or ice accumulation. Access for inspection and/or cleaning may be gained by opening the bypass door (fig. 2-10) (particle separator configuration), or removal of the access plate (fig. 2-10) (barrier filter configuration).

(2) All snow and/or ice accumulated on the forward upper portion of the aircraft must be removed prior to flight to prevent the frozen moisture from entering the inlet and clogging the filter.

(3) Inlet covers will be used for aircraft exposed to snow and icing conditions when inactive.

c. Salt Water Spray. If aircraft has been subjected to salt water, salt water spray, or operated within 10 miles of salt water, an appropriate entry will be made on DA Form 2408-13 for maintenance action.

d. Thunderstorms. Intention flight into thunderstorms is prohibited.

5-19. Flight Under Instrument Meteorological Conditions (IMC).

This aircraft is restricted to visual flight conditions.

SECTION VIII — OTHER LIMITATIONS

5-20. Heating, Defogging, and Ventilating System Limitations.

On Series 3 aircraft, with the engine airfilter scavenge air system functioning, the maximum cabin heat must be manually restricted by approximately 50 percent.

5-21. Electrical Fuel Pump.

The electrical fuel pump must be used continuously (1) whenever the aircraft is operated on emergency fuel, (2) whenever the operating altitude exceeds 15,000 ft. MSL, (3) whenever ambient air temperature exceeds 40°C (104°F).

5-22. Maximum Terrain Slope for Landing.

With the aircraft at a gross weight up to 2550 pounds, and loaded within the permissible center of gravity limits, landings can be performed in any direction up to 10-degree slopes. Down-slope landings are especially critical since the lower vertical stabilizer will contact the ground first and can cause tail rotor damage.

5-23. Main Rotor Protective Tape.

If protective tape is installed on the main rotor blades, the degradation in performance will be equivalent to approximately 70 lbs. increase in gross weight.

G

AIRSPEED OPERATING LIMITS

AIRSPEED
OPERATING LIMITS
OH-6A
T63-A-5A/-700

EXAMPLE

WANTED

MAXIMUM INDICATED AIRSPEED FOR VARIOUS TEMPERATURES PRESSURE ALTITUDES AND GROSS WEIGHTS

KNOWN

FAT = +15°C

PRESSURE ALTITUDE = 3000 FEET

GROSS WEIGHT = 2400 LB

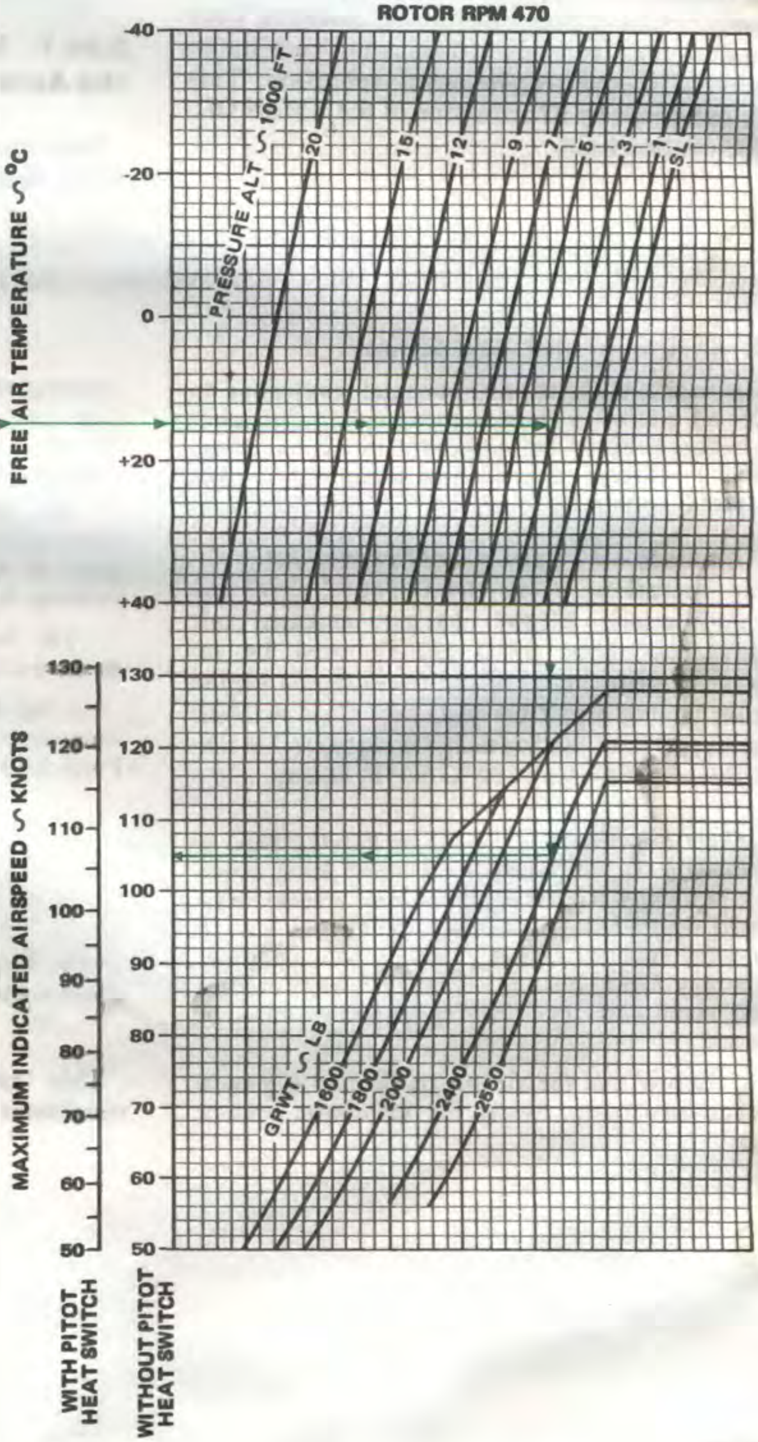
METHOD

ENTER FAT HERE

MOVE RIGHT TO PRESSURE ALTITUDE = 3000 FEET

MOVE DOWN TO GROSS WEIGHT = 2400 LB

MOVE LEFT READ MAXIMUM AIRSPEED = 105 KNOTS



DATA BASIS: FAA FLIGHT TEST, JULY 1967

10-119

Figure 5-3. Airspeed Operating Limits Chart.

SECTION VI — MANEUVERING LIMITS

5-34. Maneuvering Limits.

a. Maneuvers resulting in highly accelerated banks or dives can cause a temporary uncovering of the transmission oil pressure pump inlet and a momentary loss of transmission oil pressure. Loss of pressure for 5 seconds or less is not considered detrimental to the transmission operation. This will be indicated by illumination of the XMSN OIL PRESS caution light.

b. Aerobatic flight is prohibited.

c. Uncoordinated maneuvers shall not be performed when fuel quantity is 40 pounds or less, or when the fuel low caution light is illuminated.

5-34.1 Maximum Gross Weights for Practice Autorotations.

Practice touchdown autorotations are prohibited above 2220 pounds gross weight.

SECTION VII — ENVIRONMENTAL RESTRICTIONS

5-35. Environmental Restrictions.

This section contains environmental restrictions for the OH-6A aircraft as given in paragraphs *a* through *d*. This section is not to be confused with normal procedures under adverse environmental conditions as given in chapter 8, section IV.

a. Ambient Air Temperature Restrictions. Engine operations below -54°C (-66°F) FAT are not authorized. Flight during ambient air temperatures above 32°C (90°F) must be accomplished with the standard (open front) engine air inlet fairing (fig. 2-11) installed. Cold weather (closed front) inlet fairing usage is restricted to ambient air temperatures of 32°C (90°F) or less.

b. Flight Restrictions in Falling or Blowing Snow or Icing Conditions. Intentional flight under icing conditions is prohibited. Unless equipped with a snow ingestion/cold weather kit (para 2-24), the OH-6A aircraft is restricted from flight in falling or blowing snow. Prior to any flight after the aircraft has been exposed to icing conditions, the following inspection must be performed.

(1) Ensure that the air inlet is clear of any snow or ice accumulation. Access for inspection and/or cleaning may be gained by opening the bypass door (fig. 2-10) (particle separator configuration), or removal of the access plate (fig. 2-10) (barrier filter configuration).

(2) All snow and/or ice accumulated on the forward upper portion of the aircraft must be removed prior to flight to prevent the frozen moisture from entering the inlet and clogging the filter.

(3) Inlet covers will be used for aircraft exposed to snow and icing conditions when inactive.

c. Salt Water Spray. If the aircraft is exposed to salt water spray, an appropriate entry will be made on DA Form 2408-13 for maintenance action.

5-36. Flight Under Instrument Meteorological Conditions (IMC).

This aircraft is restricted to visual flight conditions.

All data and figure on page 5-11 is deleted.

Figure 5-4. Deleted.

SECTION VIII — HEIGHT VELOCITY

5-37. Minimum Height for Safe Landing After Engine Failure.

Airspeed-altitude combinations to be avoided in the event of an engine failure are shown in the height-velocity chart (fig. 5-5).

a. Green Region. The green region of the chart represents the area in which safe autorotational landings can be performed with average pilot skill and reaction time, using emergency procedures given in chapter 9.

b. Yellow Region. The yellow region of the chart is not a prohibited area but continuous operation in this area should be avoided as safe autorotational landings are difficult to perform when operating in these areas.

c. Red Regions. The red regions of the chart represent hazardous airspeed-altitude combinations from which an autorotational landing would be extremely difficult without incurring some degree of aircraft damage or occupant injury. Operation within the red regions is not prohibited but should be undertaken only if necessary, and with full understanding of the risk involved. Chapter 9 Emergency Procedures apply. Figure 5-5 is based upon sea level operation over a hard surface. Higher density altitudes and/or unfavorable landing surfaces create additional autorotational landing difficulties.

SECTION IX — OTHER LIMITATIONS

5-38. Heating and Defogging System Limitations.

Refer to paragraphs 2-58 and 2-59 for restrictions associated with the heating, defogging and ventilation system.

5-39. Maximum Terrain Slope for Landing.

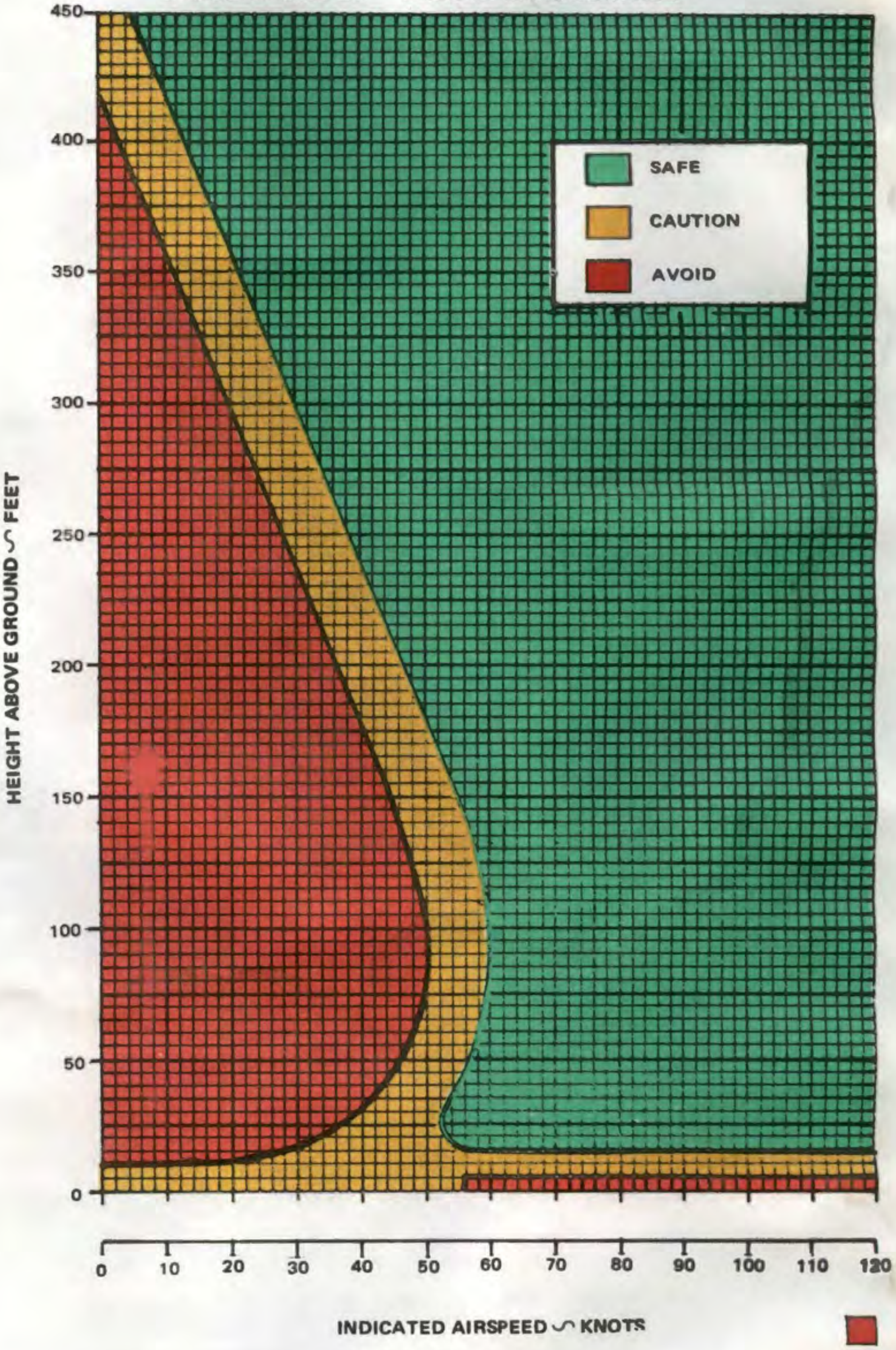
With the aircraft at a gross weight up to 2550 pounds, and loaded within the permissible center of gravity limits, landings can be performed in any direction up to 10-degree slopes. Down-slope landings are especially critical since the lower vertical stabilizer will contact the ground first and can cause tail rotor damage.

R
Y
G

MINIMUM HEIGHT
OH-6A
T63-A-5A/-700

MINIMUM HEIGHT FOR SAFE LANDING AFTER ENGINE FAILURE CHART

484 ROTOR RPM CALM WIND
GROSS WT 2550 LB SMOOTH HARD SURFACE



DATA BASIS: FAA & HUGHES FLIGHT TEST, SEPT 1968, REPT. NO. 369-FT-8043

10-122

Figure 5-5. Minimum Height for Safe Landing After Engine Failure.

CHAPTER 6

WEIGHT/BALANCE AND LOADING

SECTION I — GENERAL

6-1. Purpose.

This chapter provides information required for aircraft loading and computation of weight and balance.

6-2. Extent of Coverage.

This chapter contains sufficient instructions and data so that an aviator knowing the basic weight and moment of the aircraft can compute any combination of weight and balance, using the prescribed Army charts and forms.

6-3. Aircraft Class.

Army OH-6A aircraft are in class 2. Additional directives governing weight and balance class 2 aircraft forms and records are contained in AR 95-16, DA PAM 738-751, and TM 55-1500-342-23, Army Aviation Maintenance Engineering Manual-Weight and Balance.

6-4. Aircraft Compartments and Stations.

The OH-6A aircraft contains a cockpit and a cabin. Figure 6-1 provides a diagram showing reference datum location and compartment stations. The primary purpose of this diagram is to aid the pilot or weight and balance personnel in computation of aircraft weight/balance and loading.

SECTION II — WEIGHT AND BALANCE

6-5. Purpose.

This section contains information needed to compute the weight and balance for an individual aircraft, using the prescribed standard charts and forms.

6-6. Weight Definitions.

a. Basic Weight. The basic weight of the aircraft is that weight which includes all fixed operating equipment, to which it is only necessary to add the variable or expendable items for the various missions.

b. Operating Weight. The operating weight of the aircraft is the basic weight plus those variable items which remain substantially constant for the primary mission; these items include crew, crew baggage, emergency and extra equipment that may be required.

c. Gross Weight. The gross weight is the total weight of the aircraft and its contents.

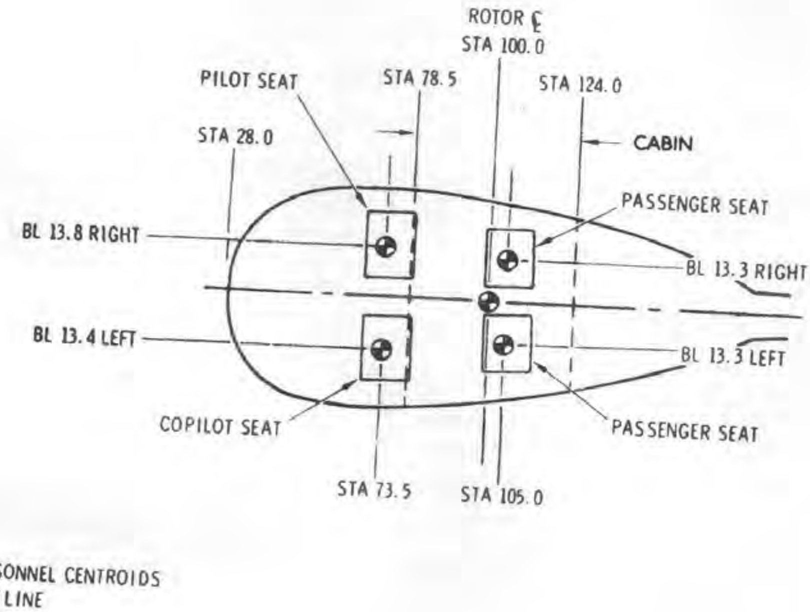
6-7. Balance Definitions.

a. Reference Datum. The reference datum is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.

b. Arm. For balance purposes, the term arm is the horizontal distance in inches from the reference datum to the center of gravity of a given item. Arms may be determined from figure 6-1.

c. Moment. Moment is the weight of an item multiplied by its arm. For the OH-6A aircraft, moment divided by 100 (moment/100) is used to simplify balance calculations by reducing the number of digits.

d. Average Arm. Average arm is the arm obtained by adding the weights and adding the moments of a number of items and dividing the total moment by the total weight.



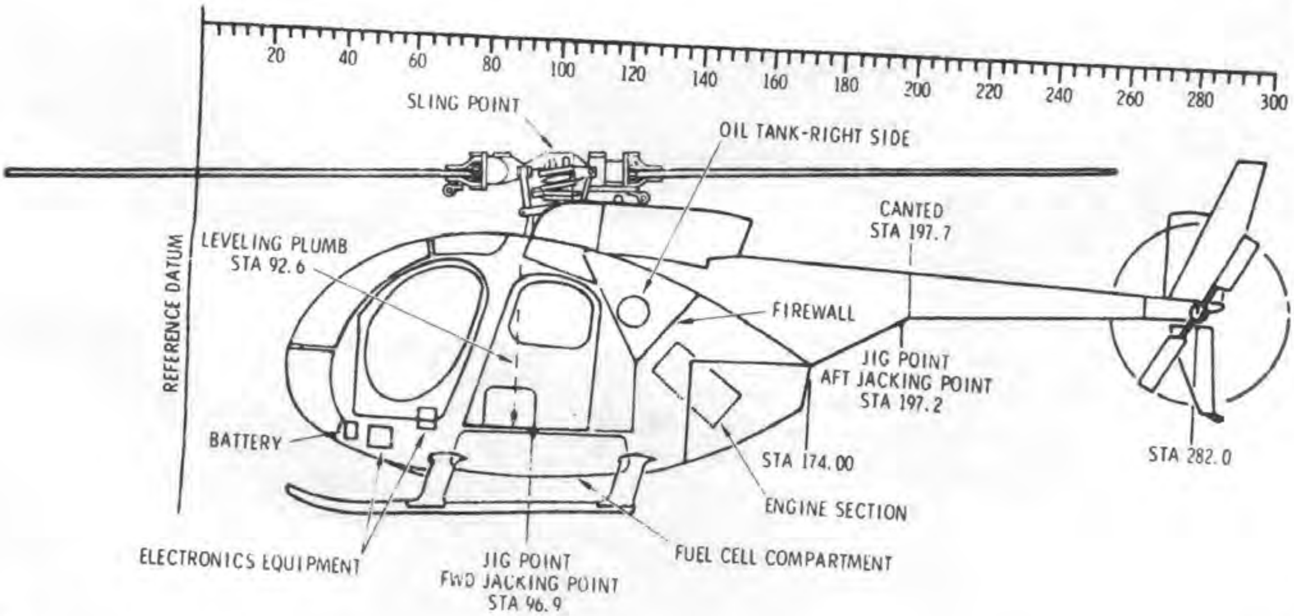


Figure 6-1. Aircraft Compartments and Station Diagram.

e. Basic Moment. Basic moment is the sum of the moments of all items making up the basic weight. When using data from an actual weighing of the aircraft, the basic moment is the total moment of the basic aircraft with respect to the reference datum.

f. Center of Gravity (CG). Center of gravity is the point about which the helicopter would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the gross weight of the helicopter.

g. CG Limits. CG limits are the extremes of movement to which the cg can travel without making the helicopter unsafe to fly. The cg of the loaded helicopter must be within these limits at takeoff, in the air, and during landing.

6-8. Charts and Forms.

The standard system of weight and balance control requires the use of several charts and forms. Refer to paragraphs 6-9 and 6-10.

6-9. Chart C - Basic Weight and Balance Record, DD Form 365-3.

Form 365-3 is a continuous history of the basic weight and moment resulting from stuctural and equipment changes in service. At all times, the last weight and moment/100 entries are considered the current weight and balance status of the basic aircraft. Refer to TM 55-1500-342-23 for preparation of DD Form 365-3.

6-10. Weight and Balance Clearance Form F, DD Form 365-4.

Form 365-4 is the summary of the actual disposition of load in the aircraft. It records the balance status of the aircraft step by step. It serves as a work sheet on which to record weight and balance calculations and any corrections that must be made to ensure that the aircraft will be within weight and cg limits. Refer to TM 55-1500-342-23 for preparation of Form 365-4.

SECTION III - FUEL OIL

6-11. Fuel and Oil Data

The OH-6A is equipped with a pair of interconnected fuel tanks (cells). When the actual or planned fuel loading (pounds or gallons) is known, the total fuel weight and moment/100 can be readily determined from the fuel moment chart, Figure 6-2, by following the example given in the chart. For weight and balance purposes, engine oil is a part of the aircraft basic weight.

Figure 6-2. Chart C - Basic Weight and Balance Record

Deleted

G

FUEL MOMENT

JP-4 FUEL – 6.5 LB/GAL

FUEL MOMENT
OH-6A
T63-A-5A/-700

EXAMPLE

WANTED

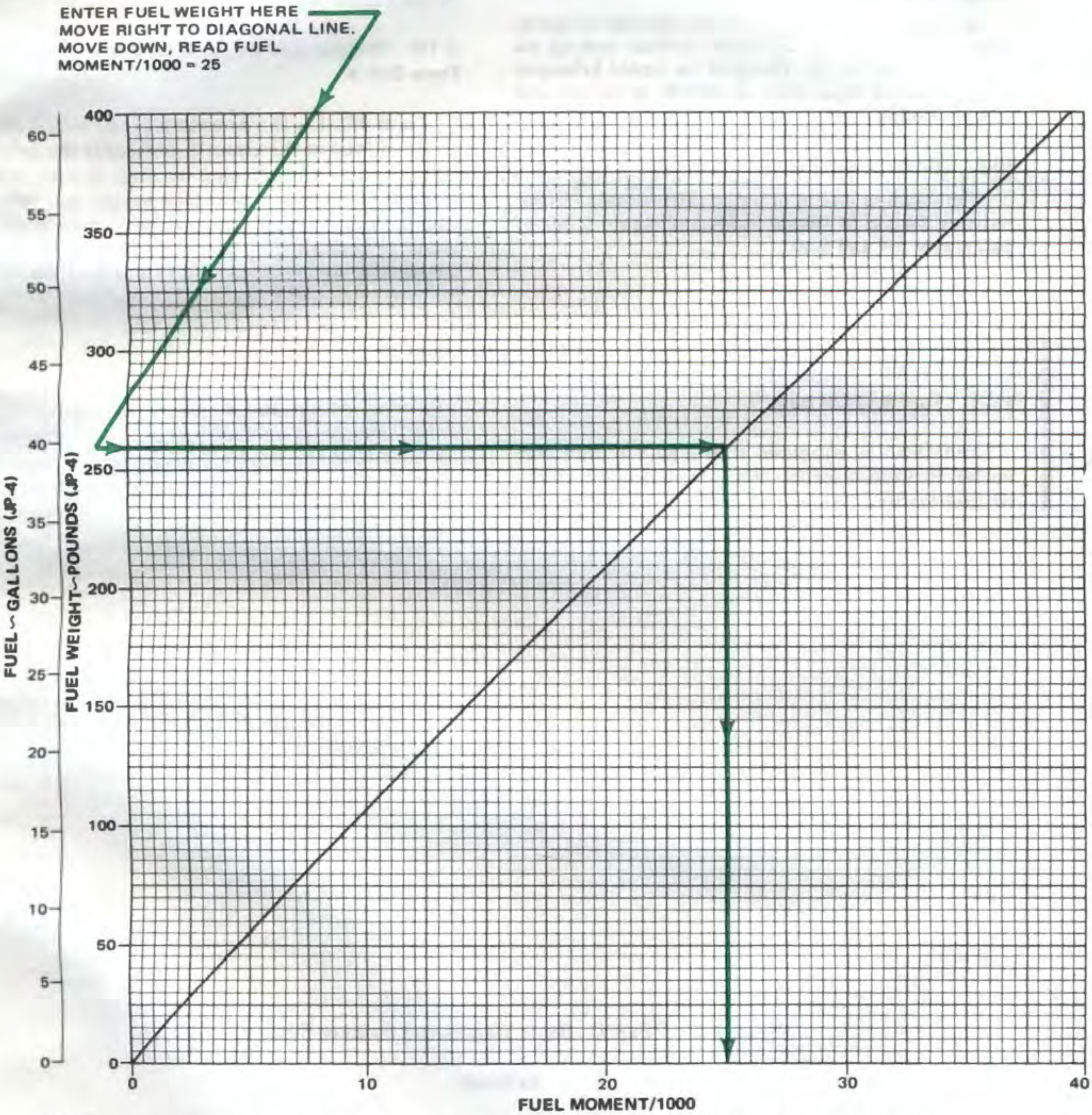
FUEL MOMENT/1000

KNOWN

FUEL QUANTITY = 260 POUNDS (40 GALLONS)

METHOD

ENTER FUEL WEIGHT HERE
MOVE RIGHT TO DIAGONAL LINE.
MOVE DOWN, READ FUEL
MOMENT/1000 = 25



NOTE: FUEL WEIGHTS AND MOMENTS APPLICABLE TO EITHER CRASH-RESISTANT FUEL SYSTEM OR NON-CRASH-RESISTANT FUEL SYSTEM.

10-136

Figure 6-2. Fuel Moment Chart.

SECTION IV — PERSONNEL

6-12. General.

See figure 6-1. Personnel provisions consist of the pilots and copilots seats located in the flight compartment and two troop seats located in the cabin.

6-13. Personnel Moments.

Refer to figure 6-3. Whenever the aircraft is operated near CG or its maximum gross weight limits, the exact weight and moment of each individual occupant, including his personal equipment, should be used for weight and balance computation. If weighing facilities are not available, or if the tactical situation does not permit weighing, compute personnel loads and moment/100 as follows:

a. Crew and passengers without tactical equipment: compute weight according to each individual's estimate.

b. Combat equipped soldiers: 240 pounds per person.

c. Combat equipped paratroops: 260 pounds per person.

6-14. Use of Personnel Moments Chart.

Using actual or calculated crew and passenger weights, follow the example given in figure 6-3 to obtain total personnel weights and moments/100.

SECTION V — MISSION EQUIPMENT

6-15. General.

OH-6A mission equipment consists of the installed avionics equipment, armor protection equipment, and the M27 armament subsystem.

6-16. Mission Equipment Moments.

Weights and moments of currently install avionics equipment and armor protective equipment are included in the aircraft's chart C - *Basic* Weight and Balance Record; refer to paragraph 6-9. To obtain M27 armament system weights and moments, refer to table 6-1.

Table 6-1. Armament Subsystem Weights and Moments

Item		Weight (lb)	Moment/100
M27 armament subsystem (with ammunition container, without ammunition)		105	97
7.62 mm ammunition:			
	100 rounds	6	6
	200	13	12
	300	19	18
	400	26	24
	500	32	30
	600	39	36
	700	45	42
	800	51	47
	900	58	54
	1000	64	59
	1100	70	65
	1200	77	71
	1300	83	77
	1400	90	83
	1500	96	89
	1600	102	95
	1700	109	101
	1800	115	107
	1900	122	113
	2000	128	119
Spare 7.62 mm ammunition container, (without ammunition)		10	9

G

PERSONNEL MOMENTS

PERSONNEL MOMENTS
OH-6A
T63-A-6A/-700

EXAMPLE

WANTED

PERSONNEL MOMENT

KNOWN

PILOT WEIGHT = 200 LB

METHOD

ENTER WEIGHT HERE
MOVE RIGHT TO INTERSECTION WITH PILOT/COPILOT SEAT LINE, MOVE DOWN, READ MOMENT/100 = 147

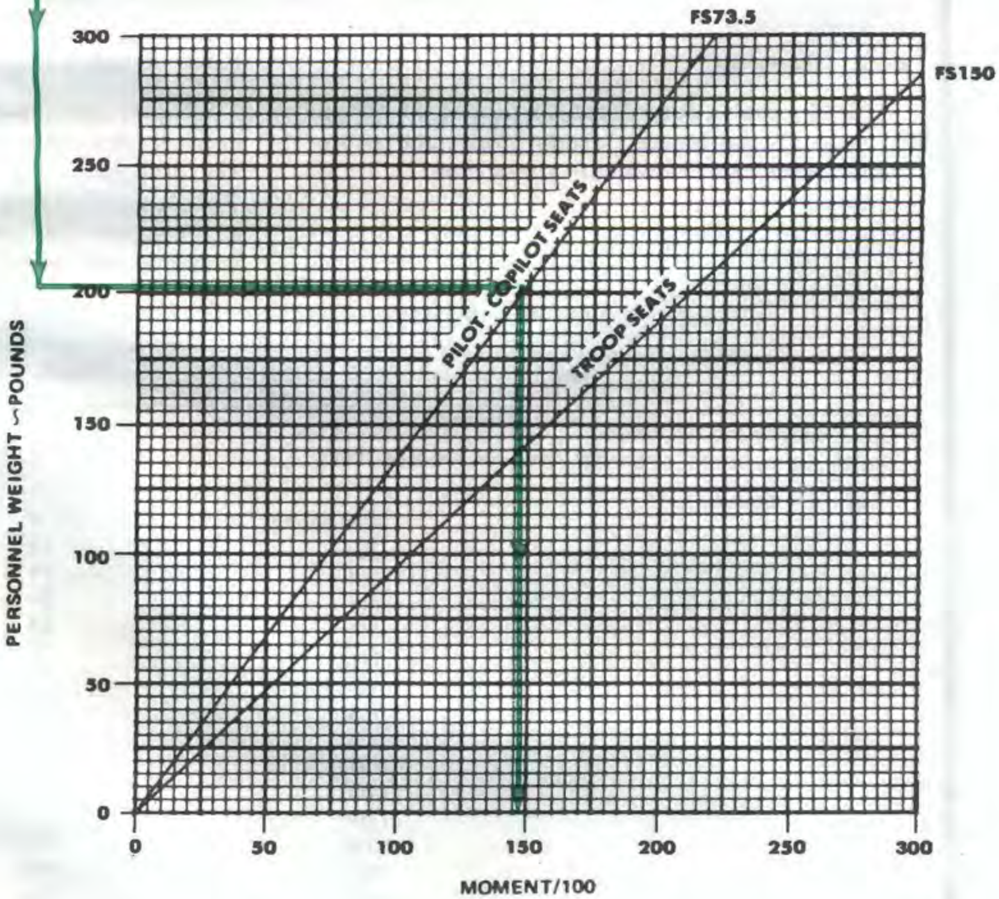


Figure 6-3. Personnel Moments Chart

SECTION VI — CARGO LOADING

6-17. General.

The cabin has a volume of approximately 40 cubic feet, and a maximum capacity of 950 pounds. Access to the cargo compartment is provided by two doors, one on each side of the aircraft. The two removable passenger/troop seats are foldable with provisions for in-place stowage. Removable tiedown fittings are secured to the floor.

a. Cabin Doors. Package size limits for loading through cabin doors are shown in figure 6-4.

b. Cabin Floor. The cabin floor (fig. 6-5) is alclad sheet, with transverse hat section stiffeners serving as the load bearing surface. The floor has a maximum loading capacity of 115 pounds per square foot. Cargo tiedown fittings are provided and there are six attachment provisions at each side of the compartment. Each tiedown fitting has a quick release pin, lanyard attached to prevent loss.

c. Stowage of Troop Seat and Belts. The two troop seats are attached to the cabin floor and the cabin aft bulkhead. Each seat is secured by six quick-release pins which attach the seat framework and back support to the bulkhead fittings and a cabin floor hat-section stiffener. Each seat can be stowed by removing the quick-release pins securing the seat legs to the floor, lifting the seat forward edge straight up, and folding it back against the bulkhead, then fastening the seat in place with the stowing strap. The seat belts are stowed by buckling the safety belt and folding the belt up within the seat.

d. Preparation of General Cargo. Prior to loading, loading personnel should investigate such data as weight, dimensions, center of gravity locations, and floor contact areas of the item of equipment for use in positioning the load. Refer to section II for weight and balance computations and cg locations, and to figure 6-5 for cargo floor contact area with cg limits. The maximum permissible dimensions of cargo items and package sizes are shown in figure 6-4. Measure all cargo items that appear to have critical dimensions for loading.

6-18. Cargo Center of Gravity.

Refer to section II for weight and balance planning and to figure 6-5 for cargo center of gravity planning.

6-19. Securing Loads.

CAUTION

Cargo shall be secured so that it will not bear against the aft bulkhead. Do not exceed the maximum floor loading capacity of 115 pounds per square foot. If the cargo item does not meet this limitation, use suitable shoring material to spread the weight over a larg: area of the floor.

6-20. Cargo Moments.

Whenever the aircraft is operated near its maximum gross weight, the exact weight and moment of all cargo should be used for weight and balance computations. If weighing facilities are not available, or if the tactical situation does not permit weighing, cargo weight should be estimated in terms of probable maximum weight to reduce the likelihood of underestimating.

6-21. Use of Cargo Moments Charts.

Using actual estimated cargo weight, follow the example given in figure 6-6 to obtain the total cargo weight and corresponding moment/1000.

SECTION VII — CENTER OF GRAVITY

6-22. Purpose.

This section contains information needed to determine whether the aircraft loading (gross weight and moment combination) will fall within the aircraft center of gravity limits.

6-23. Center of Gravity Limits Chart.

Use total weight and total moment figures entered in weight and balance Form F, follow the example given in Figure 6-7 to determine whether the aircraft load and center of gravity combination are within limits. The resultant arm (inches) figure read from the bottom scale of the chart corresponds to the aircraft's center of gravity for that particular gross weight and total moment combination.

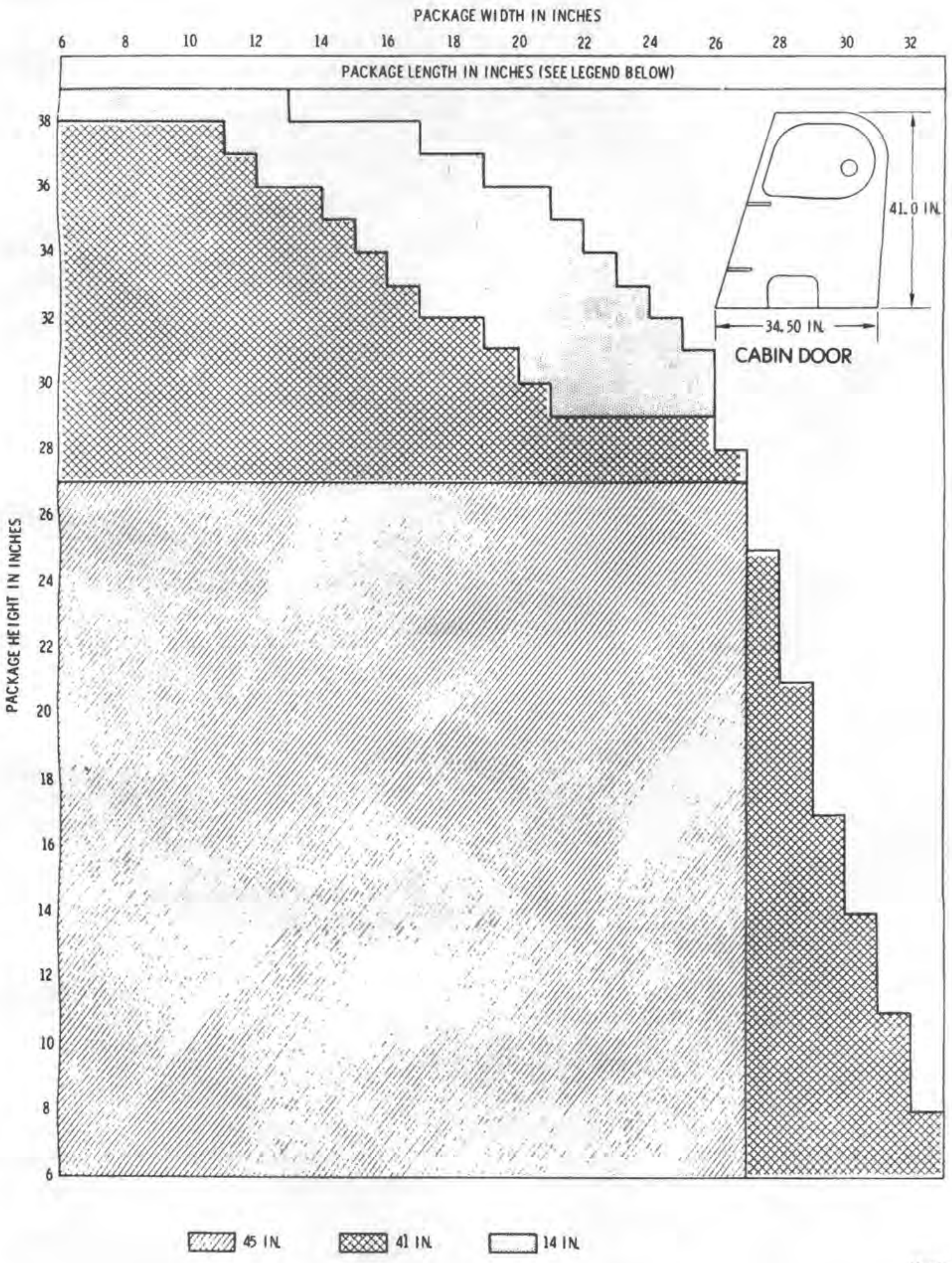


Figure 6-4. Package Size Limits for Loading Through Cabin Doors.

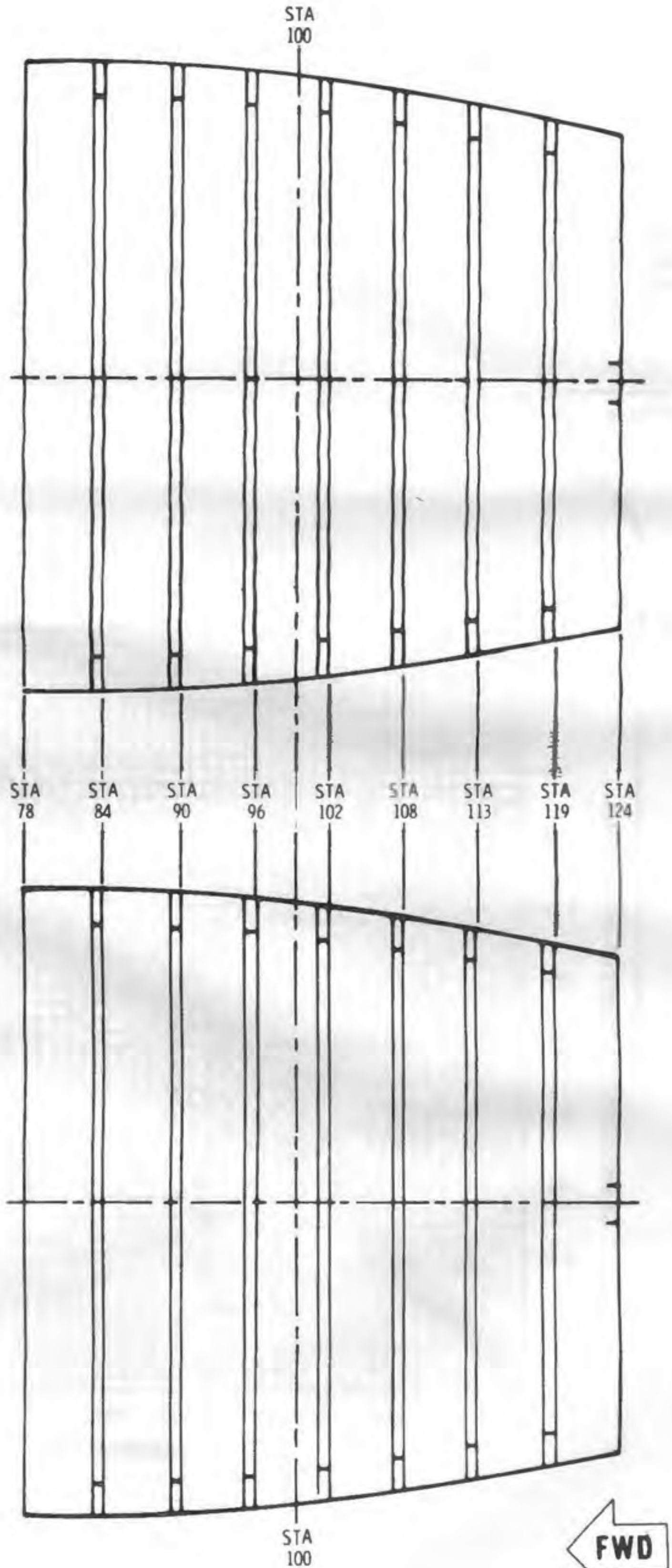


Figure 6-5. Floor Loading Center of Gravity Limit Diagram.

G

CARGO MOMENT

CARGO MOMENT
OH-6A
T63-A-5A/-700

EXAMPLE

WANTED

DETERMINE CARGO MOMENT

KNOWN

CARGO WEIGHT = 500 POUNDS
CARGO DECK STATION STATION LOCATION = 90.6

METHOD

ENTER CARGO WEIGHT HERE
MOVE RIGHT TO CARGO LOCATION,
MOVE DOWN, READ
MOMENT/100 = 460

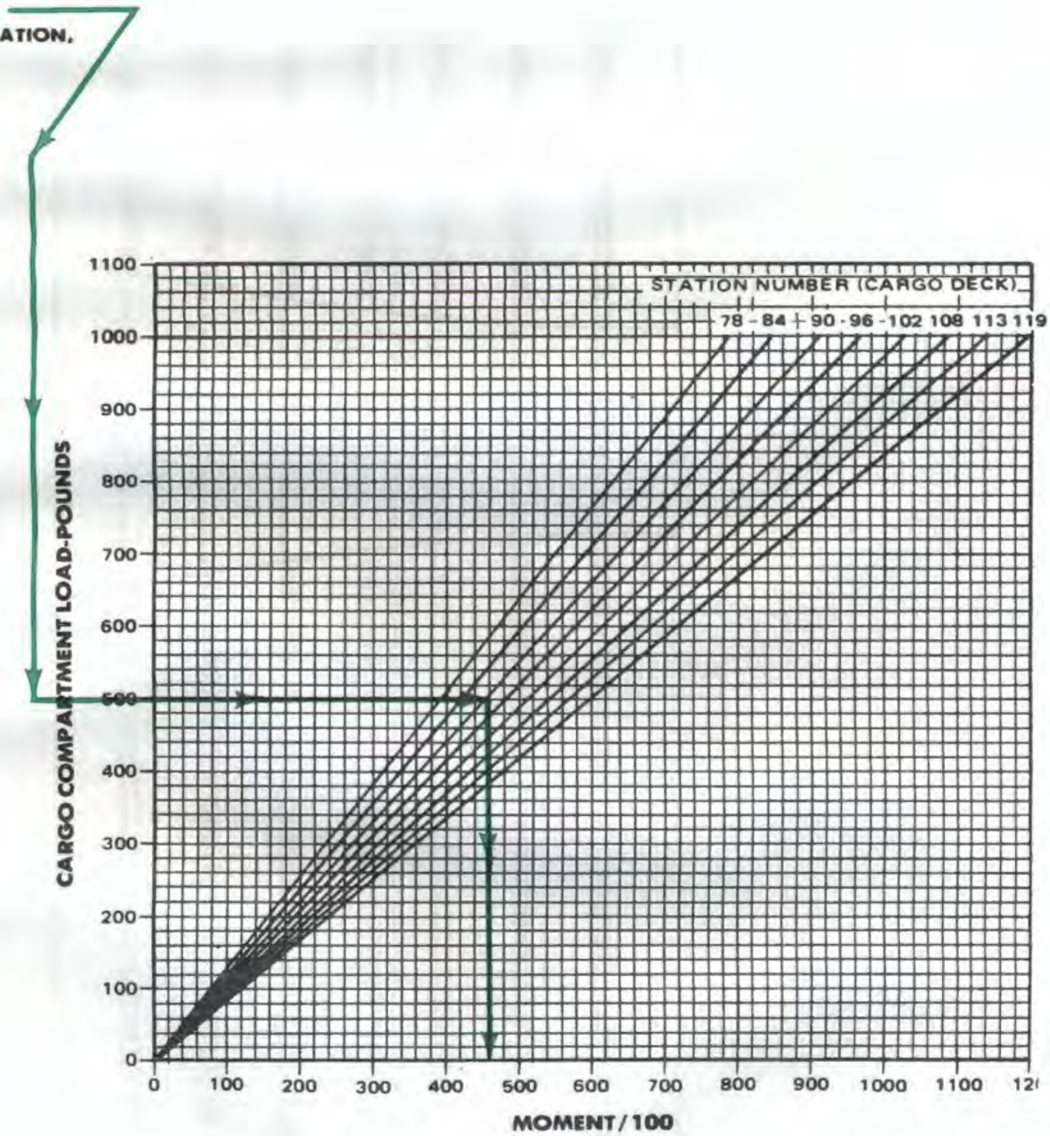


Figure 6-6. Cargo Moment Chart

CENTER OF GRAVITY LIMITS

CG LIMITS
OH-6A
T63-A-5A/-700

EXAMPLE

WANTED

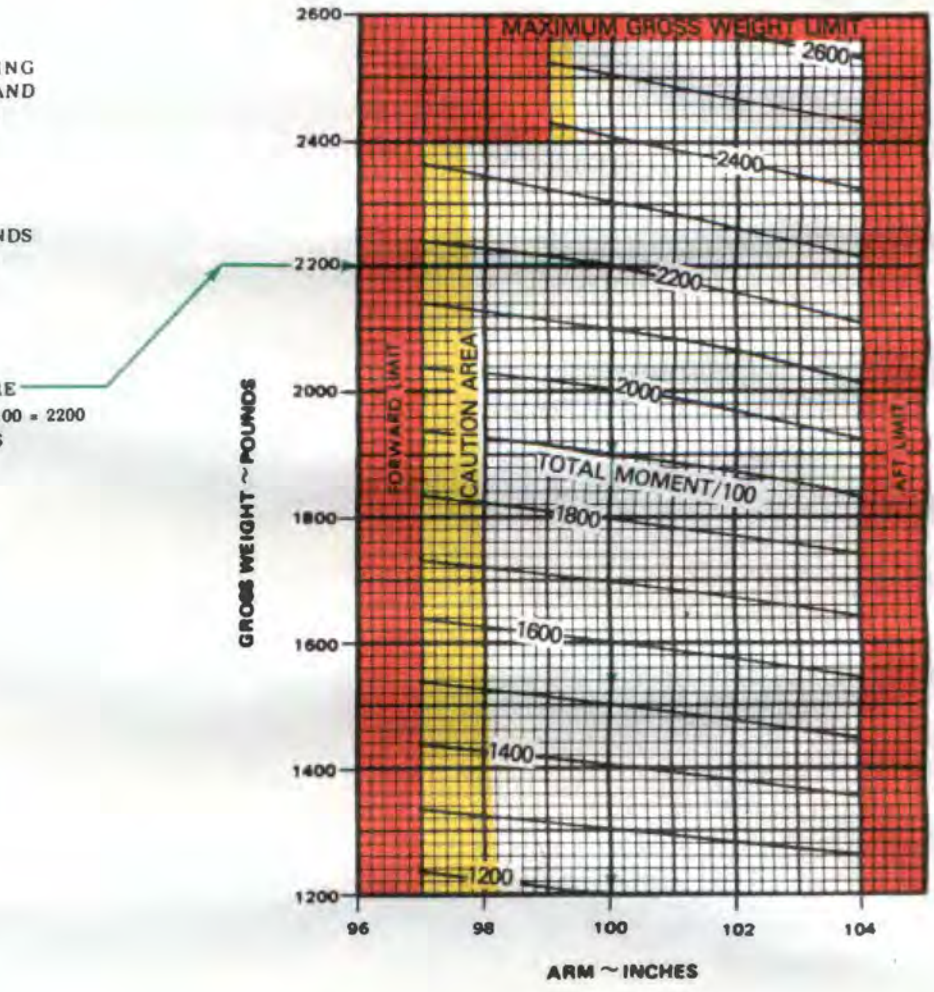
DETERMINE IF LOADING LIMITS ARE EXCEEDED AND DETERMINE C.G. POSITION

KNOWN

GROSS WEIGHT = 2200 POUNDS
TOTAL MOMENT/100 = 2200

METHOD

ENTER GROSS WEIGHT HERE
MOVE RIGHT TO MOMENT/100 = 2200
READ LOAD WITHIN LIMITS
MOVE DOWN READ
ARM = 100 (CG LOCATION)



CAUTION TAKE-OFF WITH THE CG WITHIN THE CAUTION ZONE MAY RESULT IN THE FORWARD CG LIMIT BEING EXCEEDED WHEN FUEL IS EXPENDED DURING FLIGHT. IF TAKE-OFF CG FALLS WITHIN THE CAUTION ZONE, CHECKS AT INTERMEDIATE FUEL LOADINGS BETWEEN TAKE-OFF AND LANDING MUST BE MADE TO ASSURE THE AIRCRAFT CG WILL REMAIN WITHIN THE CG LIMITS DURING FLIGHT.
MOST FORWARD CG OCCURS WITH 150 lbs FUEL REMAINING.

Figure 6-7. Center of Gravity Limits Chart.

G

CARGO MOMENT

CARGO MOMENT
OH-6A
T63-A-5A/-700

EXAMPLE

WANTED

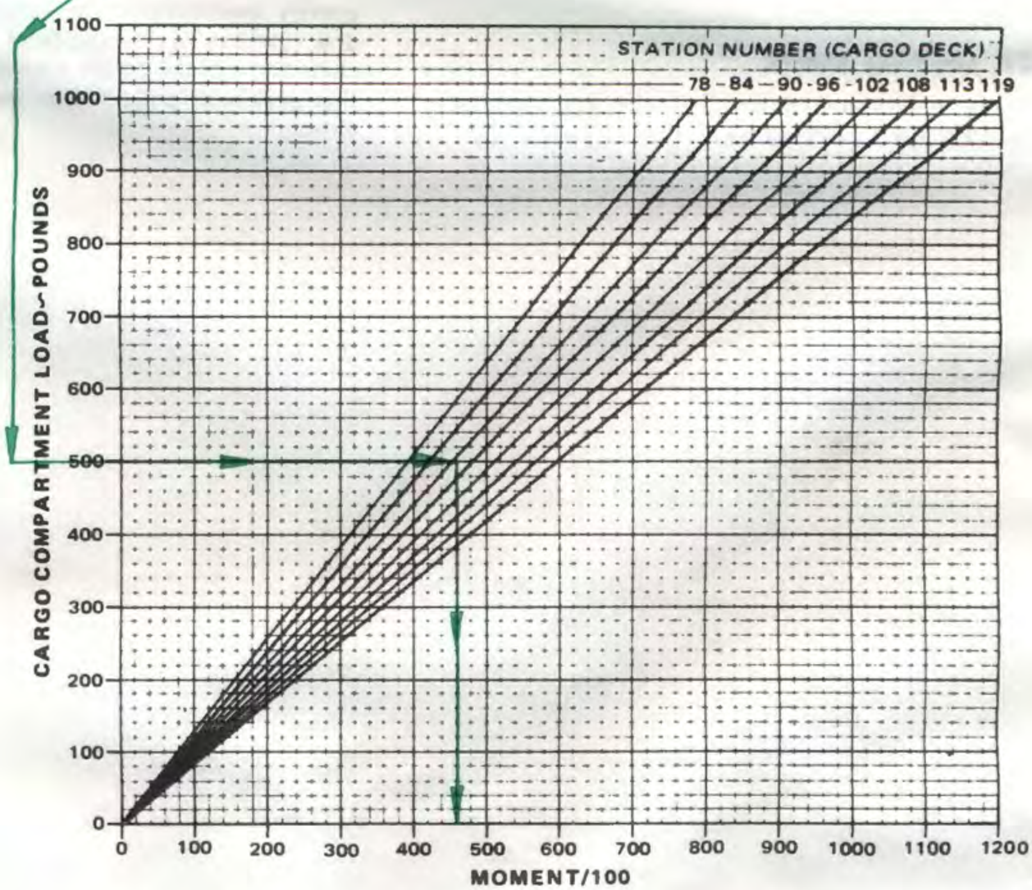
DETERMINE CARGO MOMENT

KNOWN

CARGO WEIGHT = 500 POUNDS
CARGO DECK STATION STATION
LOCATION = 90.6

METHOD

ENTER CARGO WEIGHT HERE.
MOVE RIGHT TO CARGO LOCATION,
MOVE DOWN, READ
MOMENT/100 = 460



10-137

Figure 6-8. Cargo Moment Chart.

SECTION VI — FUEL/OIL

6-23. Fuel and Oil Data.

The OH-6A is equipped with a pair of interconnected fuel tanks (cells) and a single engine oil tank.

6-24. Fuel Weight and Moment.

When the actual or planned fuel loading (pounds or gallons) is known, the total fuel weight and moment/100 can be readily determined from the fuel moment chart, figure 6-9, by following the example given in the chart.

6-25. Oil Data.

For weight and balance purposes, engine oil is a part of aircraft basic weight.

SECTION VII — ALLOWABLE LOADING

6-26. Purpose.

This section contains information needed to determine whether the aircraft loading (gross weight and moment combination) will fall within the aircraft center of gravity limits.

6-27. Loading Limits.

Gross weight and center of gravity limits are contained in chapter 5, section IV.

6-28. Center of Gravity Limits Chart.

Using the total weight and total moment figures entered in Weight and Balance Clearance Form F (para 6-11), follow the example given in figure 6-10 to determine whether the aircraft load and center of gravity combination are within limits. The resultant arm (inches) figure read from the bottom scale of the chart corresponds to the aircraft's center of gravity for that particular gross weight and total moment combination.

G

FUEL MOMENT

JP-4 FUEL – 6.5 LB/GAL

FUEL MOMENT
OH-6A
T63-A-5A/-700

EXAMPLE

WANTED

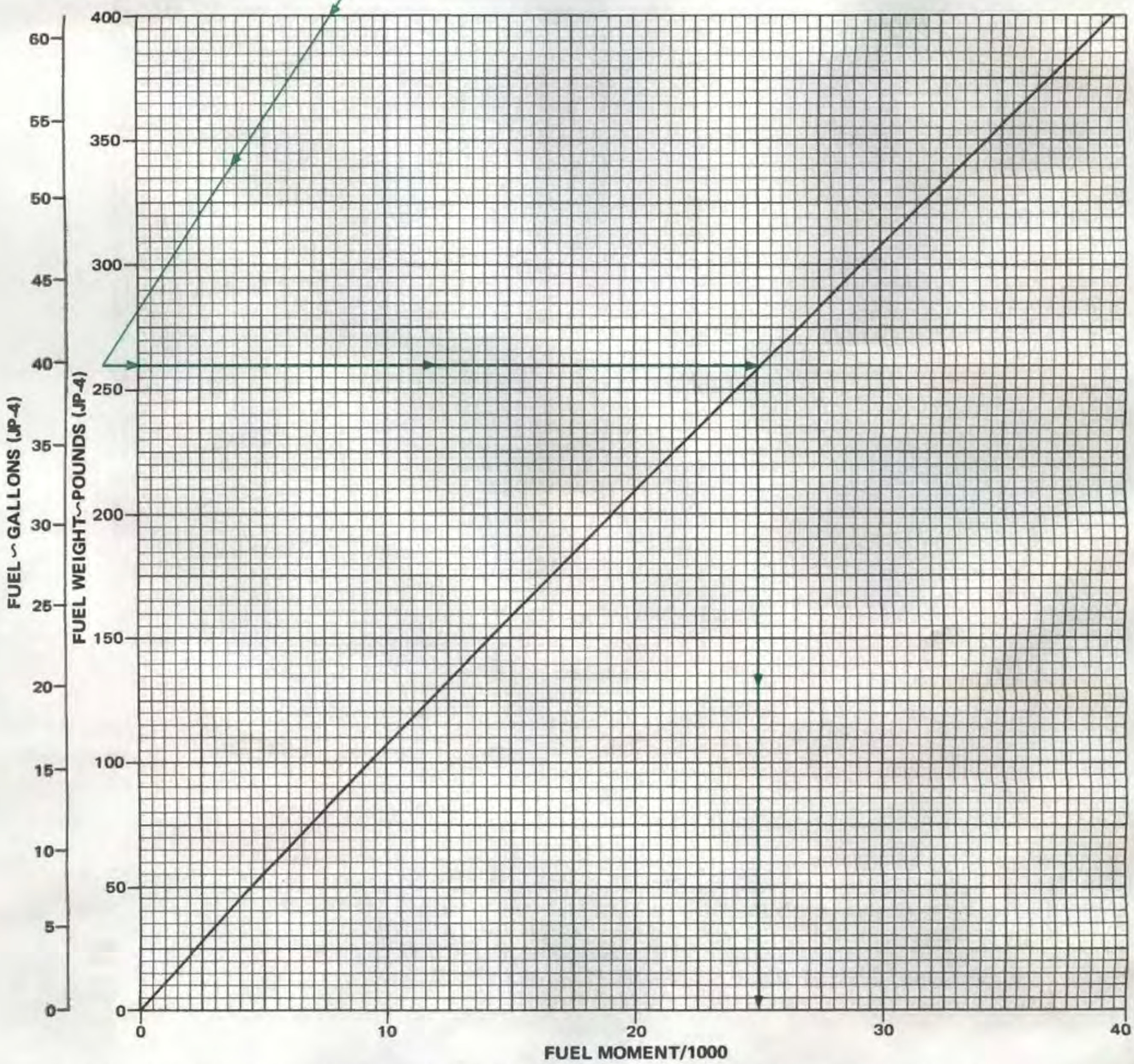
FUEL MOMENT/1000

KNOWN

FUEL QUANTITY = 260 POUNDS (40 GALLONS)

METHOD

ENTER FUEL WEIGHT HERE
MOVE RIGHT TO DIAGONAL LINE.
MOVE DOWN, READ FUEL
MOMENT/1000 = 25



NOTE: FUEL WEIGHTS AND MOMENTS APPLICABLE TO EITHER CRASH-RESISTANT FUEL SYSTEM OR NON-CRASH-RESISTANT FUEL SYSTEM.

10-136

Figure 6-9. Fuel Moment Chart.

CENTER OF GRAVITY LIMITS

EXAMPLE

WANTED

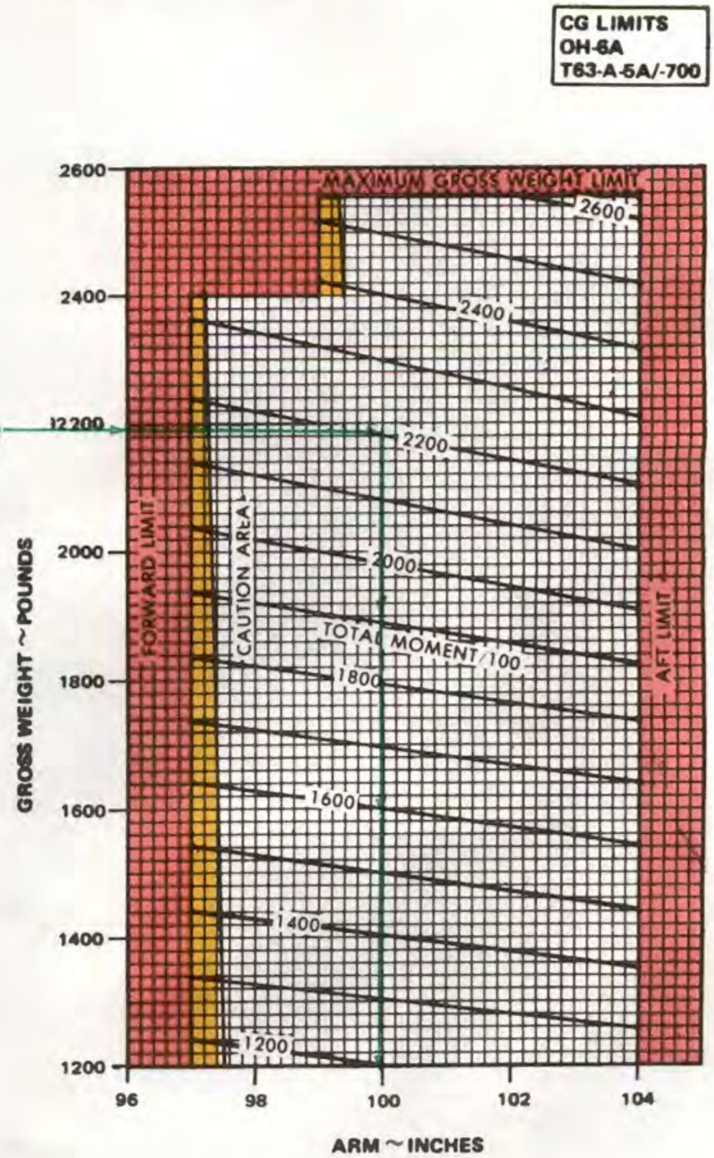
DETERMINE IF LOADING LIMITS ARE EXCEEDED AND DETERMINE C.G. POSITION

KNOWN

GROSS WEIGHT = 2200 POUNDS
TOTAL MOMENT/100 = 2200

METHOD

ENTER GROSS WEIGHT HERE
MOVE RIGHT TO MOMENT/100 = 2200
READ LOAD WITHIN LIMITS
MOVE DOWN READ
ARM = 100 (CG LOCATION)



CAUTION TAKE-OFF WITH THE CG WITHIN THE CAUTION ZONE MAY RESULT IN THE FORWARD CG LIMIT BEING EXCEEDED WHEN FUEL IS EXPANDED DURING FLIGHT. IF TAKE-OFF CG FALLS WITHIN THE CAUTION ZONE, CHECKS AT INTERMEDIATE FUEL LOADEINGS BETWEEN TAKE-OFF AND LANDING MUST BE MADE TO ASSURE THE AIRCRAFT CG WILL REMAIN WITHIN THE CG LIMITS DURING FLIGHT.

Figure 6-10. Center of Gravity Limits Chart.

CHAPTER 7

PERFORMANCE DATA

SECTION I — INTRODUCTION

7-1. Purpose.

The purpose of this chapter is to provide the best available performance data for the OH-6A helicopter. Regualr use of this information will enable you to receive maximum safe utilization from the aircraft. Although maximum performance is not always required, regular use of this chapter is recommended for the following reasons. The information provided in this chapter is primarily intended for mission planning and is most useful when planning operations in unfamiliar areas or at extreme conditions. The data may also be used inflight, to establish unit or area standing operating procedures, and to inform ground commanders of performance/risk tradeoff.

a. Knowledge of performance margin will allow you to make better decisions when unexpected conditions or alternate missions are encountered.

b. Situations requiring maximum performance will be more readily recognized.

c. Familiarity with the data will allow performance to be computed more easily and quickly.

d. Experience will be gained in accurately estimating the effects of variables for which data are not presented.

7-2. Chapter 7 Index.

The following index contains a list of the sections and their titles, the figure numbers, subjects and page numbers of each performance data chart contained in this chapter.

7-3. General.

The data presented covers the maximum range of conditions and performance that can reasonably be expected. In each area of performance, the effects of altitude, temperature, gross weight, and other parameters relating to that phase of flight are presented. In addition to the presented data, your judgment and experience will be necessary to accurately obtain performance under a given set of circumstances. The conditions for the data are listed under the title of each chart. The effects of different conditions are discussed in the text accompanying each phase of performance. Where practical, data are presented at conservative conditions. However NO GENERAL CONSERVATISM HAS BEEN APPLIED. All performance data presented are within the applicable limits of the aircraft.

CAUTION

Exceeding operation limts can cause permanent damage to critical components. Over-limit operation can decrease performance, cause immediate failure, or failure on a subsequent flight.

7-4. Limits.

Applicable limits are shown on the charts as red lines. Performance generally deteriorates rapidly beyond limits. If limits are exceeded, minimize the amount and time. Enter the maximum value and time above limits on DA Form 2408-13 so proper maintenance action can be taken.

7-5. Use of Charts.

a. Chart Explanation. The first page of each section describes the chart(s) and explains its uses.

b. Color Coding. Chart color codes are used as follows.

(1) Green is used for example guidelines.

(2) Red is used for limit lines.

(3) Yellow is used for precautionary or time-limited operation.

c. Reading the Charts. The primary use of each chart is given in an example and a green guideline is provided to help you follow the route through the chart. The use of a straight edge (ruler or page edge) and a hard fine point pencil is recommended to avoid cumulative errors. The majority of the charts provide a standard pattern for use as follows: enter first variable on top left scale, move right to the second variable, reflect down at right angles to the third varible, reflect left at right angles to the fourth variable, reflect down, etc., until the vinal variable is read out at the final scale. In addition to the primary use, other uses of each chart are explained in the text accompanying each

Chapter 7 Index

Chapter 7 Index (Cont)

set of performance charts. Colored registration blocks located at the bottom and top of each chart are used to determine if slippage has occurred during printing. Letter codes (G, green; R, red; and Y, yellow) adjacent to the upper or lower registration blocks are used to indicate whether the colors have been printed in their intended positions. If slippage has occured, or if colors are printed incorrectly, refer to chapter 5 for correct operating limits.

NOTE

An example of an auxiliary use of the charts referenced above is as follows: Although the hover chart is primarily arranged to find torque required to hover, by entering torque available as torque required, maximum skid height for hover can also be found. In general, any single variable can be found if all others are known. Also, the tradeoffs between two variables can be found. For example, at a given density altitude and pressure altitude, you can find the maximum gross weight capability as free air temperature changes.

7-6. Data Basis.

The type of data used is indicated at the bottom of each performance chart under DATA BASIS. The applicable report and date of the data are also given. The data provided generally is based on one of four categories:

a. Flight Test Data. Data obtained by flight test of the aircraft by experienced flight test personnel at precise conditions using sensitive calibrated instruments.

b. Derived From Flight Test. Flight test data obtained on a similar rather than the same aircraft and series. Generally small corrections will have been made.

c. Calculated Data. Data based on tests, but not on flight test of the complete aircraft.

d. Estimated Data. Data based on estimates using aerodynamic theory or other means but not verified by flight test.

7-7. Specific Conditions.

The data presented are accurate only for specific conditions listed under the title of each chart. Variables for which data are not presented, but which may affect that phase of performance, are discussed in the text. Where data are available or reasonable estimates can be made, the amount that each variable affects performance will be given.

7-8. General Conditions.

In addition to the specific conditions, the following general conditions are applicable to the performance data.

a. Rigging. All airframe and engine controls are assumed to be rigged within allowable tolerances.

b. Pilot Technique. Normal pilot technique is assumed. Control movements should be smooth and continuous.

c. Aircraft Variation. Variations in performance between individual aircraft are known to exist; however, they are considered to be small and cannot be individually accounted for.

d. Instrument Variation. The data shown in the performance charts do not account for instrument inaccuracies or malfunctions.

e. Calibrated Torque. Variations between calibrated and indicated torque are known to exist, however, they are considered to be small and cannot be accounted for.

f. Configuration. Except as otherwise noted, all data is for the clean configuration (all doors installed, without armament). All data is based upon operation without protective tape (para 2-52) installed on main rotor blades; with tape installed, the degradation in performance will be equivalent to approximately a 70 pound increase in gross weight.

7-9. Performance Discrepancies.

Regular use of this chapter will allow you to monitor instruments and other aircraft systems for malfunction, by comparing actual performance with planned performance. Knowledge will also be gained concerning the effects of variables for which data are not provided, thereby increasing the accuracy of performance predictions.

7-10. Definitions of Abbreviations.

a. Unless otherwise indicated in the following list of abbreviations, abbreviations and symbols used in this manual conform to those established in Military Standard MIL-STD-12, which is periodically revised to reflect current changes in abbreviations usage. Accordingly, it may be noted that certain previously established definitions have been replaced by more current abbreviations and symbols.

b. Capitalization and punctuation of abbreviations varies, depending upon the context in which they are used. In general, lower case abbreviations are used in text material, whereas abbreviations used in charts and illustrations appear in full capital letters. Periods do not usually follow abbreviations; however, periods are used with abbreviations that could be mistaken for whole words if the period were omitted.

c. The following list provides definitions for abbreviations used in this manual. The same abbreviation applies for either singular or plural applications.

List of Abbreviations

Abbreviation	Definition	Abbreviation	Definition
AGL	Above ground level	*OGE	Out of ground effect
ALT	Altitude	LB	Pound
C	Celsius	LB/HR	Pounds per hour
CAS	Calibrated airspeed	MAX	Maximum
CL	Centerline	MIN	Minimum
CONT	Continuous	NMI	Nautical mile
*END	Endurance	NO.	Number
F	Fahrenheit	PRESS	Pressure
FAT	Free air temperature (fig. 7-2)	PSI	(See PSIG)
FT	Foot	PSIG	Pounds per square inch (Gage)
FPM	Feet per minute	*Q	Torque
FWD	Forward	*R/C	Rate of climb
G	Gravity (force)	*R/D	Rate of descent
GAL	Gallon	RPM	Revolutions per minute
GAL/HR	Gallons per hour	STA	Station
GRWT	Gross weight	SQ FT	Square foot
HP	Horsepower	TAS	True airspeed
HR	Hour	TO	Takeoff
IAS	Indicated airspeed	VDC	Volts, direct current
IGE	In ground effect	*VNE	Velocity never exceed (airspeed limitation)
IN	Inch		
KN	Knot		
°	Degree		

*Not listed in MIL-STD-12

SECTION II - TEMPERATURE CONVERSION

7-11. Temperature Conversion Chart (Figure 7-2)

Free Air Temperatures. Obtain the local free air temperature and record in space provided under departure heading. Estimate FAT for climb, cruise, and arrival by subtracting 2°C for each 1000 feet altitude increase above departure point (if destination is below departure elevation, add 2°C for each 1000 feet difference in elevation). Record temperature in spaces provided under climb, cruise, and arrival headings.

Figure 7-1. Deleted.

All data and figure on page 7-5 has been deleted.

G

TEMPERATURE CONVERSION CHART

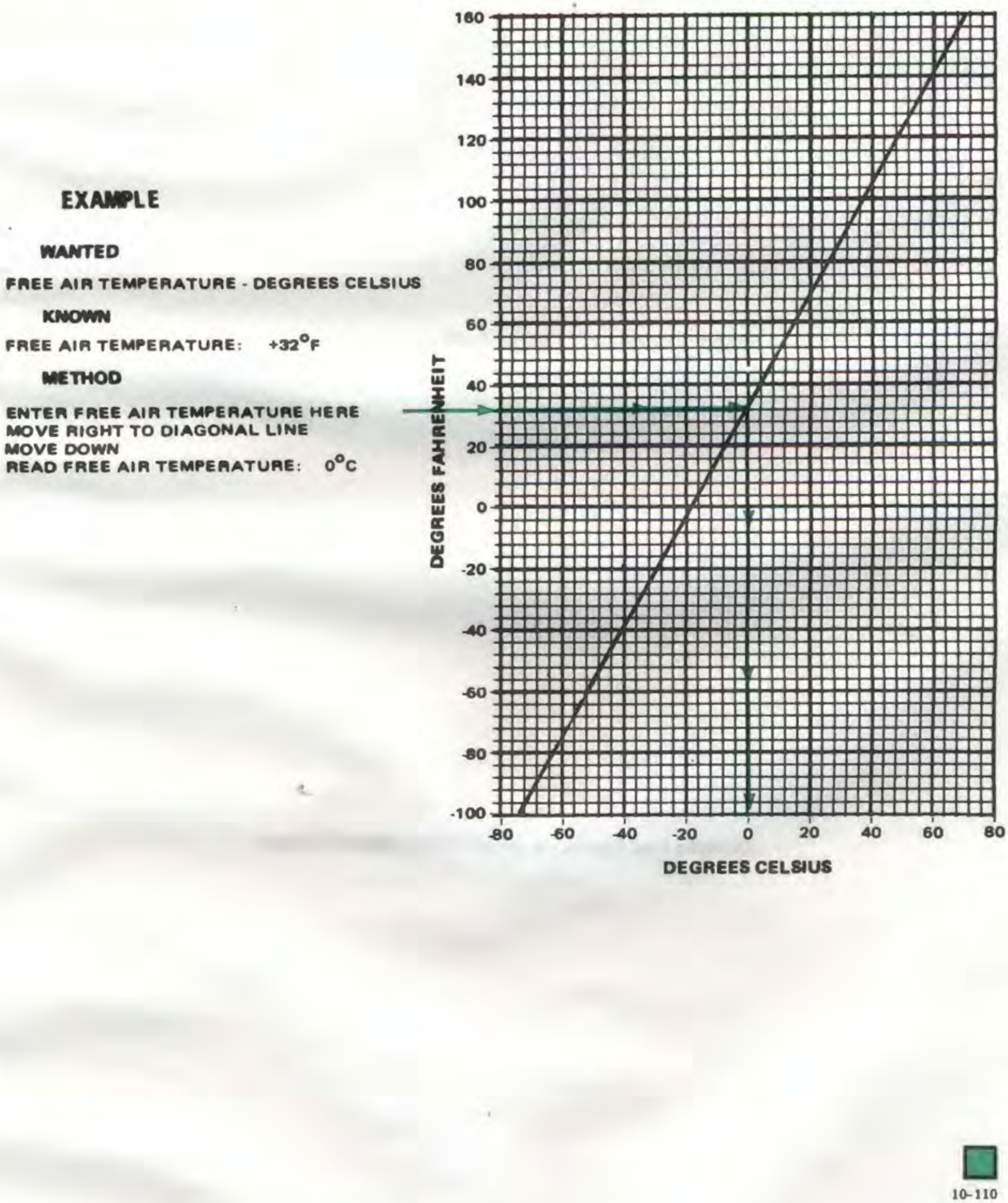


Figure 7-2. Temperture Conversion Chart.

All data on page 7-7 has been deleted.

SECTION III — MAXIMUM TORQUE AVAILABLE

7-13. Description.

The maximum torque available chart (fig. 7-3) shows the effects of altitude and temperature on maximum engine torque pressure.

7-14. Use of Chart.

The primary use of the chart is illustrated by the example. To determine the maximum torque available, it is necessary to know the pressure altitude and free air temperature. Enter the left side of the chart at the known pressure altitude, move right to the known temperature, then down and read maximum torque available.

7-15. Conditions.

a. The chart is based on speeds of 470 rotor/6000 engine rpm with JP-4 fuel and engine bleed air OFF.

b. Maximum torque available is reduced by 4% when bleed air is used.

G
R

MAXIMUM TORQUE AVAILABLE – [5 MINUTE LIMIT]

BLEED AIR OFF

470 ROTOR/6000 ENGINE RPM JP-4 FUEL

MAX TORQUE
OH-6A
T63-A-5A/-700

EXAMPLE

WANTED

CALIBRATED TORQUE

KNOWN

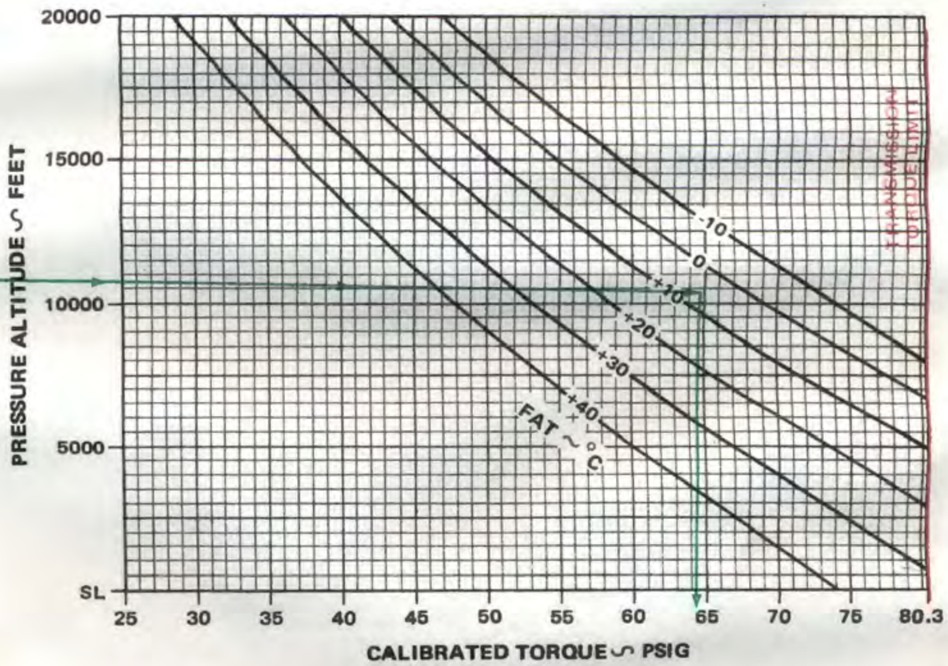
PRESSURE ALTITUDE = 11000 FT

FAT = 0°C

METHOD

ENTER PRESSURE ALTITUDE HERE

MOVE DOWN, READ CALIBRATED TORQUE = 66.0 PSIG



DATA BASIS: USAASTA PROJECT NO. 65-37, APRIL 1969

10-114

Figure 7-3. Maximum Torque Available Chart.

SECTION IV — CONTINUOUS TORQUE AVAILABLE

7-16. Description.

The continuous torque available chart (fig. 7-4) shows the effects of altitude and temperature on continuous torque available.

7-17. Chart Differences.

The upper chart shows continuous torque available for bleed air OFF. The lower chart shows continuous torque available with maximum bleed air obtainable from the engine.

NOTE

Engine bleed air can be distributed to: Cabin heating and defogging, engine inlet anti-icing, particle-separator scavenge air, and the cold weather/snow ingestion kit.

7-18. Use of Charts.

The primary uses of the charts are illustrated by the examples. To determine the continuous torque available, it is necessary to know the pressure altitude, the free air temperature, and whether bleed air is ON or OFF. Enter the left side of the appropriate chart at the known pressure altitude, move right to the known temperature, then down and read continuous torque available.

7-19. Conditions.

These charts are based on speeds of 470 rotor/6000 engine rpm with JP-4 fuel.

CONTINUOUS TORQUE AVAILABLE
470 ROTOR/6000 ENGINE RPM JP-4 FUEL

CONT TORQUE
OH-6A
T63-A-5A/-700

EXAMPLE A

WANTED

CALIBRATED TORQUE

KNOWN

PRESSURE ALTITUDE = 13000 FT

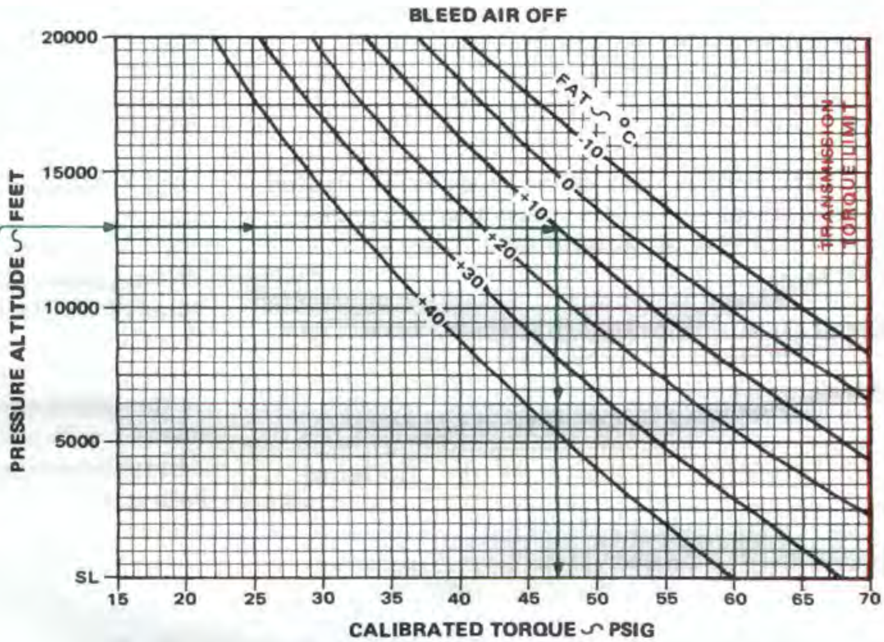
FAT = 10°C

METHOD

ENTER PRESSURE ALTITUDE HERE

MOVE DOWN, READ CALIBRATED TORQUE

(BLEED AIR OFF) = 47 PSIG



EXAMPLE B

WANTED

CALIBRATED TORQUE BLEED AIR ON

KNOWN

PRESSURE ALTITUDE = 13000 FT

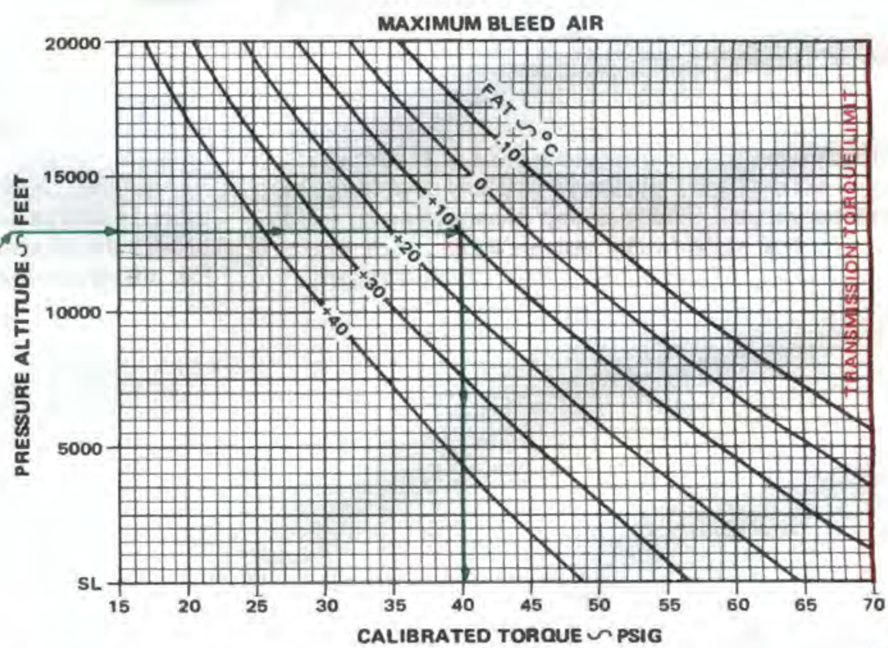
FAT = 10°C

METHOD

ENTER PRESSURE ALTITUDE HERE

MOVE DOWN, READ CALIBRATED TORQUE

(BLEED AIR ON) = 40 PSIG



DATA BASIS: USAASTA PROJECT NO. 65-37, APRIL 1969
*ALLISON ENGINE MODEL SPEC 580-F, AMENDMENT 1, AUG 1965 PERFORMANCE CALCULATIONS

10-116

Figure 7-4. Continuous Torque Available Chart.

SECTION V - HOVER

7-20. Description.

The hover chart (fig. 7-5) presents the torque required to hover at various conditions of pressure altitude, free air temperature, gross weight, and skid height.

7-21. Use of Chart.

a. The primary use of the chart is illustrated by the example. To determine the torque required to hover, it is necessary to know the pressure altitude, free air temperature, gross weight, and the desired skid height. Enter the upper right grid at the known pressure altitude, move right to the temperature, move down to the gross weight, move left to the desired skid height, then down and read the torque required to hover.

b. In addition to its primary use, the hover chart may be used to predict the maximum hover height. This capability is needed for use of the takeoff chart. To determine maximum hover height, it is necessary to know pressure altitude, free air temperature, gross weight, and maximum torque available. Enter at the known pressure altitude, move right to the temperature, move down to the gross weight, then left to intersection with maximum torque available and read skid height. This skid height is the maximum hover height.

c. The hover chart may also be used to determine the maximum gross weight for hover at a given skid height, pressure altitude and temperature condition. Enter at the known pressure altitude, move right to the temperature, then move down to the bottom of the lower grid and mark the position. Now enter lower left grid at maximum torque available, move up to skid height, then right to the position marked at bottom of lower grid and read gross weight. This is the maximum gross weight at which the helicopter will hover.

7-22. Conditions.

a. **The hover chart is based on calm wind conditions, level surface and 470 rotor/600 engine rpm/103%. Data presented is based upon operations without protective tape installed on the main rotor blades. The degradation in performance due to the installation of tape is equivalent to approximately a 70-pound increase in gross weight. To determine torque required to hover with the protective tape installed, enter the chart at a gross weight 70 pounds heavier than the actual weight of the helicopter.**

b. Hover at the conditions indicated by the yellow (AVOID) area on the chart should be avoided when crosswind or tailwind is greater than 10 knots.

c. In ground effect hover data is based on hovering over a level surface. For normal transition from hover to forward flight, minimum skid height should be 3 feet to prevent skid-ground contact. If the surface over which hovering will be conducted is known to be steep, uneven, covered with high vegetation, or if the type of terrain is unknown, the flight should be planned for out of ground effect hover capability.

G R Y

HOVER

470 ROTOR RPM

LEVEL SURFACE CALM WIND

HOVER
OH-6A
T63-A-5A/-700

EXAMPLE

WANTED

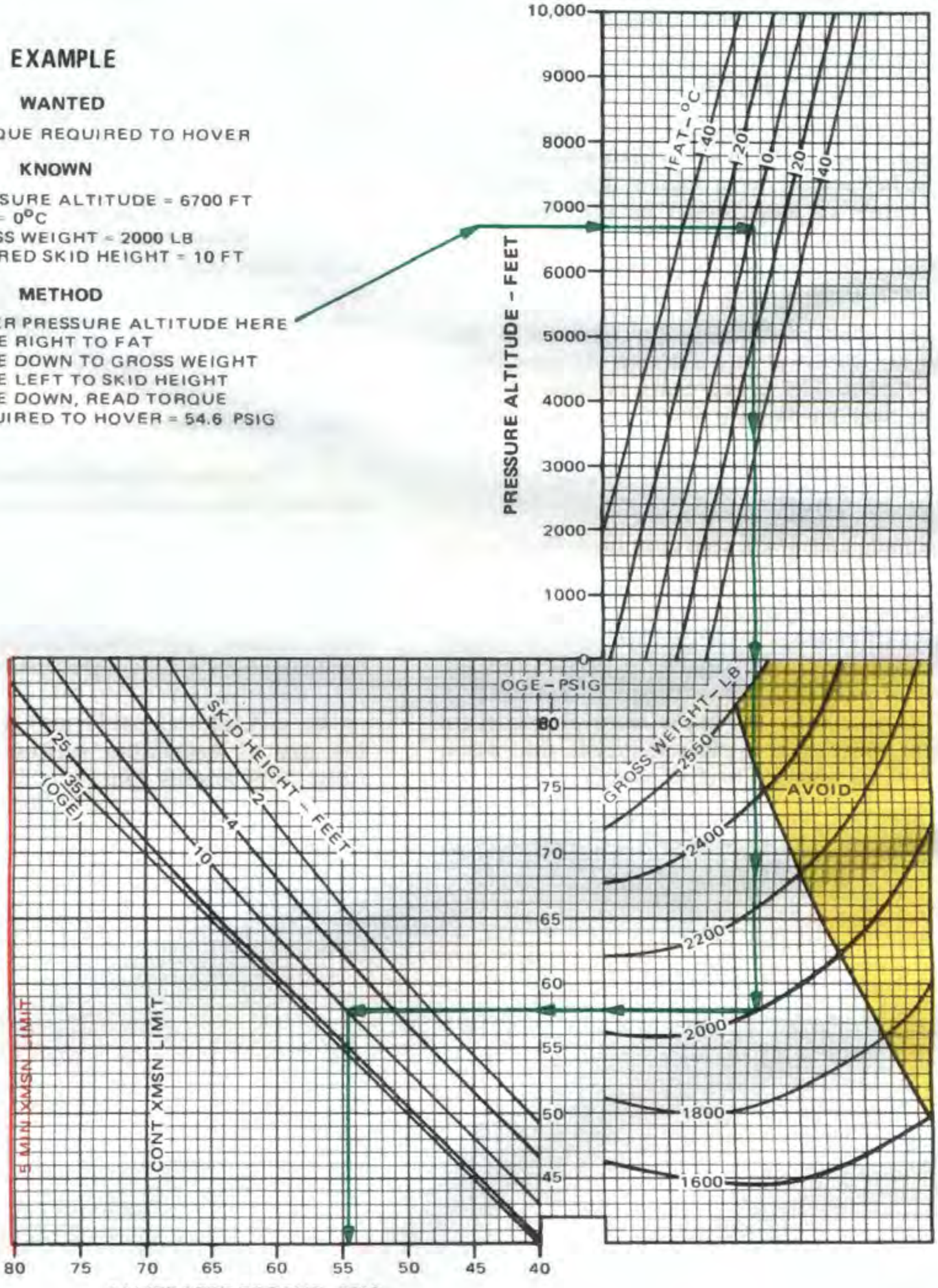
TORQUE REQUIRED TO HOVER

KNOWN

PRESSURE ALTITUDE = 6700 FT
FAT = 0°C
GROSS WEIGHT = 2000 LB
DESIRED SKID HEIGHT = 10 FT

METHOD

ENTER PRESSURE ALTITUDE HERE
MOVE RIGHT TO FAT
MOVE DOWN TO GROSS WEIGHT
MOVE LEFT TO SKID HEIGHT
MOVE DOWN, READ TORQUE
REQUIRED TO HOVER = 54.6 PSIG



DATA BASIS: DERIVED FROM FLIGHT TEST

G R Y

Figure 7-5. Hover Chart

10-139

SECTION VI — TAKEOFF

7-23. Description.

The takeoff chart (fig. 7-6) shows the distances required to clear various obstacles, based upon maximum hover height capabilities. The takeoff method is the level-acceleration technique discussed in paragraph 8-35.

NOTE

The maximum hover heights shown are only a measure of the helicopter's climb capability and do not imply that a higher than normal hover height (3 feet) should be used during the actual takeoff.

7-24. Chart Differences.

The upper chart presents distance required to clear an obstacle for climbout at a constant 50 knot INDICATED airspeed. The lower chart presents distance required to clear an obstacle for climbouts at various TRUE airspeeds.

7-25. Use of Chart.

The primary uses of the chart are illustrated by the examples.

a. To determine the distance required to clear an obstacle at a climbout of 50 knots IAS, it is necessary to know maximum hover height and obstacle height. Calculation of maximum hover height is described in section V, Hover. Enter the upper chart at maximum hover height, move right to obstacle height, then down and read distance required to clear obstacle.

b. To determine the distance required to clear an obstacle at various TRUE airspeeds, it is necessary to know maximum hover height, climbout TAS and obstacle height. Calculation of maximum hover height is described in section V. Enter the lower chart at maximum hover height, move right to climbout TAS, move down to obstacle height, then left and read distance required to clear obstacle. Additionally, the lower chart may be used to determine the climbout TAS by first determining the maximum hover height. Then enter at the known distance, move right to the obstacle height, then up to the maximum hover height and read climbout TAS.

c. Before takeoff a hover check may be made to verify the hover capability. If winds are present, the hover check may disclose that the helicopter can actually hover at a greater skid height than the calculated value, since the hover chart is based upon calm wind conditions.

7-26. Conditions.

a. The takeoff chart is based on calm wind conditions. Since the surface wind velocity and direction cannot be accurately predicted, all takeoff planning should be based on calm wind conditions. Takeoff into the wind will improve the takeoff performance. A tailwind during takeoff and climbout will increase the obstacle clearance distance and could prevent a successful takeoff.

b. All takeoff performance data are based on the use of maximum torque available and 470 rotor/6000 engine rpm.

G
R
Y

TAKEOFF

LEVEL ACCELERATION TECHNIQUE

CALM WIND LEVEL SURFACE 6000 ENGINE RPM MAXIMUM TORQUE AVAILABLE

TAKEOFF
OH-6A
T63-A-5A/-700

EXAMPLE A

WANTED

DISTANCE TO CLEAR OBSTACLE

KNOWN

MAXIMUM HOVER HEIGHT ≈ 20 FEET

OBSTACLE HEIGHT = 125 FEET

METHOD

ENTER MAX HOVER HEIGHT HERE

MOVE RIGHT TO OBSTACLE HEIGHT

MOVE DOWN, READ DISTANCE TO CLEAR OBSTACLE = 960 FT

EXAMPLE B

WANTED

DISTANCE TO CLEAR OBSTACLE

KNOWN

MAX HOVER HEIGHT ≈ 8 FEET

OBSTACLE HEIGHT = 75 FEET

CLIMBOUT AIRSPEED = 50 KNOTS

METHOD

ENTER MAX HOVER HEIGHT HERE

MOVE RIGHT TO CLIMBOUT TRUE AIRSPEED

MOVE DOWN TO OBSTACLE HEIGHT

MOVE LEFT READ DISTANCE TO CLEAR OBSTACLE = 780 FEET

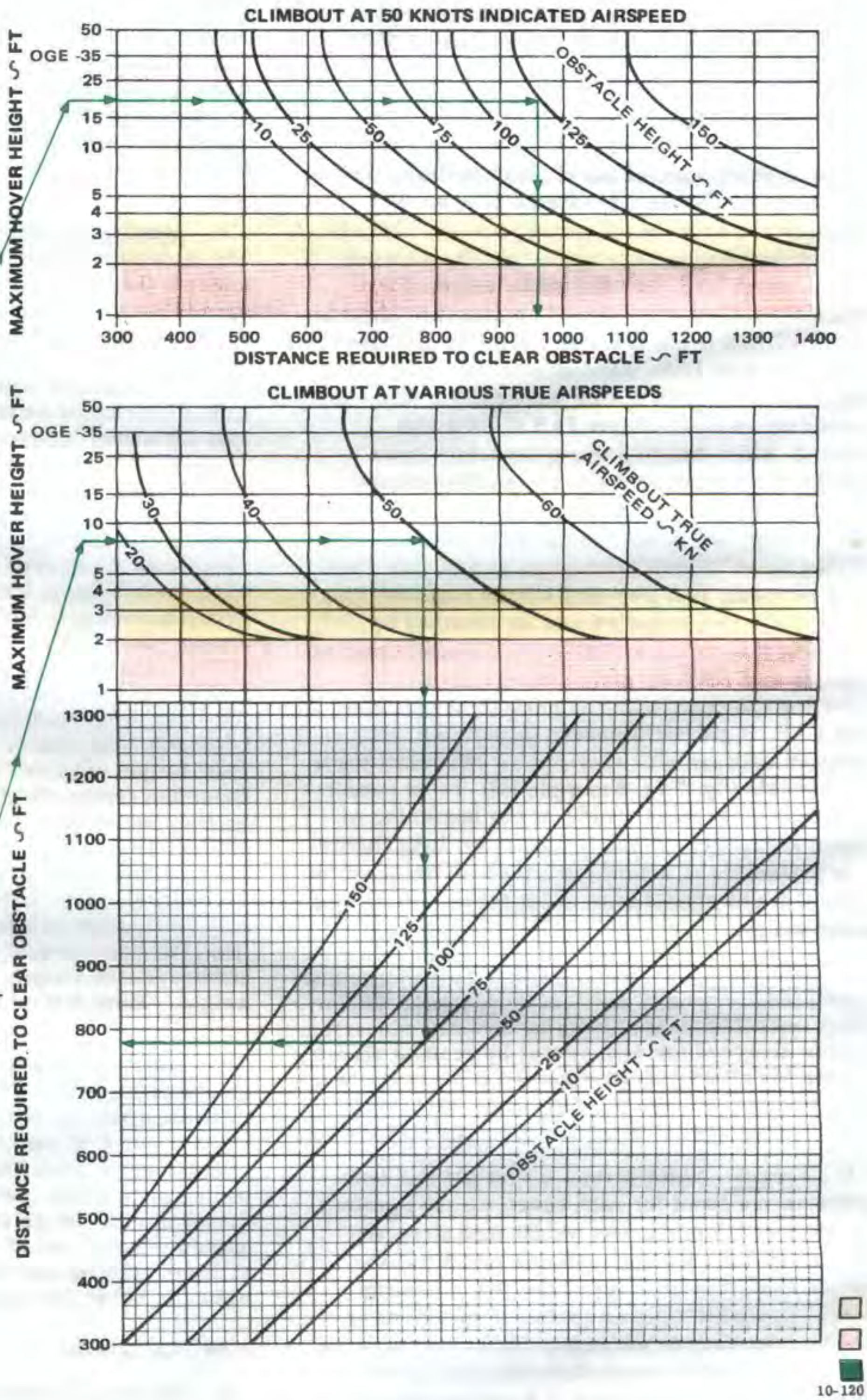


Figure 7-6. Takeoff Chart.

SECTION VII - CRUISE

7-27. Description.

The cruise charts (fig. 7-7 through 7-15) present torque requirements for level flight at various airspeeds, gross weights, pressure altitudes, and free air temperatures. Fuel Flow is also shown.

7-28. Use of Charts.

The primary uses of the charts are illustrated by the examples. To use the charts, it is usually necessary to know the planned pressure altitude, the estimated free air temperature, the planned cruise speed TAS, and the gross weight. First, select the proper chart based on pressure altitude and FAT. Enter the chart at the cruise airspeed (either TAS or IAS), move across the chart to the right to obtain TAS if IAS was entered. Move left across the chart to obtain IAS if TAS was entered, when crossing the appropriate gross weight. Maximum performance conditions are determined by entering the chart where the maximum range line or maximum endurance and rate of climb line intersect the gross weight line; then read airspeed, fuel flow and torque required. Normally sufficient accuracy can be obtained by selecting the chart nearest to the planned cruising altitude and FAT or, more conservatively, by selecting the chart with the next higher altitude and FAT. If greater accuracy is required, interpolation between altitudes and/or temperatures is permissible (fig. 7-7a, Example III). To be conservative, use the gross weight at the beginning of cruise flight. For greater accuracy on long flights, it is preferable to determine cruise information for several flight segments to allow for the decreasing gross weight.

a. Airspeed. True and indicated airspeeds are presented at opposite sides of each chart. On any chart indicated airspeed can be directly converted to true airspeed (or vice versa) by reading directly across the chart without regard for the other chart information. Maximum permissible airspeed (V_{NE}) limits appear as red lines on each chart.

b. Torque. Since pressure altitude and temperature are fixed for each chart, torque required varies according to gross weight and airspeed. The continuous torque available and 5 minute torque available lines represent the maximum torque available from an installed specification engine operating at the engine limits specified, in chapter 5. Higher torque than that represented by these lines may be used if it can be obtained without exceeding the limitations presented in chapter 5.

c. Fuel Flow. Fuel flow scales are provided opposite the torque scales. On any chart, torque may be converted directly to fuel flow without regard to other chart information.

d. Maximum Range. The maximum range lines indicate the combinations of gross weight and airspeed that will produce the greatest flight range per pound of fuel under zero wind conditions. See chart Example B.

e. Maximum Endurance and Rate of Climb. The maximum endurance and rate of climb lines indicate the combinations of gross weight and airspeed that will produce the maximum endurance and the maximum rate of climb. The torque required for level flight at this condition is a minimum, providing a minimum fuel flow (maximum endurance) and a maximum torque change available for climb (maximum rate of climb).

f. Change in Frontal Area. Since the cruise information is given for the clean configuration, adjustments to torque should be made when operating with alternative configurations. To determine the change in torque, first obtain the appropriate multiplying factor from the drag area change (para 7-32), then enter the cruise chart at the planned cruise speed IAS, move left to the broken ΔQ line, and move up and read ΔQ. Multiply ΔQ by the multiplying factor to obtain change in torque, then add or subtract change in torque from torque required for the clean configuration. Enter the cruise chart at resulting torque required, move up, and read fuel flow. If the resulting torque required exceeds the governing torque limit, the torque required must be reduced to the limit. The resulting reduction in airspeed may be found by subtracting the change in torque from the limit torque; then enter the cruise chart at the reduced torque, and move up to the gross weight. Move left or right to read TAS or IAS.

g. Additional Uses. The low-speed end of the cruise chart (below 40 knots) is shown primarily to familiarize you with the low-speed power requirements of the helicopter. It shows the power margin available for climb or acceleration during maneuvers, such as NOE flight. At zero airspeed, the torque represents the torque required to hover out of ground effect. In general, mission planning for low-speed flight should be based on hover out of ground effect.

7-29. Conditions.

a. The cruise charts are based on 470 rotor/6000 engine rpm and bleed air OFF.

b. The charts are based on clean configuration. Data presented is based upon operation without protective tape installed on the main rotor blades. The degradation in performance due to the installation of tape is equivalent to approximately a 70-pound increase in gross weight. To determine cruise performance data with the protective tape installed, enter the charts at a gross 70 pounds heavier than the actual weight of the helicopter.

G R Y

CRUISE

PRESSURE ALTITUDE - SEA LEVEL

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700

EXAMPLE I

WANTED

TORQUE REQUIRED, AIRSPEED, AND FUEL FLOW FOR MAXIMUM RANGE.

KNOWN

PRESSURE ALTITUDE = SL, FAT = 20°C, AND GROSS WEIGHT = 2400 POUNDS.

METHOD

AT THE INTERSECTION OF THE MAXIMUM RANGE LINE AND THE 2400 POUND LINE
MOVE LEFT, READ IAS = 114 KN.
MOVE RIGHT, READ TAS = 117 KN.
MOVE UP, READ FUEL FLOW = 155 LB/HR.
MOVE DOWN, READ CALIBRATED TORQUE = 59.6 PSIG

EXAMPLE II

WANTED

TORQUE REQUIRED, AIRSPEED, AND FUEL FLOW FOR MAXIMUM ENDURANCE.

KNOWN

PRESSURE ALTITUDE = SL, FAT = 20°C, AND GROSS WEIGHT = 2400 POUNDS.

METHOD

AT THE INTERSECTION OF THE MAXIMUM ENDURANCE AND THE 2400 POUND LINES
MOVE LEFT, READ IAS = 61 KN.
MOVE RIGHT, READ TAS = 63 KN.
MOVE UP, READ FUEL FLOW = 114 LB/HR.
MOVE DOWN, READ CALIBRATED TORQUE = 33.7 PSIG.

EXAMPLE III
(INTERPOLATION NOT ILLUSTRATED)

WANTED

MAXIMUM ENDURANCE AIRSPEED, FUEL FLOW, AND TORQUE.

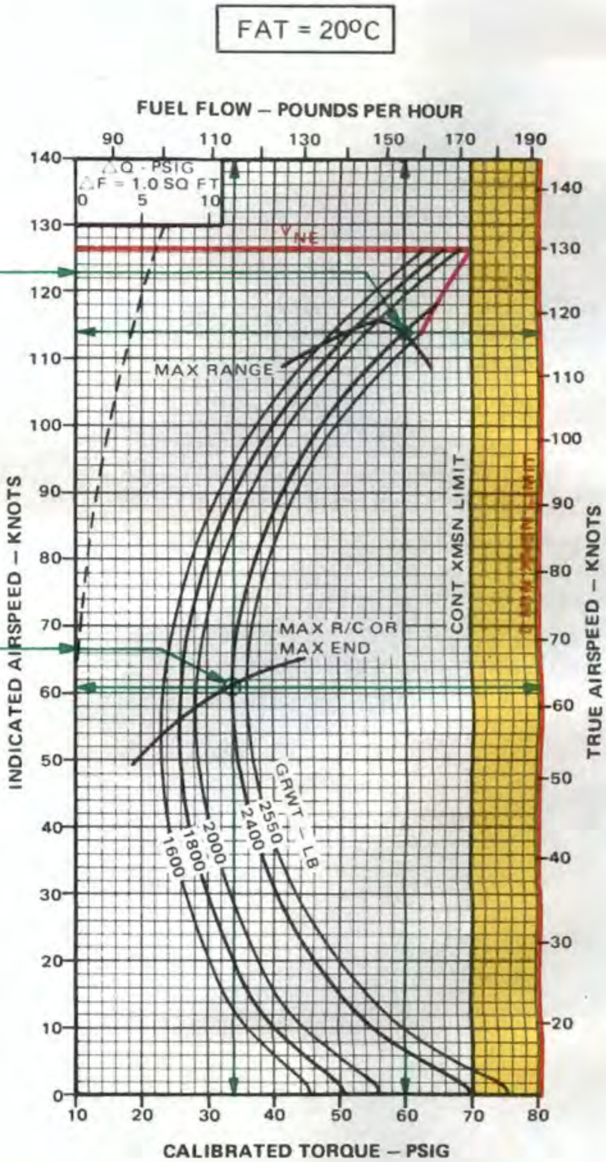
KNOWN

PRESSURE ALTITUDE = 1000 FT, FAT = 10°C, AND GROSS WEIGHT = 2400 POUNDS.

METHOD

READ AIRSPEED, TORQUE, AND FUEL FLOW FOR EACH ADJACENT ALTITUDE AND FAT, THEN INTERPOLATE BETWEEN FAT AND ALTITUDE AS FOLLOWS:

ALTITUDE	SEA LEVEL		2000 FEET		SOLUTION 1000 FEET
FAT	0	20	0	20	10
TORQUE	34	34	34	34	34
FUEL FLOW	109	114	106	109	110
IAS	62	61	61	59	61
TAS	62	63	63	63	63



DATA BASIS: DERIVED FROM FLIGHT TEST

G R Y

Figure 7-7a. Cruise Chart Example, Sea Level, 20°C

10-140

G R Y

CRUISE
PRESSURE ALTITUDE - SEA LEVEL
470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700

FAT = 20°C

EXAMPLE

WANTED

TORQUE REQUIRED AND FUEL FLOW FOR ALL-DOORS-REMOVED CONFIGURATION.

KNOWN

PRESSURE ALTITUDE = SL, FAT = 20°C, GW = 2400 LB, ALL DOORS REMOVED, IAS = 100 KN.

METHOD

FROM DRAG AREA CHANGE TABLE (PARAGRAPH 7-32) OBTAIN DRAG AREA = +1.5 SQ FT
MULTIPLYING FACTOR = DRAG AREA

ENTER CRUISE CHART AT IAS = 100 KN

MOVE RIGHT TO BROKEN ΔQ LINE

MOVE UP TO READ ΔQ = 2.5 PSIG

MULTIPLY ΔQ BY MULTIPLYING FACTOR TO GET CHANGE IN TORQUE = 3.8 PSIG

RE-ENTER CRUISE CHART AT IAS = 100 KN

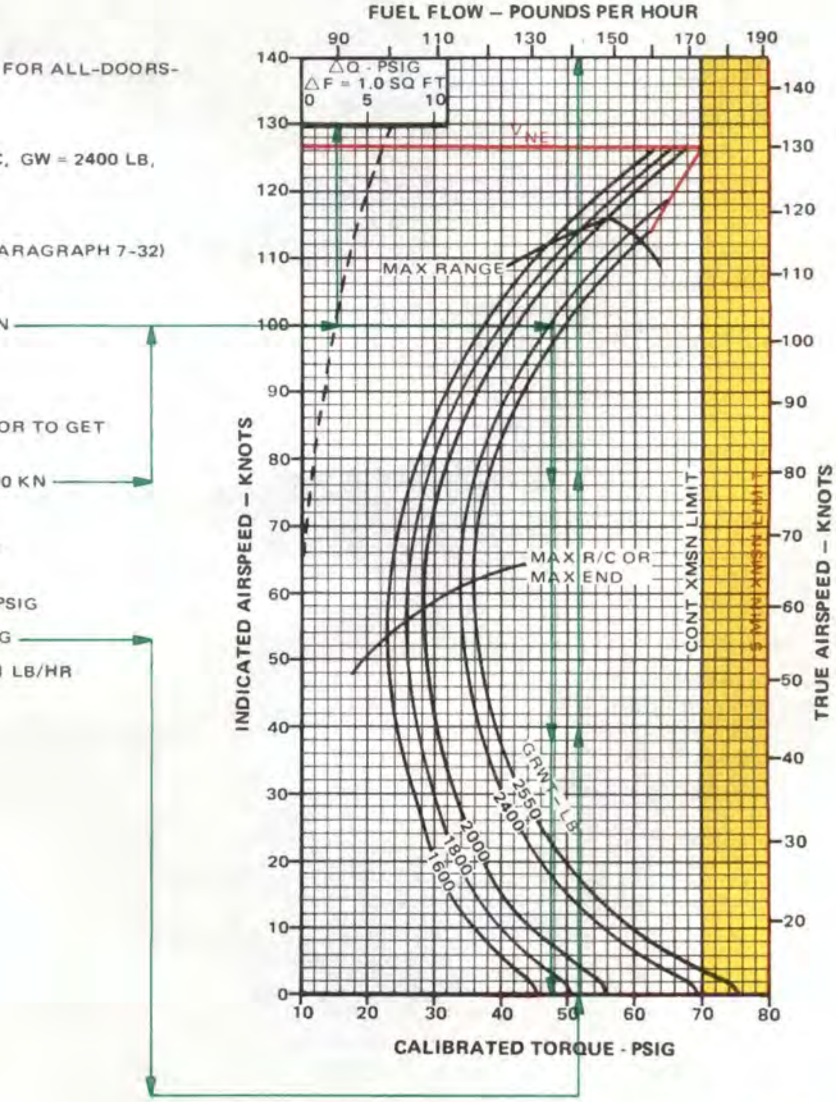
MOVE RIGHT TO GW = 2400 LB

MOVE DOWN AND READ CALIBRATED TORQUE = 47.5 PSIG

TORQUE REQUIRED = 47.5 +3.8 = 51.3 PSIG

RE-ENTER CRUISE CHART AT 51.3 PSIG

MOVE UP AND READ FUEL FLOW = 141 LB/HR



G R Y

DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 7-7b. Cruise Chart Example, Sea Level, 20°C

10-141

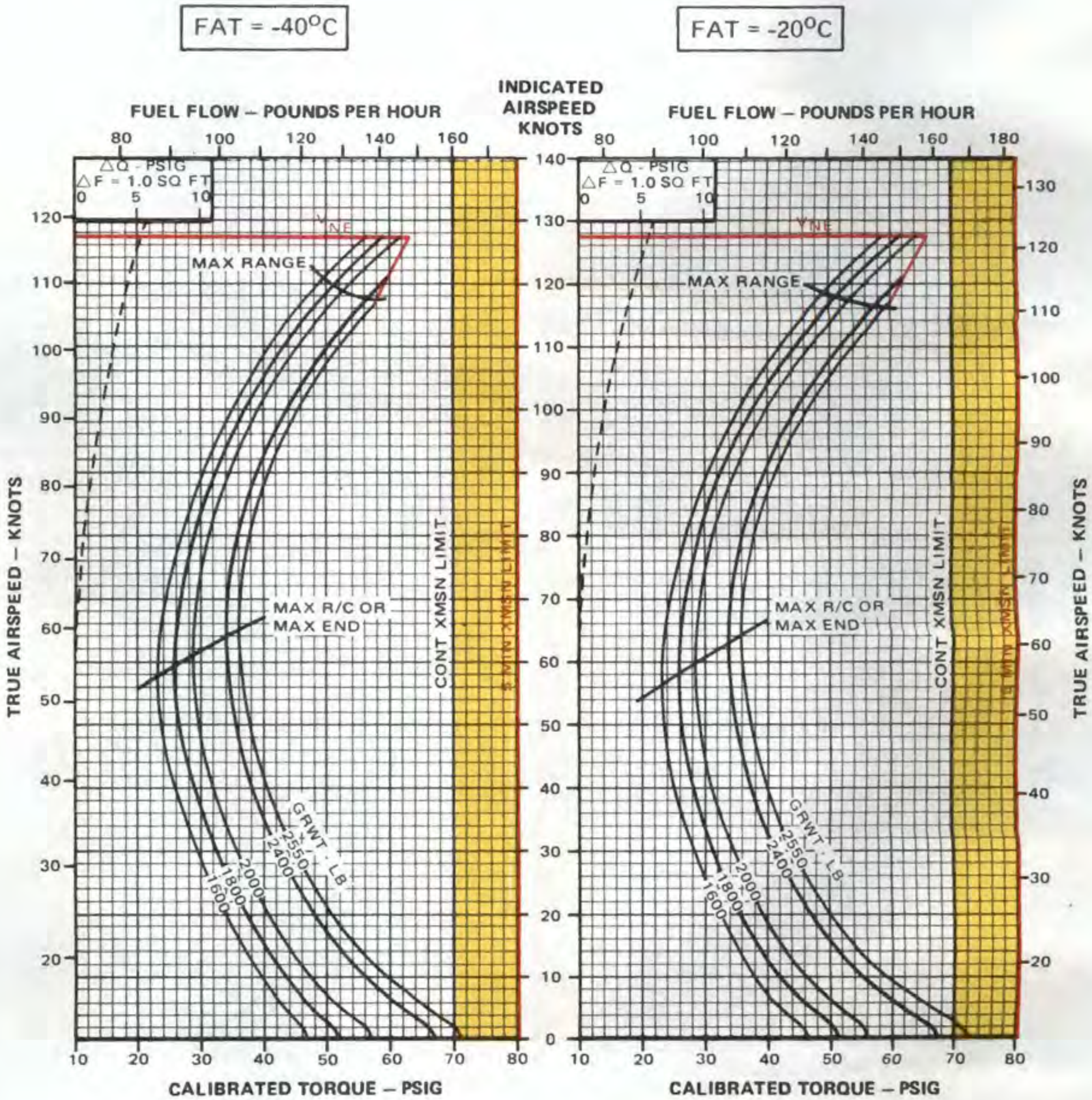
R Y

CRUISE

PRESSURE ALTITUDE - SEA LEVEL

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-8a. Cruise Chart, Sea Level, -40°C and 20°C

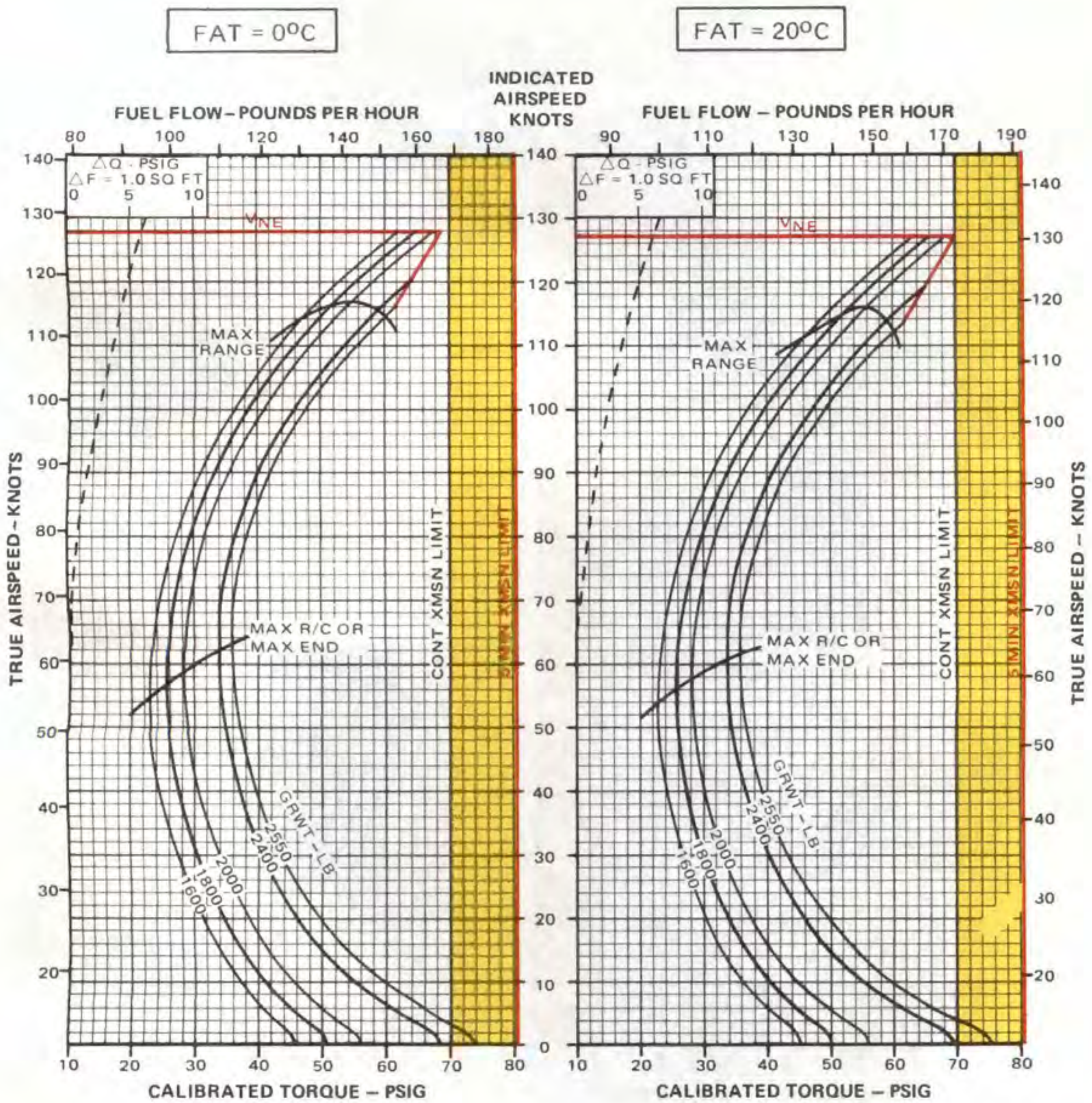
10-142

CRUISE

PRESSURE ALTITUDE - SEA LEVEL

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 7-8b. Cruise Chart, Sea Level, 0°C and 20°C

10-143

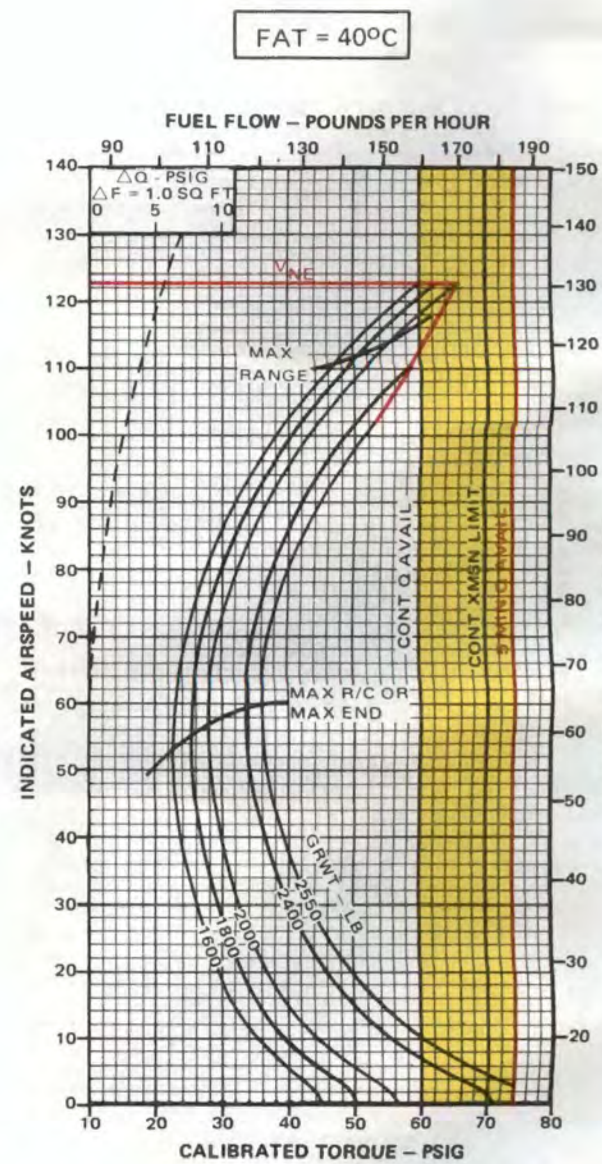
R Y

CRUISE

PRESSURE ALTITUDE - SEA LEVEL

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



R Y

DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 7-8c. Cruise Chart, Sea Level, 40°C

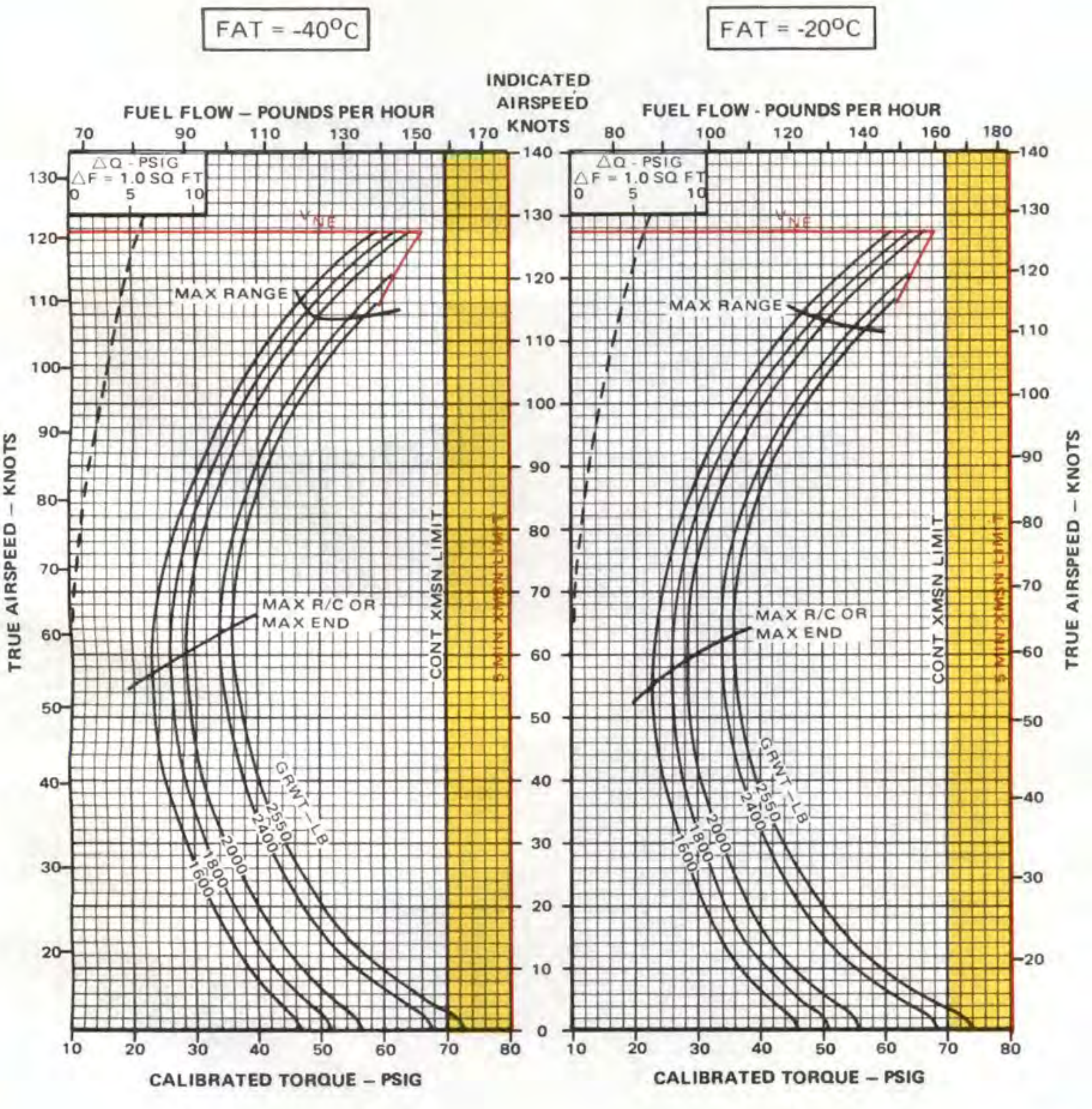
10-144

CRUISE

PRESSURE ALTITUDE - 2000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



R Y

DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 7-9a. Cruise Chart, 2000 Feet, -40°C and 20°C

10-145

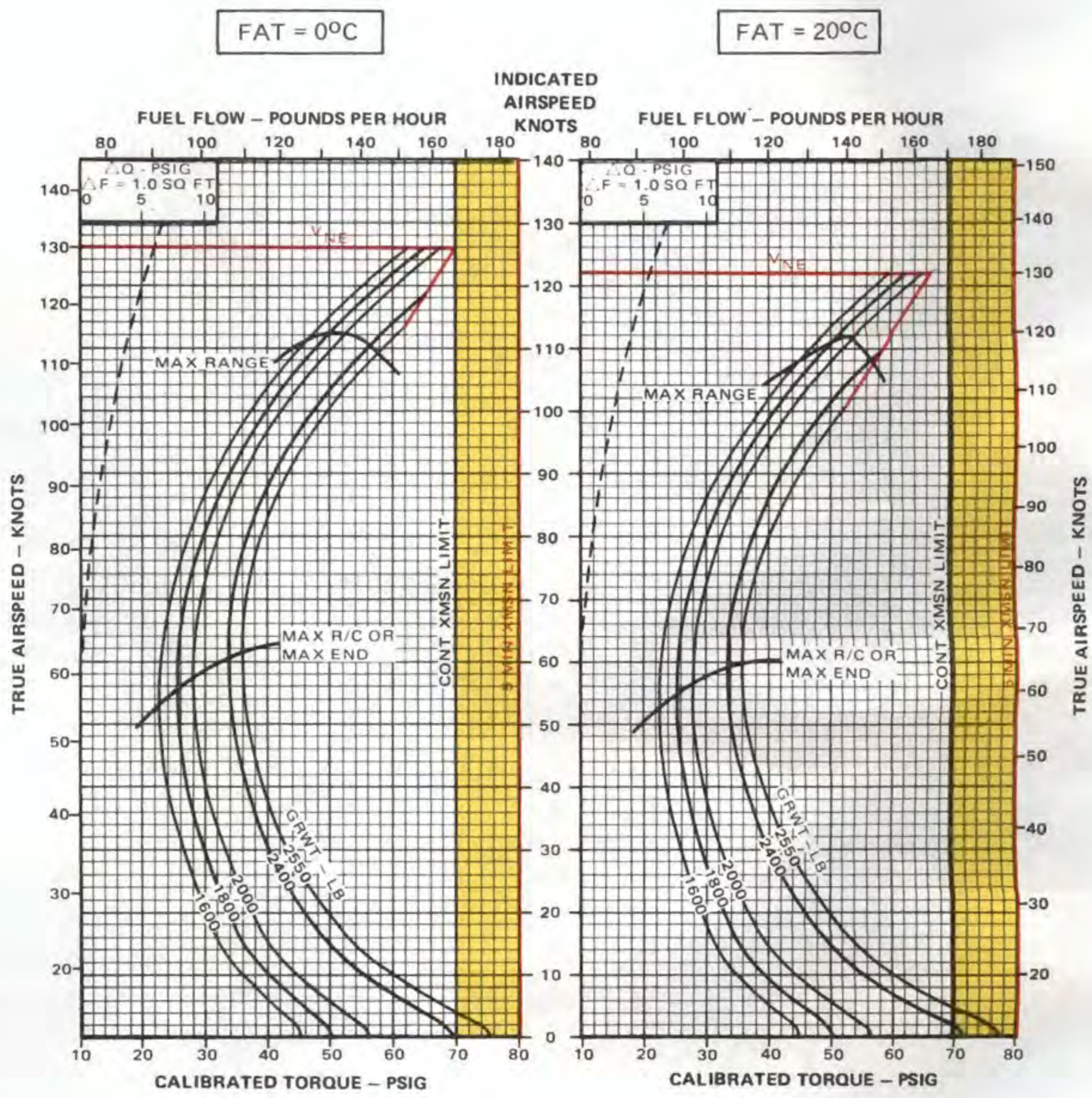
R Y

CRUISE

PRESSURE ALTITUDE - 2000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-9b. Cruise Chart, 2000 Feet, 0°C and 20°C

10-146

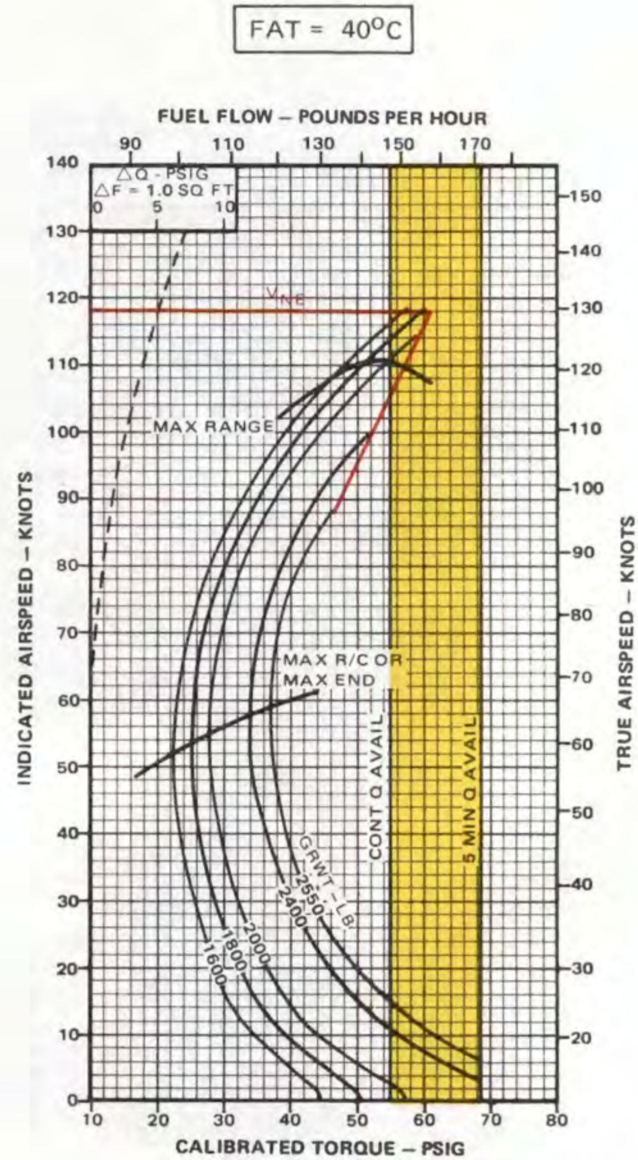
R Y

CRUISE

PRESSURE ALTITUDE - 2000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-9c. Cruise Chart, 2000 Feet, 40°C

10-147

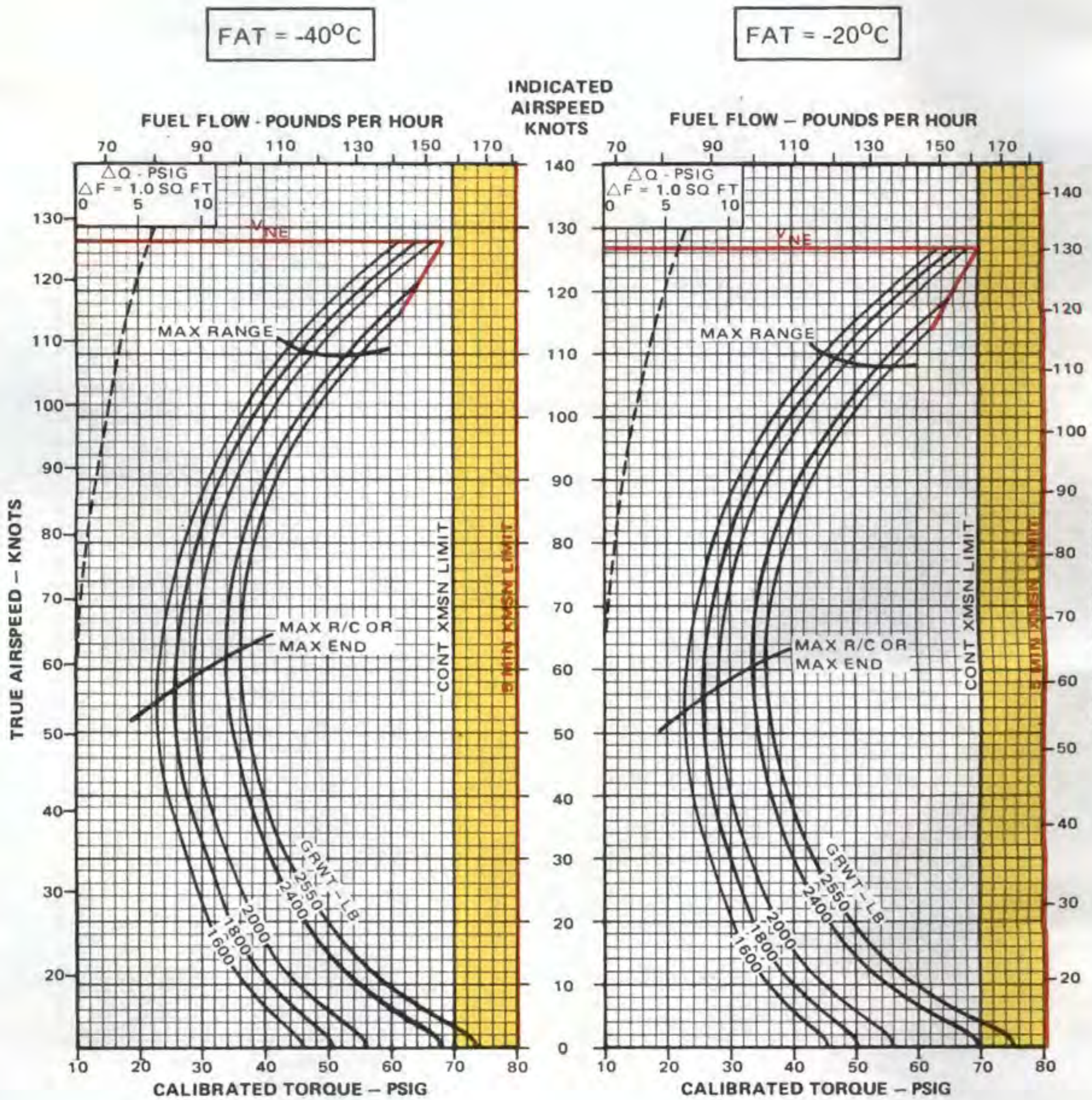
R Y

CRUISE

PRESSURE ALTITUDE – 4000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-10a. Cruise Chart, 4000 Feet, -40°C and -20°C

10-148

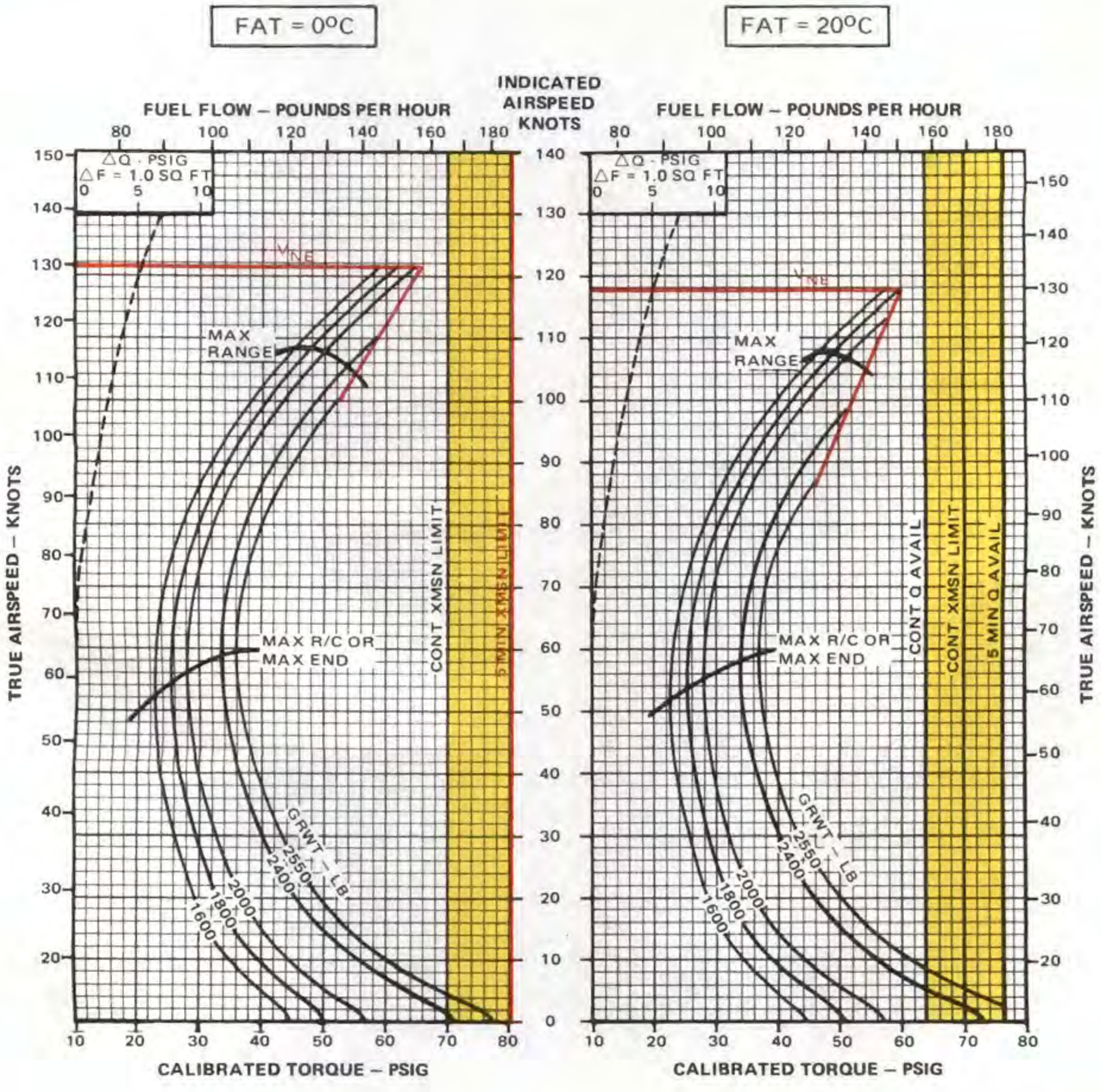
R Y

CRUISE

PRESSURE ALTITUDE – 4000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



R Y

DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 7-10b. Cruise Chart, 4000 Feet 0°C and 20°C

10-149

R Y

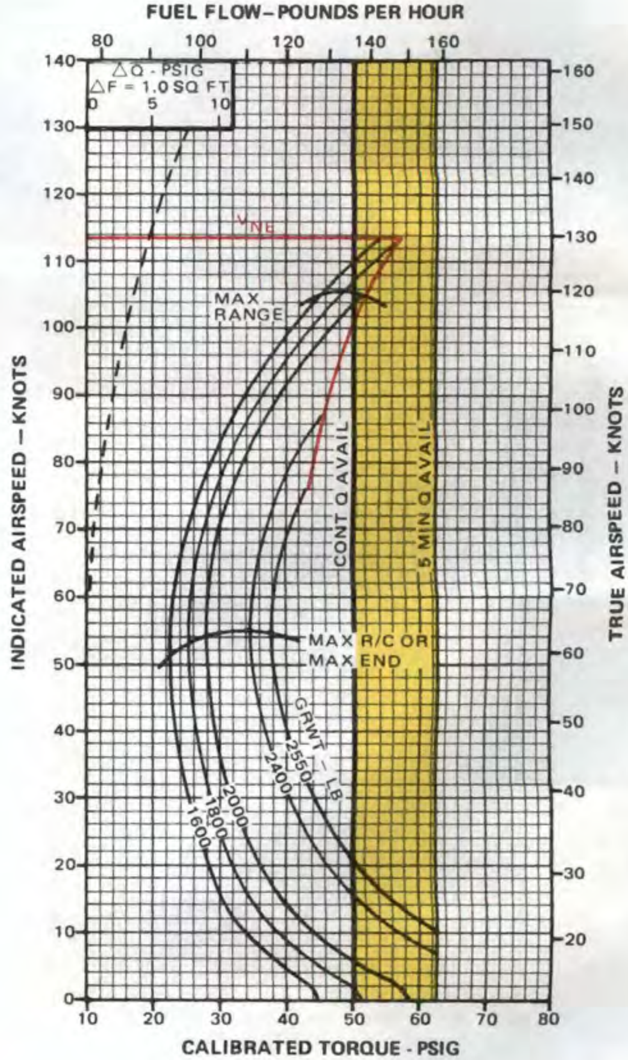
CRUISE

PRESSURE ALTITUDE – 4000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700

FAT = 40°C



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-10c. Cruise Chart, 4000 Feet, 40°C

10-150

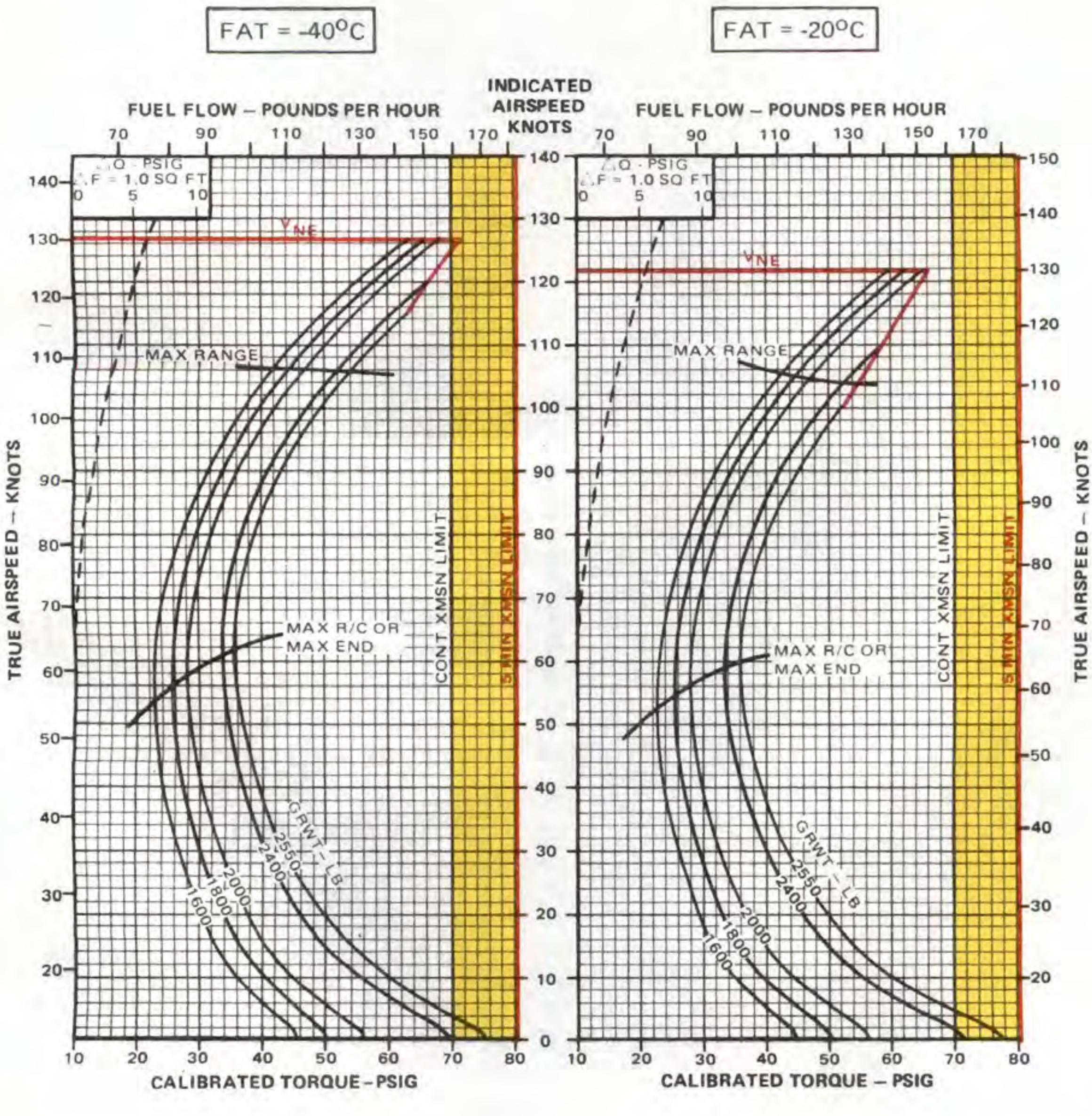
R Y

CRUISE

PRESSURE ALTITUDE — 6000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



R Y

DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 7-11a. Cruise Chart, 6000 Feet, -40° and -20°C

10-151

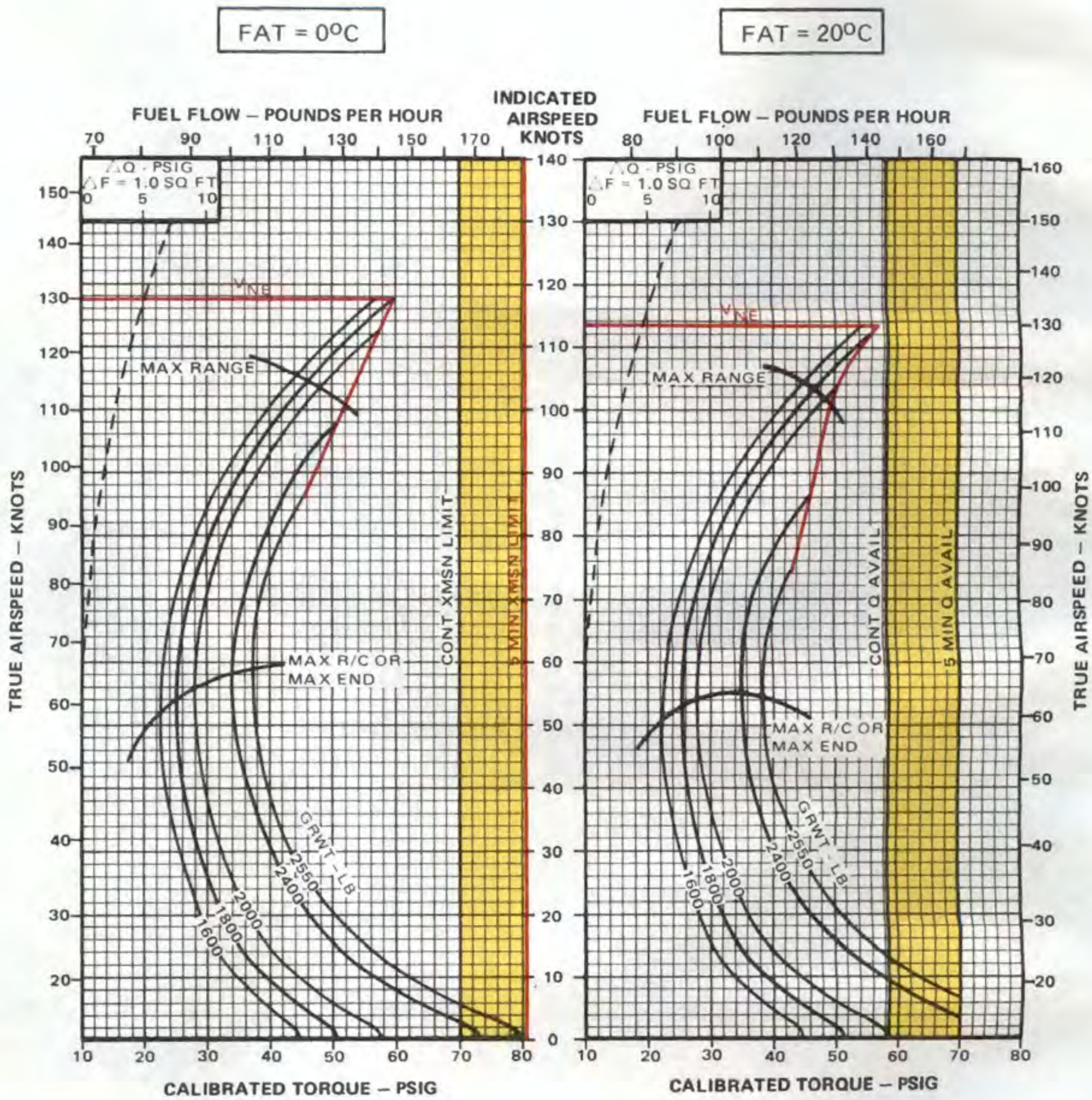
R Y

CRUISE

PRESSURE ALTITUDE — 6000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-11b. Cruise Chart, 6000 Feet, 0° and 20°C

10-152

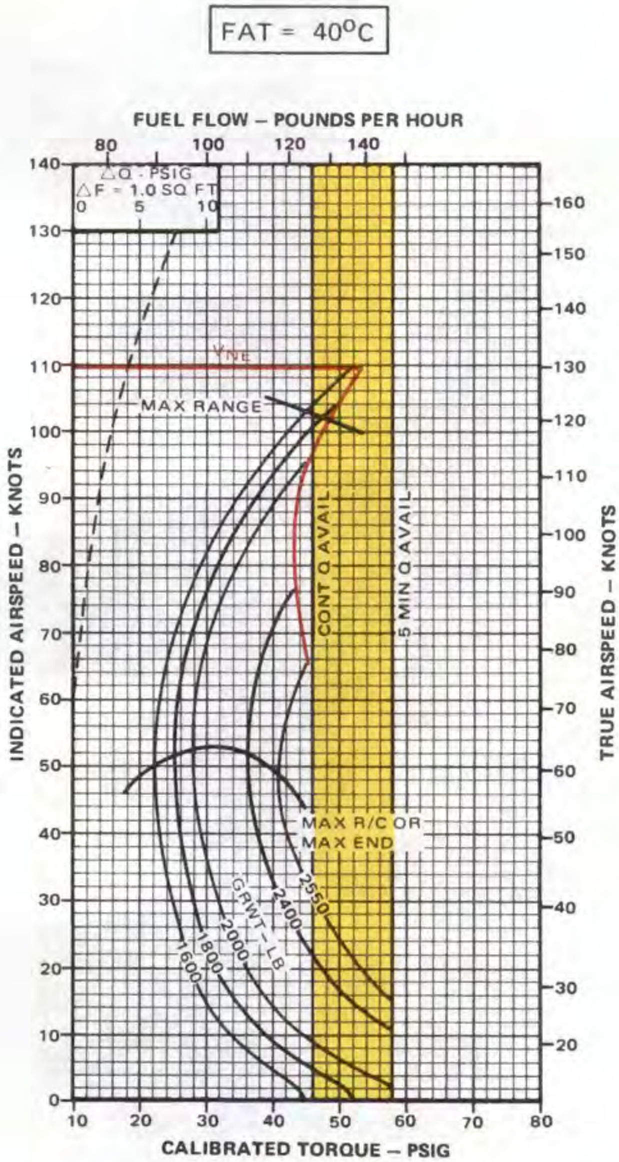
R Y

CRUISE

PRESSURE ALTITUDE — 6000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-11c. Cruise Chart, 6000 Feet, 40°C

10-153

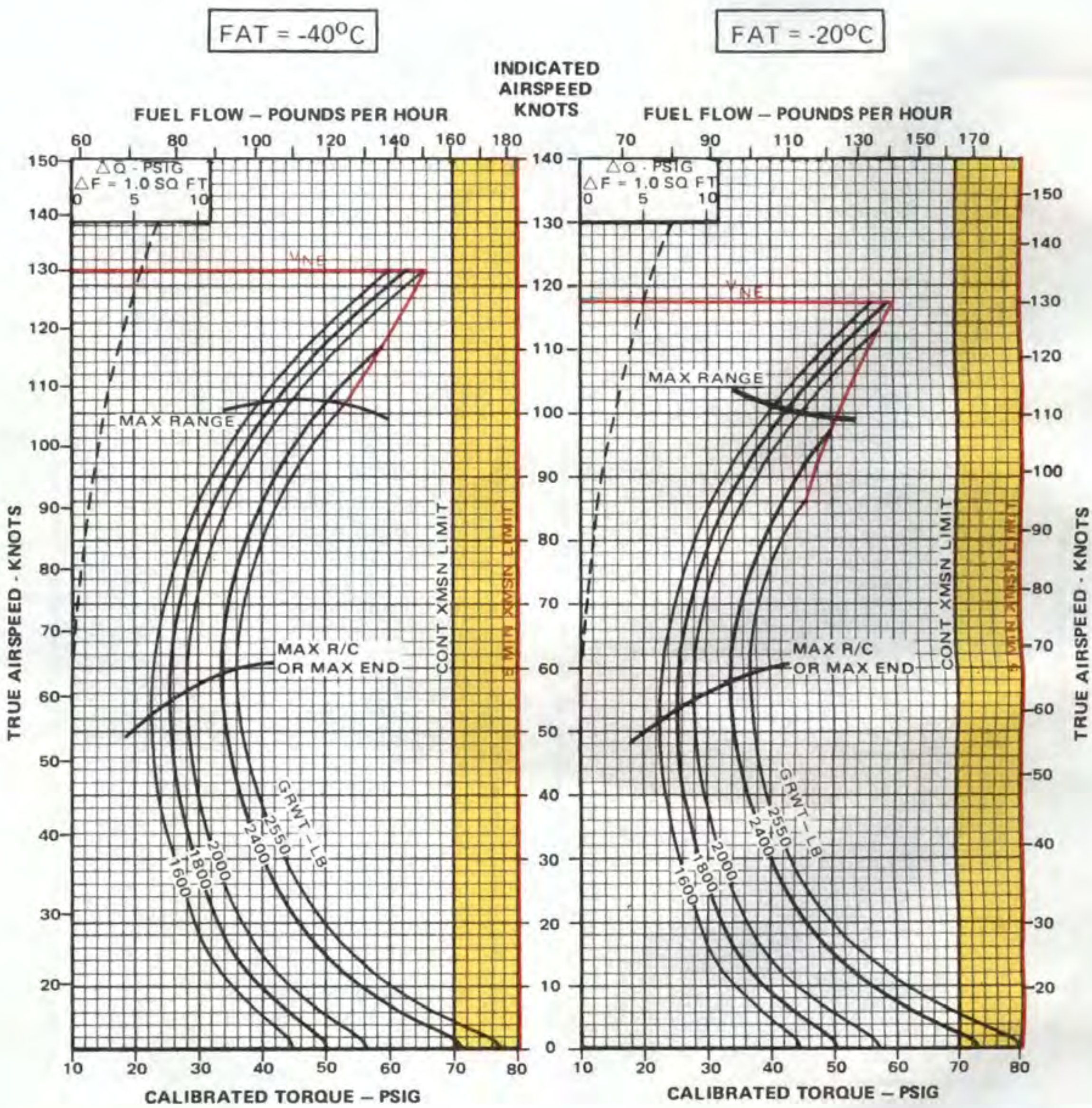
R Y

CRUISE

PRESSURE ALTITUDE — 8000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-12a. Cruise Chart, 8000 Feet, -40°C and -20°C

10-154

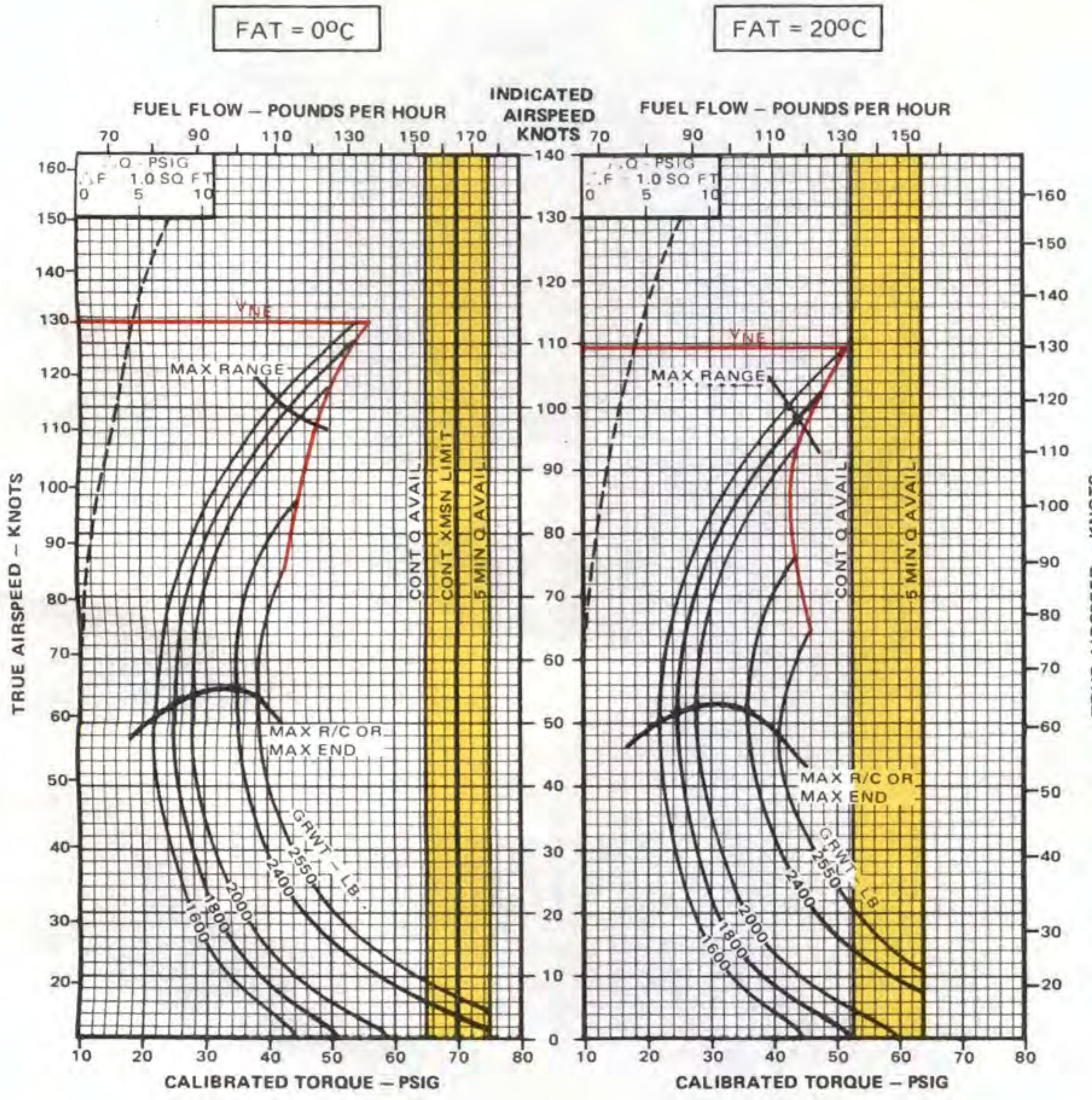
R Y

CRUISE

PRESSURE ALTITUDE — 8000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-12b. Cruise Chart, 8000 Feet, 0°C and 20°C

10-155

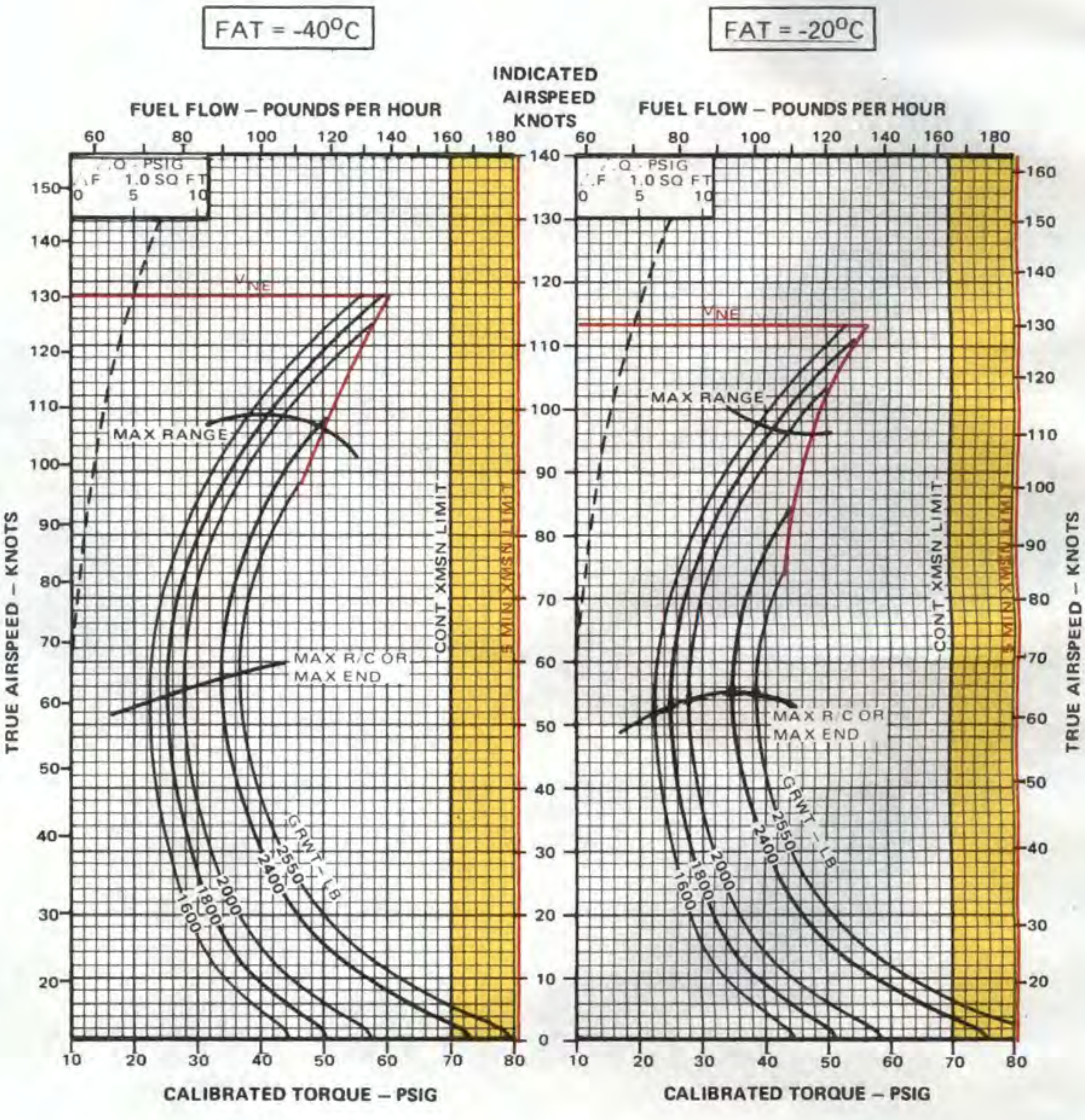
R Y

CRUISE

PRESSURE ALTITUDE — 10,000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-13a. Cruise Chart, 10,000 Feet, 40°C and -20°C

10-156

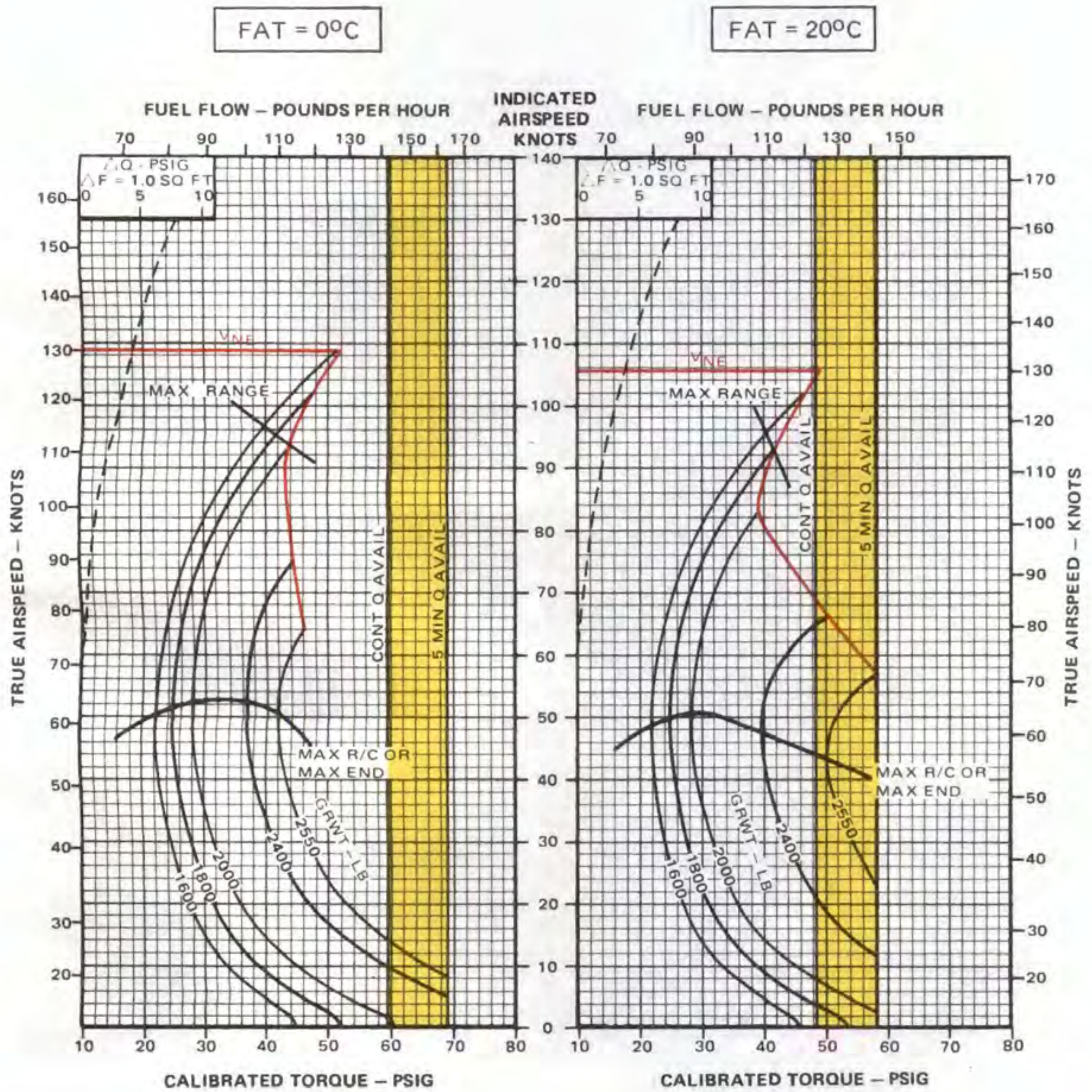
R Y

CRUISE

PRESSURE ALTITUDE — 10,000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



R Y

DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 7-13b. Cruise Chart, 10,000 Feet, 0°C and 20°C

10-157

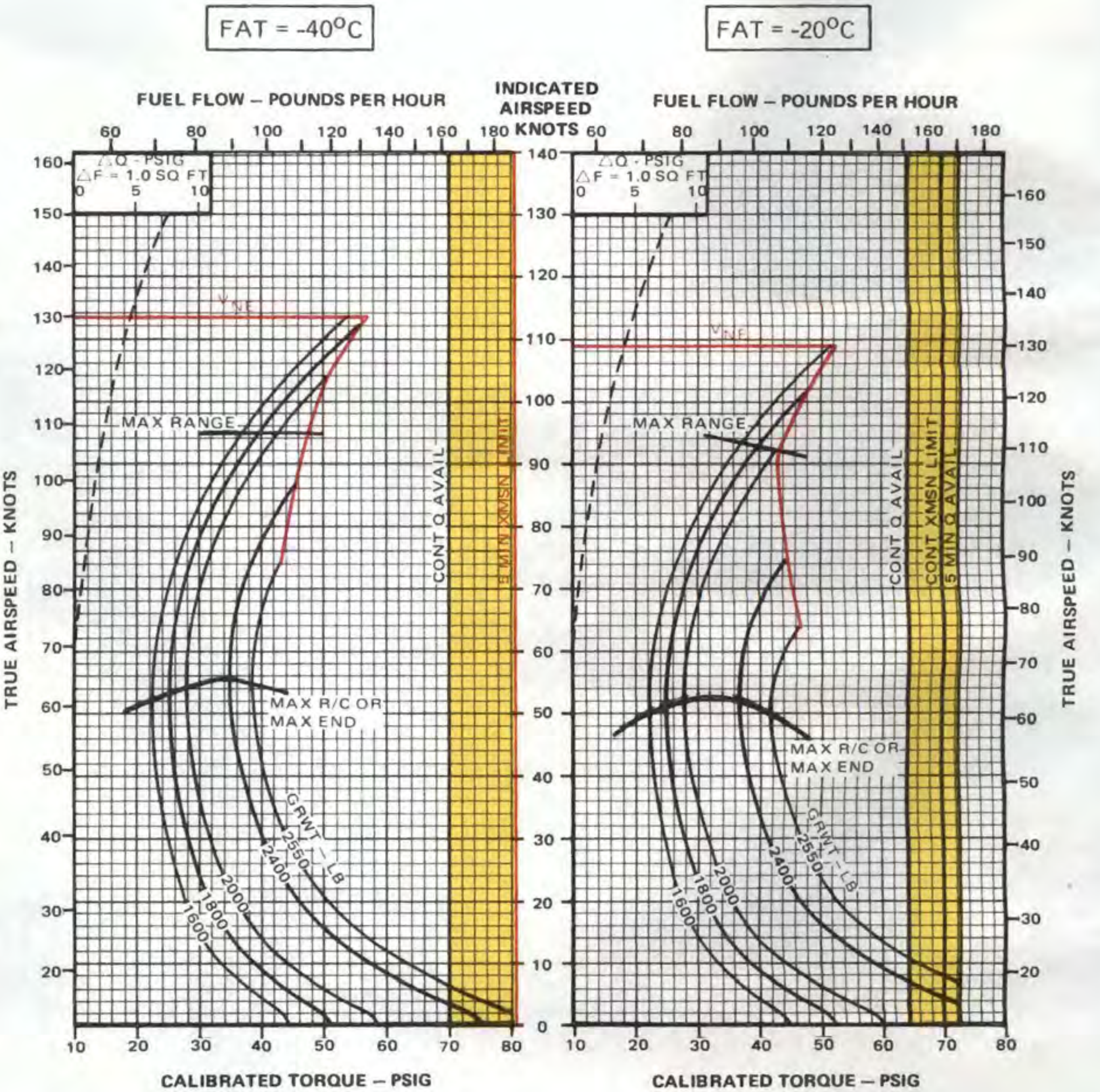
R Y

CRUISE

PRESSURE ALTITUDE — 12,000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-14a. Cruise Chart 12000 Feet - 40°C - 20°C

10-158

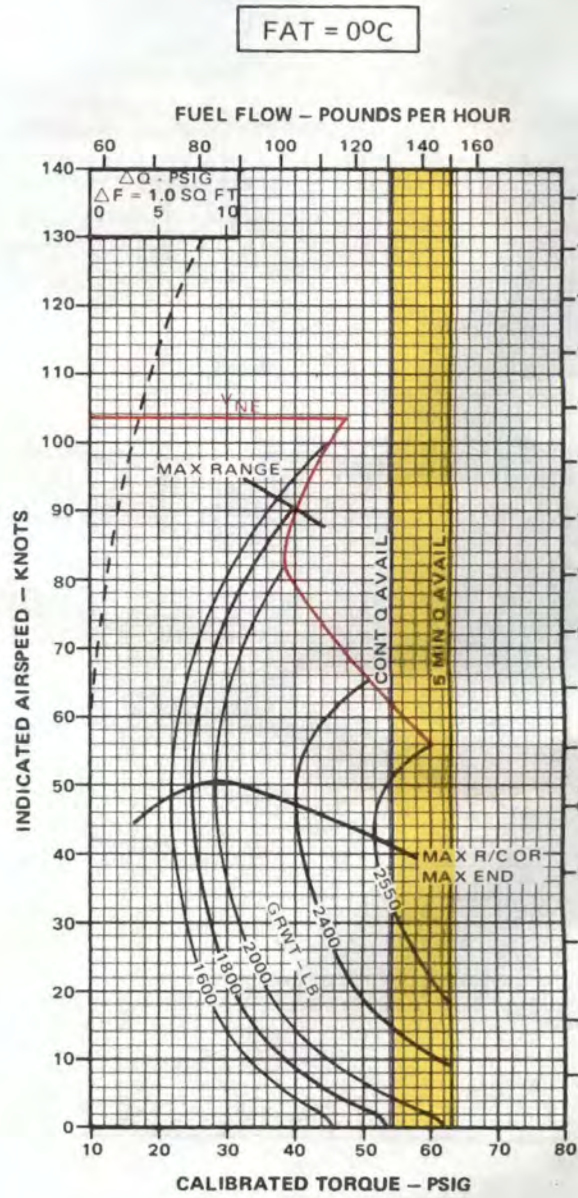
R Y

CRUISE

PRESSURE ALTITUDE — 12,000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



R Y

DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 7-14b. Cruise Chart, 12,000 Feet, 0°C

10-159

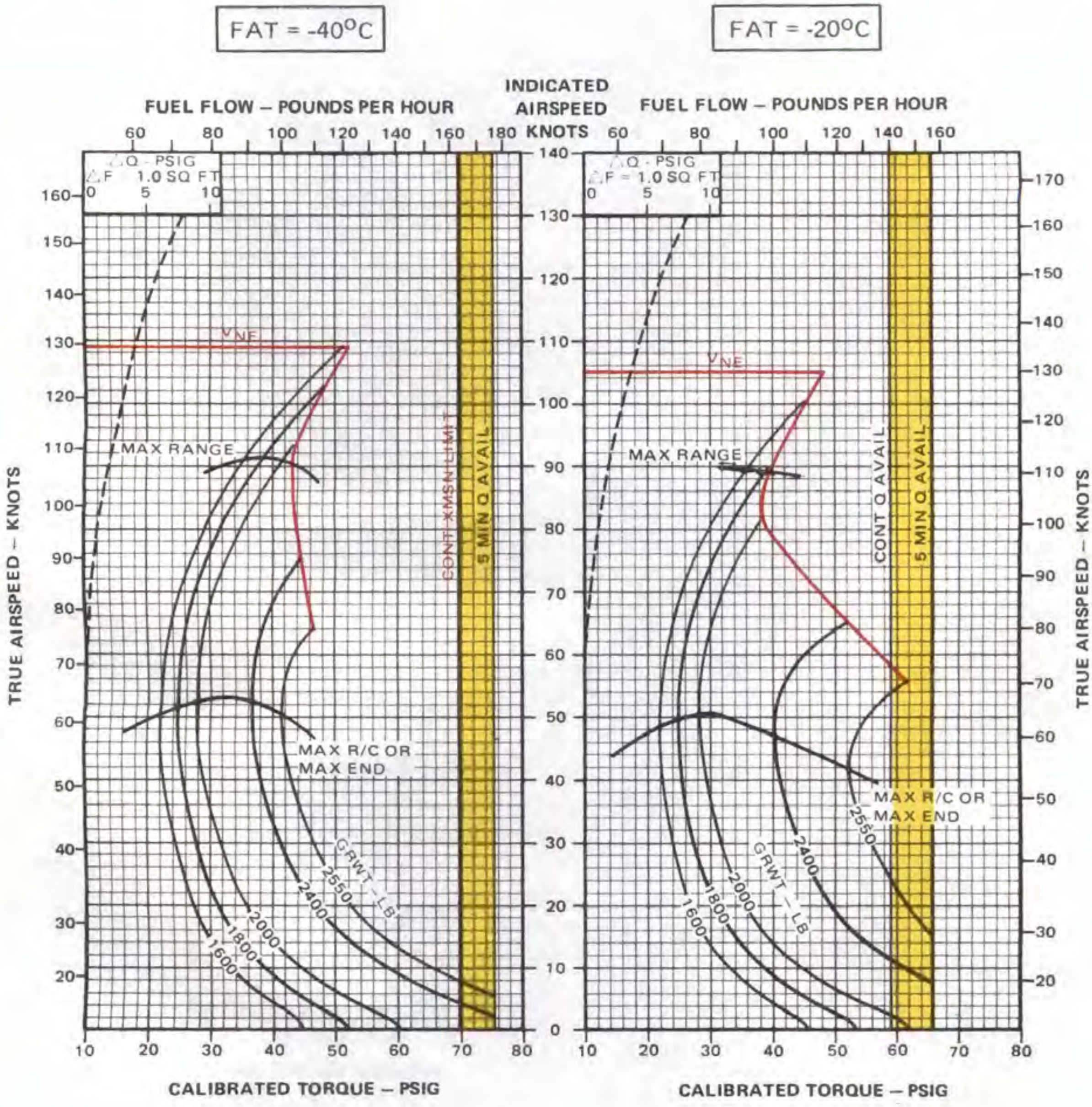
R Y

CRUISE

PRESSURE ALTITUDE – 14,000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST

R Y

Figure 7-15a. Cruise Chart, 14,000 Feet, -40°C and -20°C

10-160

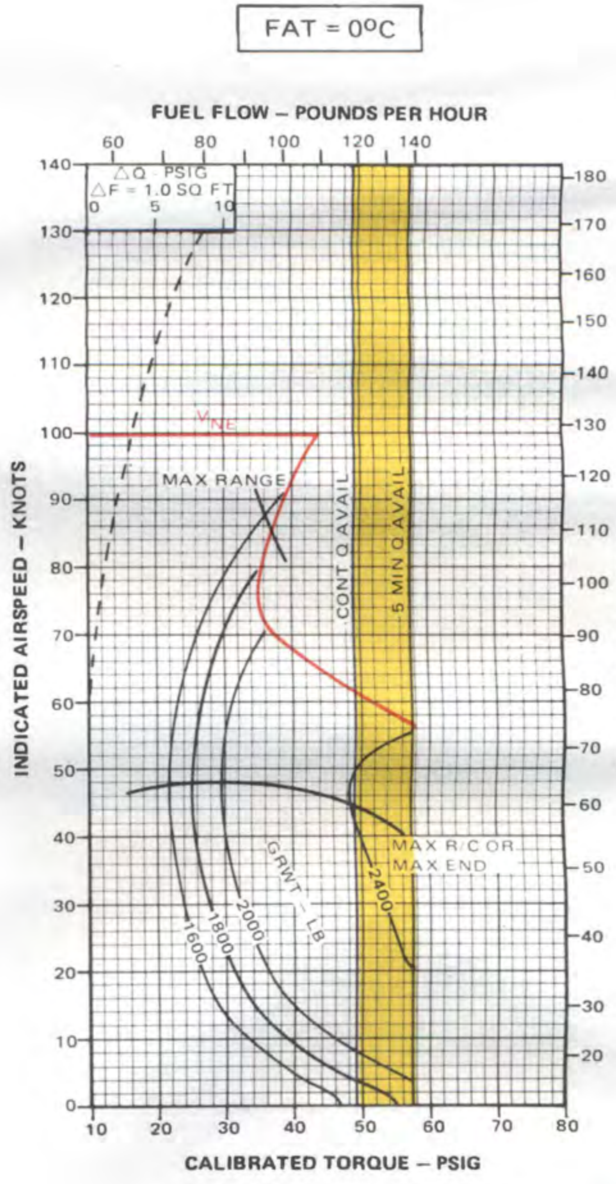
R Y

CRUISE

PRESSURE ALTITUDE – 14,000 FEET

470 ROTOR/100% N2 RPM, JP-4 FUEL

CRUISE
OH-6A
T63-A-5A/-700



R Y

DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 7-15b. Cruise Chart, 14,000 Feet, 0°C

10-161

Figure 7-16 Deleted.

All data and figure on page 7-27 has been deleted.

SECTION VIII — CLIMB DESCENT

7-30. Description — Climb-Descent chart.

The climb-descent chart (fig 7-17) shows the change in torque (above or below torque required for level flight under the same gross weight and atmospheric conditions) to obtain a given rate of climb or descent.

7-31. Use of Climb-Descent Chart.

The primary uses of the chart are illustrated by the chart examples.

a. The torque change obtained from the upper grid scale must be added to the torque required for level flight (for climb) – or subtracted from the torque required for level flight (for descent) – obtained from the appropriate cruise chart in order to obtain a total climb or descent torque.

b. By entering the bottom of the chart with a known torque change, moving upward to the gross weight, and left to the corresponding rate of climb or descent may also be obtained.

7-32. Conditions.

The climb-descent chart is based on the use of 483 rotor/6180 engine rpm/103%.

7-33. Description — Climb Performance Charts.

The climb performance charts (fig. 7-18 and 7-19) represent a synthesis of the cruise charts to ease estimation of the climb portion of the flight plan. The charts show relationships between gross weight, initial and final altitude and temperatures, and time to climb, distance covered while climbing, and fuel expended while climbing. Two charts are available, one for climbing at maximum torque and the other for climbing at continuous torque.

7-34. Use of Climb Performance Charts.

Enter at the top left at the known gross weight, move right to the initial altitude, move down to the free air temperature at that altitude, and move left and record time, distance, and fuel flow for that altitude. Enter again at the gross weight, move right to the final altitude, move down to the free air temperature at that altitude, and move right and record the time, distance, and fuel flow for that altitude. Subtract the time, distance, and fuel flow values of the initial altitude-temperature condition from those of the final altitude-temperature condition to find the time to climb, distance covered, and fuel used while climbing.

7-35. Conditions — Climb Performance Charts

The charts represent two climb conditions, one for maximum torque and one for continuous torque, bleed air off. Climb is assumed to be a 60 knots TAS as this is near the airspeed for maximum rate of climb at most atmospheric conditions. Warmup and taxi fuel are *not* included in fuel flow calculations. Climb performance is calculated for 470 rotor/6000 engine rpm/100%. Data presented is based upon operation without the protective tape installed on the main rotor blades. The degradation in performance due to the installation of the tape is equivalent to approximately a 70-pound increase in gross weight. To determine climb performance data for operation with the protective tape installed, enter the charts at a gross weight 70-pounds heavier than the actual weight of the helicopter.

G
B
Y

CLIMB – DESCENT
470 ROTOR/6000 ENGINE RPM JP-4 FUEL

CLIMB-DESCENT
OH-6A
T63-A-5A/-700

EXAMPLE A

WANTED

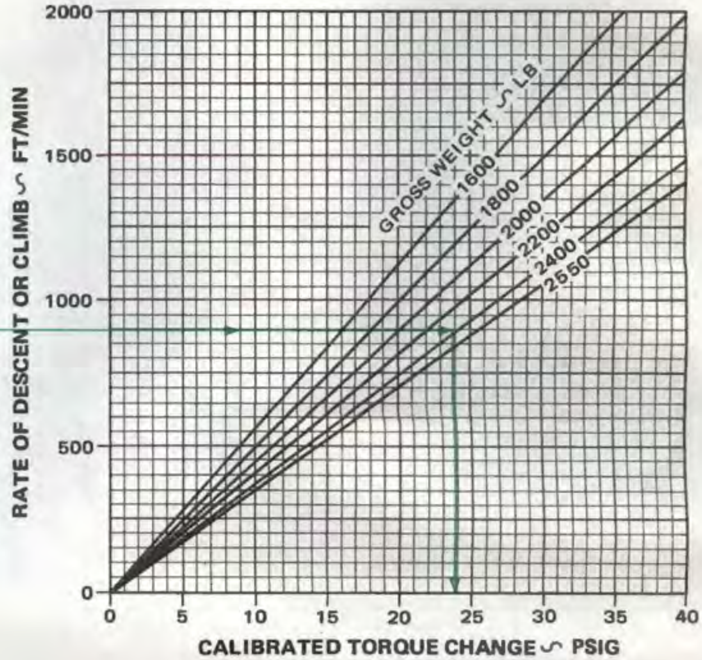
CALIBRATED TORQUE CHANGE REQUIRED FOR DESIRED R/C OR R/D

KNOWN OR ESTIMATED

GROSS WEIGHT = 2400 LB
DESIRED R/C = 900 FT/MIN

METHOD

ENTER R/C HERE
MOVE RIGHT TO GROSS WEIGHT
MOVE DOWN, READ CALIBRATED TORQUE CHANGE = 24 PSIG



REMARKS: TORQUE CHANGE IS THE DIFFERENCE BETWEEN THE TORQUE USED DURING THE CLIMB OR DESCENT, AND THE TORQUE REQUIRED FOR LEVEL FLIGHT AT THE SAME CONDITIONS (ALTITUDE, TEMPERATURE, GROSS WEIGHT, AIRSPEED, CONFIGURATION, ETC.)

EXAMPLE B

WANTED

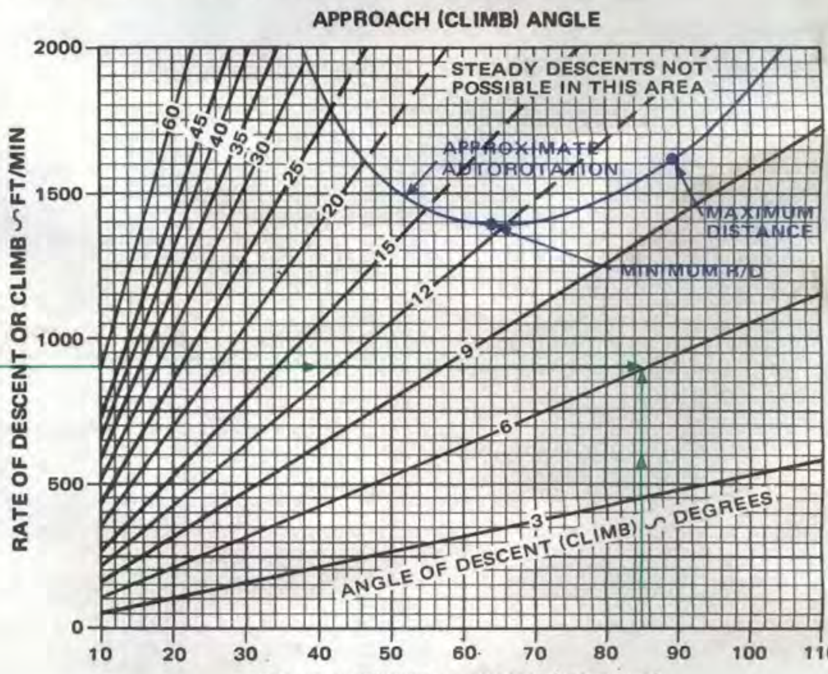
DESCENT ANGLE

KNOWN OR ESTIMATED

DESIRED R/D = 900 FT/MIN
TAS = 85 KNOTS

METHOD

ENTER R/D HERE
MOVE RIGHT TO 85 KN TAS
READ ANGLE OF DESCENT = 6°



DATA BASIS: DERIVED FROM OH-6A FLIGHT TEST USAASTA 65-37 APRIL 1969

10-115

Figure 7-17. Climb-Descent Chart.

G

CLIMB – PERFORMANCE
MAXIMUM TORQUE
470 ROTOR/6000 ENGINE RPM CLIMB AT 60 KN TAS
BLEED AIR OFF JP-4 FUEL

CLIMB-TORQUE
OH-6A
T63-A-5A/-700

EXAMPLE:

WANTED:

TIME TO CLIMB
DISTANCE TRAVELED
FUEL USED

KNOWN:

GROSS WEIGHT = 2400 LBS
INITIAL PRESSURE ALTITUDE = 2000 FT
FINAL PRESSURE ALTITUDE = 10000 FT
INITIAL FAT = 0°C
FINAL FAT ESTIMATED AT -20°C

METHOD:

ENTER HERE AT GROSS WEIGHT MOVE RIGHT TO INITIAL PRESSURE ALTITUDE

MOVE DOWN TO INITIAL FAT ON TIME, DISTANCE, AND FUEL CHARTS MOVE LEFT, READ =

TIME = 1.2 MIN
DISTANCE = 1.2 NMI
FUEL = 3.5 LB

REENTER AT SAME GROSS WEIGHT MOVE RIGHT TO FINAL PRESSURE ALTITUDE

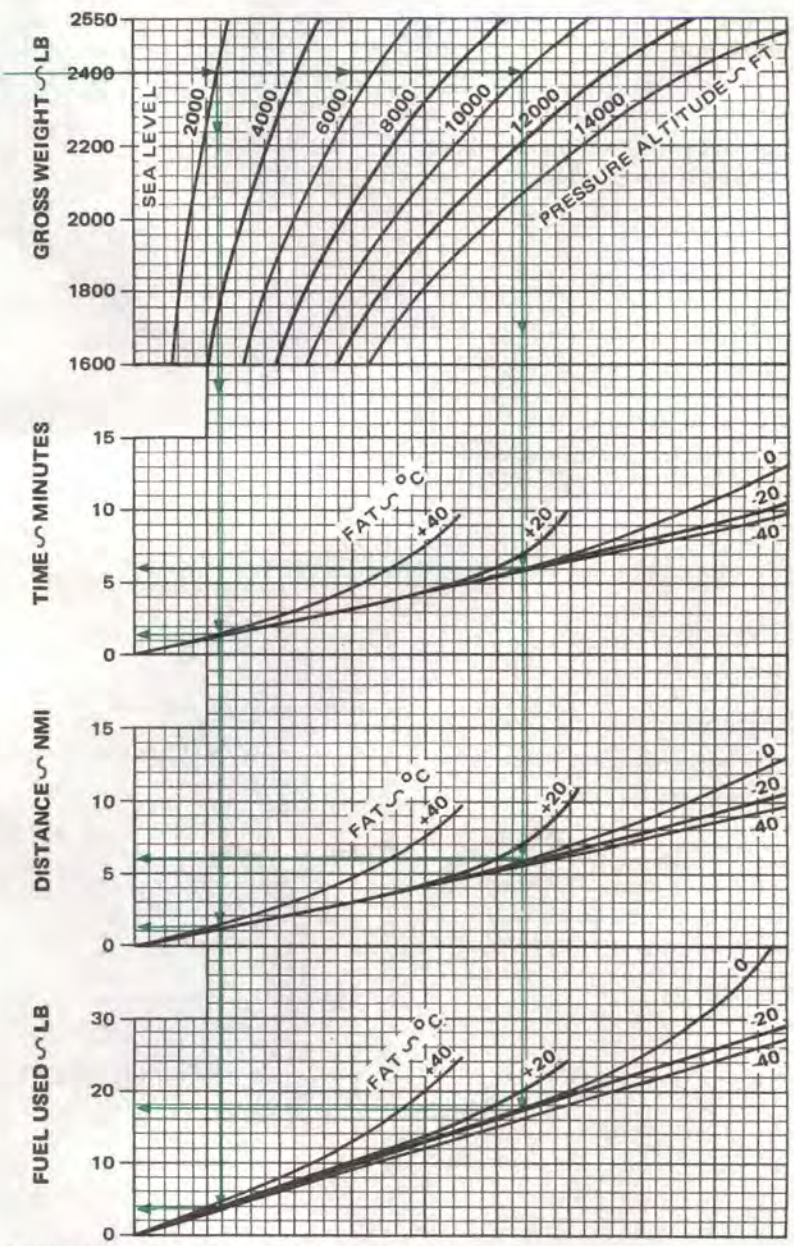
MOVE DOWN TO FINAL FAT, ON TIME, DISTANCE, AND FUEL CHARTS MOVE LEFT, READ:

TIME = 6 MIN
DISTANCE = 6 NMI
FUEL = 18 LB

TIME TO CLIMB = 6 -1.2 = 4.8 MIN

DISTANCE COVERED = 6 -1.2 = 4.8 NMI

FUEL USED =17.5 = 3.5 = 14.0 LB



DATA BASIS: DERIVED FROM FLIGHT TEST, USAASTA PROJECT NO. 65-37, APRIL 1969

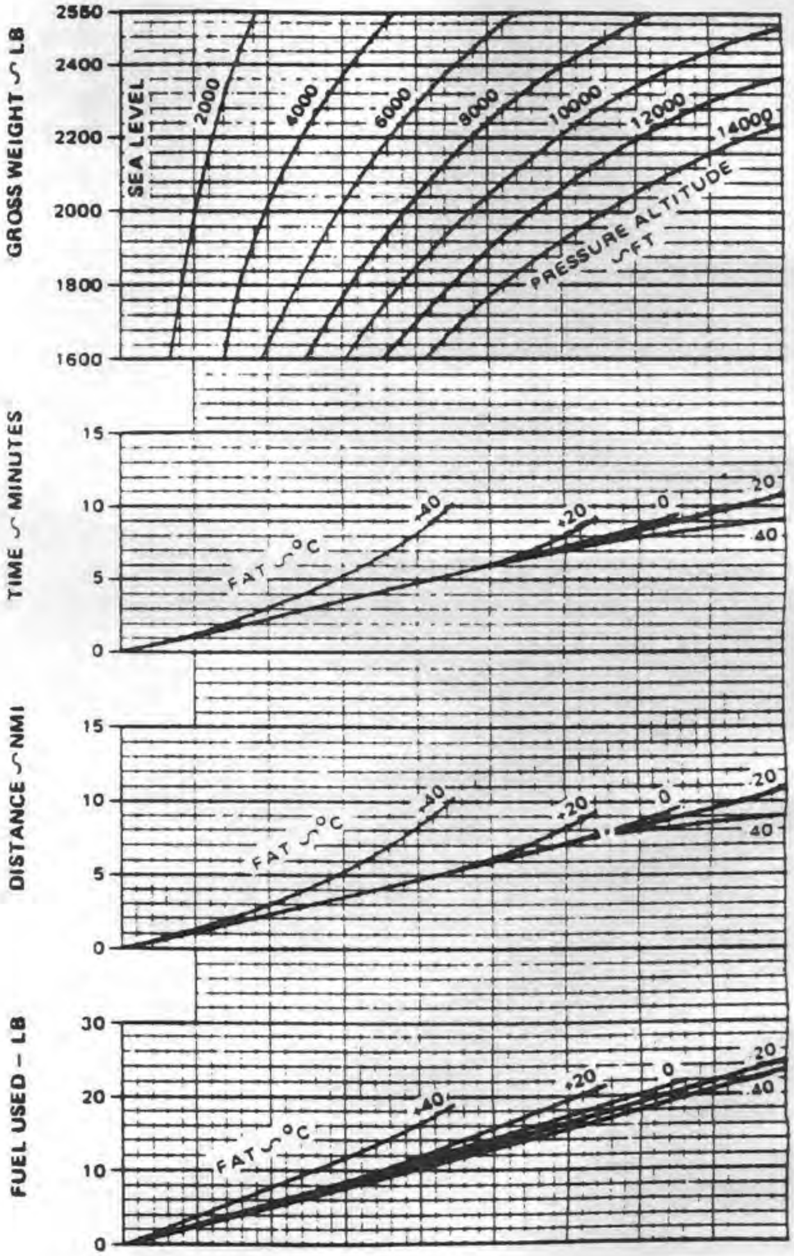
10-117

Figure 7-18. Climb Performance Chart, Maximum Torque.

CLIMB – PERFORMANCE
CONTINUOUS TORQUE

470 ROTOR/6000 ENGINE RPM   CLIMB AT 60 KN TAS
BLEED AIR OFF   JP-4 FUEL

CLIMB-CONT. TORQUE
OH-6A
T63-A-5A/-700



DATA BASIS: DERIVED FROM FLIGHT TEST, USAASTA PROJECT NO. 65-37, APRIL, 1969

10-118

Figure 7-19. Climb Performance Chart, Continuous Torque.

SECTION IX — GROUND FUEL FLOW

7-36. Decription.

The ground fuel flow chart (fig. 7-20) shows the fuel flow for idle and 100 percent rotor RPM with flat pitch.

7-37. Use of Chart.

The primary use of the chart is illustrated by the example. To determine the idle fuel flow, it is necessary to know the pressure altitude and free air temperature. Enter at the pressure altitude, move right to FAT in appropriate grid, then move down and read fuel flow on the bottom scale. Fuel flow for 100 percent rotor RPM with flat pitch is determined in the same manner. Refer to the cruse charts to obtain fuel flow for cruise power conditions.

7-38. Conditions.

This chart is based on the use of JP-4 fuel.

G

GROUND FUEL FLOW

JP-4 FUEL

GROUND FUEL FLOW
OH-6A
T63-A-T63-A-5A/-700

EXAMPLE

WANTED

FUEL FLOW AT ENGINE IDLE AND AT 470 ROTOR RPM WITH FLAT PITCH

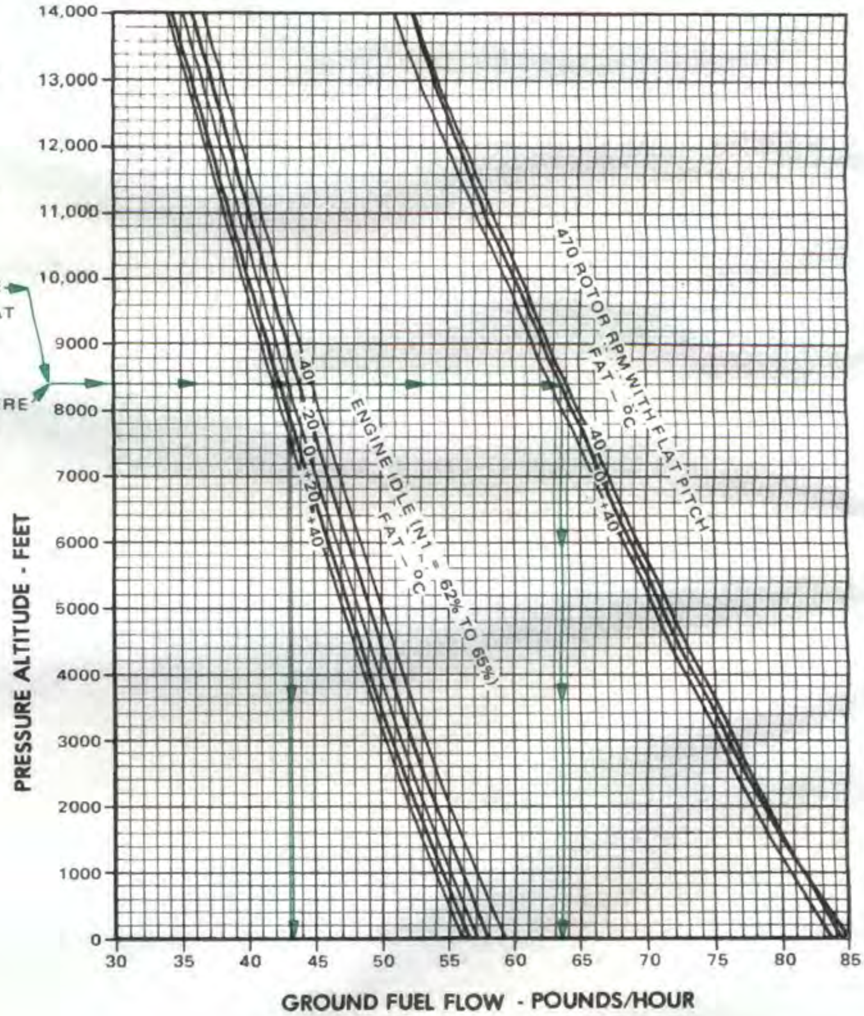
KNOWN

PRESSURE ALTITUDE = 8400 FEET
FAT = 0°C

METHOD

ENTER PRESSURE ALTITUDE HERE
MOVE RIGHT TO (ENGINE IDLE) FAT
MOVE DOWN, READ ENGINE IDLE FUEL FLOW = 43.3 LB/HR

REENTER PRESSURE ALTITUDE HERE
MOVE RIGHT TO (470 ROTOR RPM WITH FLAT PITCH) FAT
MOVE DOWN, READ 470 ROTOR RPM WITH FLAT PITCH FUEL FLOW = 63.5 LB/HR



DATA BASIS: CALCULATED

G

Figure 7-20. Ground Fuel Flow Chart.

10-112A

SECTION XI — Deleted.

Figure 7-21 Deleted.

All data and figure on page 7-35 has been deleted.

CHAPTER 8

NORMAL PROCEDURES

SECTION I — MISSION PLANNING

8-1. MISSON PLANNING.

Mission planning begins when the mission is assigned and extends to the preflight check of the helicopter. It includes, but is not limited to, checks of operating limits and restrictions; weight, balance and loading; performance; publications; flight plan; and crew and passenger briefings. The pilot shall ensure compliance with the contents of this manual which are applicable to the mission.

8-2. AVIATION LIFE SUPPORT EQUIPMENT (ALSE).

All aviation life support equipment required for mission; e.g., helmets, gloves, survival vests, survival kits, etc., shall be checked.

8-3. CREW DUTIES/RESPONSIBILITIES.

The minimum, crew required to fly the helicopter is a pilot. During single—pilot operations, the pilot shall occupy the right-hand pilot's seat. Additional crew members, as required, may be added at the discretion of the commander. The manner in which each crew member performs his duties is the responsibility of the pilot.

a. *Crew Briefing.* A crew briefing shall be conducted to ensure a thorough understanding of individual and team responsibilities. The briefing should include, but not be limited to, copilot, crew chief, mission—equipment operator, ground—crew responsibilities, and the coordination necessary to complete the mission in the most efficient manner. A review of visual signals is desirable when ground guides do not have voice communications with the crew.

b. *Passenger Briefing.* The following is a guide that should be used in accomplishing required passenger briefings; items that do not pertain to a specific mission may be omitted.

(1) Crew introduction.

(2) Equipment.

(a) Personal to include ID tags.

(b) Professional.

(c) Survival.

(3) Flight Data.

(a) Route.

(b) Altitude.

(c) Time en route.

(d) Weather.

(4) Normal procedures.

(a) Entry and exit of helicopter

(b) Seating.

(c) Seat belts.

(d) Movement in the helicopter.

(e) Internal communication.

(f) Security of equipment.

(g) Smoking.

(h) Oxygen.

(i) Refueling.

(j) Weapons.

(k) Protective masks.

(l) Parachutes.

(m) Ear protection.

(n) Aviation life support equipment (ALSE).

(5) Emergency procedures.

(a) Emergency exits.

(b) Emergency equipment.

(c) Emergency landing/ditching procedures.

(d) Bail out.

(e) Survival.

(f) Recovery.

SECTION II. OPERATING PROCEDURES AND MANEUVERS

8-4. OPERATING PROCEDURES AND MANEUVERS.

This section deals with normal procedures and includes all steps necessary to ensure safe, efficient operation of the helicopter from the time a preflight begins until the flight is completed and the helicopter is parked and secure. Unique feel, characteristics, and reaction of the helicopter during various phases of operation and the techniques and procedures used for taxiing, takeoff, climb, etc., are described, including precautions to be observed. Your flying experience is recognized; therefore, basic flight principles are avoided. Only the duties of the minimum crew neccessary for the actual operation of the helicopter are included. Additional crew duties are covered as necessary in Section I, CREW DUTIES. Mission equipment checks are contained in Chapter 4, MISSION EQUIPMENT. Procedures specifically related to instrument flight that are different from normal procedures are covered in this section, following normal procedures. Descriptions of functions, operations, and effects of controls are covered in Section IV, FLIGHT CHARACTERISTICS, and are repeated in this section only when required for emphasis. Checks that must be performed under adverse environmental conditions, such as desert and cold-weather operations, supplement normal procedures checks in this section and are covered in Section V, ADVERSE ENVIRONMENTAL CONDITIONS.

8-5. SYMBOLS DEFINITION.

Items which apply only to night or only to instrument flying shall have a "N" or an "I," respectively, immediately preceeding the check to which it is pertinent. The symbol "O" shall be used to indicate "if installed." Those duties which are the responsibility of the copilot, will be indicated by a circle around the step number; i.e., 4. The symbol star " " indicates that a detailed procedure for the step is located in the performance section of the condensed checklist. The symbol asterisk "*" indicates that performance of step is mandatory for all thru—flights. The asterisk applies only to checks performed prior to takeoff. Placarded items such as switch and control labels appear in upper case.

8-6. CHECKLIST.

Normal procedures are given primarily in checklist form and amplified as necessary in accompanying paragraph form, when a detailed description of a procedure or maneuver is required. A condensed version of the amplified checklist, omitting all explanatory text, is contained in the operator's checklist. To provide for easier cross—referencing, the procedural steps in the checklist are numbered to coincide with the corresponding numbered steps in this manual.

8-7. PREFLIGHT CHECK.

The pilot's "walk—around" interior checks are outlined in the following procedures. The preflight check is not intended to be a detailed mechanical inspection, but simply a guide to help the pilot check the condition of the helicopter. The steps that are essential for safe helicopter operation are included. The preflight may be made as comprehensive as conditions warrant at the discretion of the pilot.

8-8. BEFORE EXTERIOR CHECK.

WARNING

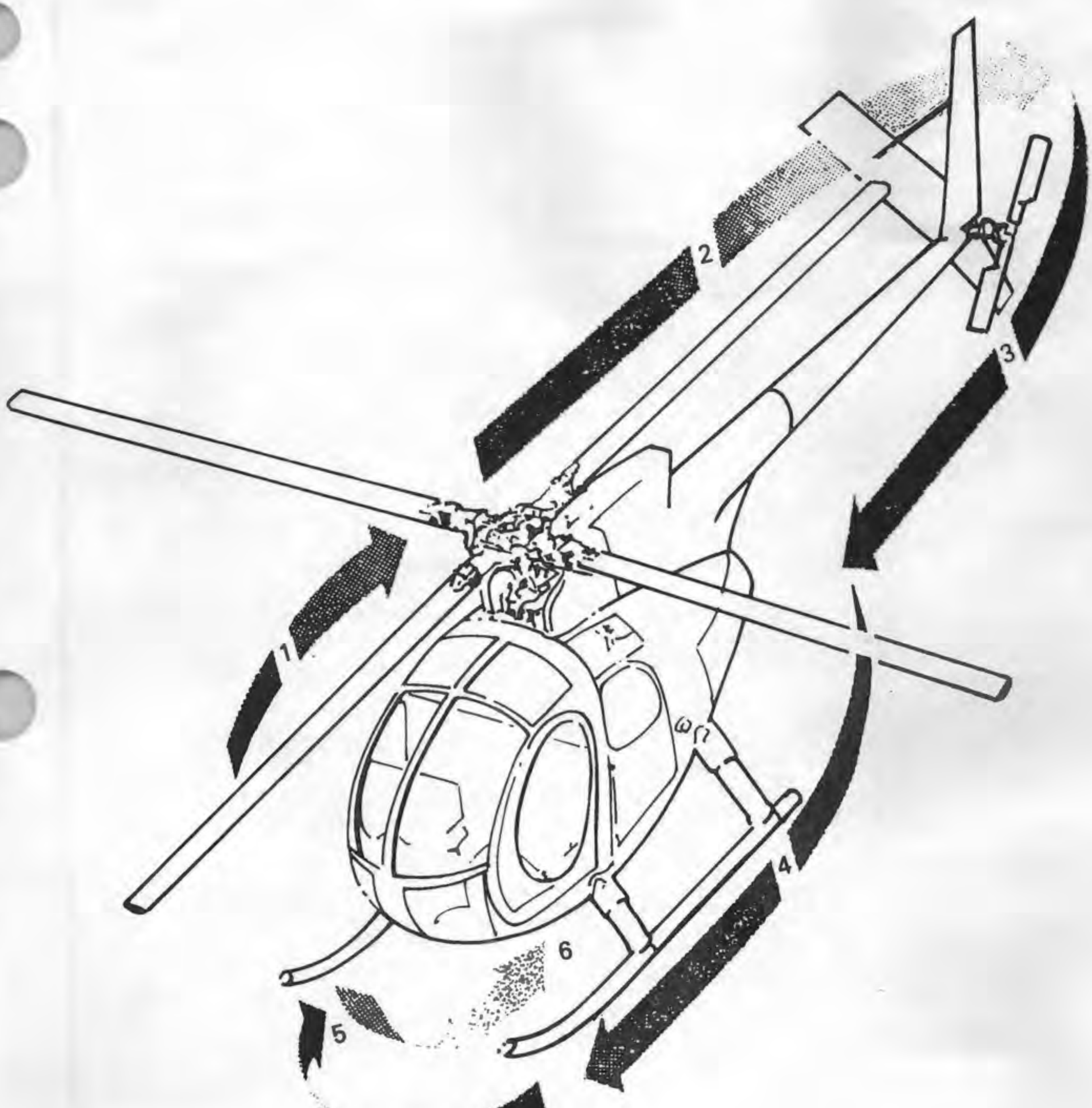
Do not preflight until armament systems are safe.

O* 1. Armament system — Safe as follows:

O a. Armament systems — Safe; ground safety pins in, safing devices installed, and gun clear.

O b. ARMAMENT SAFE switch — SAFE if armament is installed.

O c. ARMAMENT MASTER switch — OFF if armament is installed.



AREA 1. FUSELAGE-CABIN RIGHT SIDE
AREA 2. AFT FUSELAGE-RIGHT SIDE
AREA 3. AFT FUSELAGE-LEFTSIDE
AREA 4. FUSELAGE-CABIN LEFT SIDE
AREA 5. FUSELAGE-FRONT
AREA 6. FUSELAGE-UNDER SIDE

Figure 8-1. Inspection Areas

2. Publications — check DA Forms 2408-12, -13, -14, and -18; DD Form 1896 if required; DD Form 365-4, Compass Cards; locally required forms, records and publications; and availability of operator's manual (-10) and checklist (- CL).

O* 3. Covers, locking devices, tiedowns, and grounding cables — Removed and secured.

* 4. Ignition lock switch — ON.

5. Cockpit — Check as following items are checked.

a. FUEL PUMP switch — OFF.

b. BATT switch — BATT.

c. Fuel gage — Check quantity.

d. Lights — Check if use is anticipated (landing, anticollision, position, and interior lights, and NVG lighting), then, OFF.

e. Caution and warning lights — Check illumination. On series 1 and 2 aircraft, the XMSN OIL PRESS and ENGINE OUT warning lights should be flashing; the GENERATOR OUT caution light should illuminate. On series 3 aircraft the TRANS OIL PRESS and ENGINE OUT warning and MASTER CAUTION lights should be flashing. The DC GEN light should be illuminated. During daylight operation, check that Flight—OFF—BRT—light Rheostat is OFF. All other lights — press to test.

f. NVF position lights — ON, IR searchlight —ON; check lights for condition and operation as required, then OFF.

g. BATT switch — OFF.

h. First aid kit — Check.

i. Pilot seat, seat belts, shoulder harness, and armor. Check condition.

j. Fire extinguisher — Check.

k. Radio access compartment — Check.

l. Pilot pedals — Adjust.

m. Cabin door jettison pins — Check.

n. Crew door — Check condition.

8-9. EXTERIOR CHECK.

See Figure 8-1.

8-10. FUESLAGE — CABIN RIGHT SIDE (AREA 1).

1. Cabin interior — Check as following items are checked:

a. Forward landing gear dampers — Check for extension and condition.

O* b. Cargo/loose equipment — Check for proper loading and tiedown.

* c. Passenger seat and belts — Check condition. Ensure shoulder harnesses and seat belts are properly fastened together and tightened when not in use.

* d. Transmission oil level — Check.

O e. Cabin door — Check condition.

2. Main rotor system — Check condition.

3. Engine and transmission air inlets — Check unobstructed engine air filter bypass door secure.

4. Fuselage — Check as following items are checked:

a. Landing gear — Check condition of fairing, skid, and skid shoe — Handling wheel removed.

b. IR searchlight — Check condition and security.

WARNING

Do not fly aircraft with ground handling wheels installed.

c. Fuel sample — Check for contamination before first flight of the day. If the fuel sump has not been drained, drain a sample and check.

d. Fuel — Check quantity on first flight of the day and when refueled. Cap secure.

e. Engine oil tank — Check condition, oil level and cap secure.

f. Static port — Check unobstructed.

g. ADF atenna — Check condition.

8-11. AFT FUSELAGE — RIGHT SIDE (AREA 2).

1. Fuselage — check condition as following items are checked.

O a. Antennas — Check condition.

b. Stablizers and strut — Check condition.

c. Tail skid — Check condition.

8-12. AFT FUSELAGE — LEFT SIDE (AREA 3).

*1. Tail rotor transmission and oil level — Check condition.

*2. Tail rotor and controls — Check condition and free movement.

*3. Main rotor blades — Check condition. Do not handle trim tabs.

4. Fuselage — Check.

8-13. FUSELAGE — CABIN LEFT SIDE (AREA 4).

1. Engine compartment — Check condition; door secure.

2. Fuselage — Check condition as following items are checked.

O* a. Mission equipment — Check weapons and other equipment as required to support the mission. Refer to Chapter 4, MISSION EQUIPMENT, for equipment checks.

b. Landing gear — Check condition of fairing, skids, and skid shoe. Handling wheel removed.

O c. Cabin door — Check condition.

3. Cockpit — Check as following items are checked:

a. Copilot seat, seat belt, shoulder harness, and armor — Check condition. Secure seat belt and shoulder harness if seat is not used.

b. Cyclic — Check secure or stow as required.

c. Pedals — Adjust as required.

d. Battery compartment — Check condition

e. Cabin door jettison pins — Check.

f. Crew door — Check condition.

8-14. FUSELAGE — FRONT AND UNDERSIDE (AREAS 5 AND 6).

1. Fuselage Front — check as following items are checked:

a. Canopy/windshield — Check condition.

b. Air inlet — Check unobstructed

c. FM homing antenna — Check condition.

d. Pitot tube — Check unobstructed.

e. Pedals — Check control linkages unobstructed.

2. Fuselage underside — Check condition as following items are checked.

O a. ADF sense antenna — check condition.

b. Fuel vent — Check unobstructed.

*3. Crew and passenger briefing — Complete as required. Refer to crew and passenger briefing in Section II, CREW DUTIES.

8-15. BEFORE STARTING ENGINE

O* 1. Armament system — Check and set as required.

2. Shoulder harness lock(s) — Check operation and leave unlocked.

*3. Overhead controls and switches — Set as follows:

a. Utility light — OFF.

b. CABIN HEAT AND DEFOG lever — OFF.

c. ENGINE DE—ICER lever — OFF.

d. BYPASS AIR control — Check full aft position.

4. Magnetic compass — Check.

5. Instrument panel instruments and switches — Check and set as follows:

a. Flight instruments.

b. Systems instruments.

c. PITOT HEAT switch — OFF.

6. Console switches and circuit breakers — Set as follows:

a. Avionics — OFF; set as required.

b. Circuit breakers — In.

c. INVERTER switch — OFF.

d. GEN switch — GEN.

e. DIR GYRO switch — MAGNETIC or SLAVE.

f. AUX TANK or UTILITY POWER switch — OFF.

g. FUEL PUMP switch — OFF.

h. FUEL VALVE — Check open (Down).

*i. BATT switch — As required. BATT for battery start: EXT for GPU start.

*j. LIGHTS switches — Set as required.

(1) POS LT switch — As required.

(2) ANTI—COLLISION switch — ANTICOLLISION.

(3) NVG POS LT switch — ON, adjust intensity.

a. NVG filters — Check.

*7. GPU — Connect for GPU start.

8. Engine out audible and RE—IGN system — Check for warning tone is headset and illumination of the RE—IGN light. GEN switch — ON then OFF.

9. Flights controls — Check and set as follows:

a. Control frictions — OFF.

b. Check full travel. Center cyclic and pedals. The cyclic must be laterally in the center of the friction slot and longitudinally one-third from full aft to avoid droop stop damage. Collective pitch unobstructed and down.

c. Control frictions — As required.

*10. Throttle — Check and set for start. Move to full open, then idle stop, them to the fuel cutoff position.

8-16. STARTING ENGINE

*1. Fireguard — Posted if available.

*2. Rotor blades — Check clear and untied.

*3. Engine — Start as follows:

a. Starter switch — Press to hold.

b. TOT — Check below 200°C.

c. Throttle — Open to the idle position at peak of N1 rpm provided the following N1 limits are maintained.

FAT	MINIMUM N-1
7° and above	15%
7°C thru -18°C	13%
-18°C FAT and below	12%

d. Main rotor — Check moving by 30% N1.

e. TOT — Monitor for over—temperature conditions.

f. Starter switch — Release at 58% N1.

g. Engine oil pressure — Check.

h. XMSN OIL PRESSURE warning light — Check out.

i. N1 — 62 to 65 percent.

O*4. SCAV AIR switch — SCAV AIR. A slight but discernible increase in TOT should follow. If not, operation of the scavenge air system may be checked by hand, feeling for air flow out the scavenge air outlet, then OFF.

* 5. Ground power unit (GPU start) — Disconnect.

* 6. BATT switch (GPU start) — BATT.

7. GEN switch — GEN.

* 8. DC Amps — Check 60 amps or less before inverter is turned on.

* 9. INVERTER switch — INVERTER. The attitude gyro and homing, heading, bearing indicator should be operating properly.

*10. Avionics — ON as required.

8-17. ENGINE RUN UP.

* 1. Engine instruments — Check. Control Frictions — Off as required.

* 2. Throttle — Slowly increase to full open. Set N2 to 101 percent.

3. HEAT and DE—ICER systems — Check if use is anticipated as follows; then, set as required.

a. ENGINE DE—ICER — By moving the control lever full aft, check for a rise in TOT and then forward. TOT should decrease.

b. CABIN HEAT and DE—FOG — Check by moving the switch to PITOT HEAT; check for a rise in TOT then forward. TOT should decrease.

c. PITOT HEAT — Check by moving the switch to PITOT HEAT; check for increase in DC AMPs, then OFF.

4. Avionics — Check as required.

*5. Flight instruments — Check and set as follows:

a. Altimeter — Set and compare altitude with field elevation.

b. Heading indicators — Check that the heading indicator is aligned and corresponds with the magnetic compass. Set heading indicator as required.

O*6. Doors — Secured.

7. Health Indicator Test (HIT Check). Perform before first flight of the day; refer to HIT TOT log in helicopter log book.

O*8. SCAV AIR switch — As required.

9. Deceleration check — Perform (if required, see Chapter 5, FUEL OPERATION LIMITS) as follows:

NOTE

Above check is only required when using alternate fuel.

a. N2 RPM — 101 percent and stabilize 15 seconds.

b. Throttle — Idle. Simultaneously start a time count.

c. Stop time as N1 passes through 65 percent.

NOTE

Multiple attempts may be required before proficiency is obtained in timing the deceleration.

d. Check deceleration time. Minimum allowable time is 2 seconds. If deceleration time is less than 2 seconds, make two checks to confirm the time.

e. If deceleration time is less than 2 seconds, aircraft will not be flown until maintenance action is accomplished as prescribed in TM 55-1520-231-23. Enter conditions in "Remarks" section on DA Form 2408-13.

f. Throttle — Open.

8-18. HOVER CHECK.

Perform the following checks at a hover:

1. Engine instruments — Check.
2. Power — Check. The power check is performed by comparing torque required to hover with the predicted values from performance charts in Chapter 7.
3. Flight instruments — Check as required.

a. Altimeter — Check for indication.

b. Slip indicator — Ball free in race.

c. Heading indicator and magnetic compass — Check for turn indications left and right.

d. Attitude indicator — Check indications nose high and low and banks left and right.

8-19. BEFORE TAKEOFF.

Immediately prior to takeoff, the following checks shall be accomplished:

*1. N2 — 101% (103% hover).

*2. Systems — Check engine, transmission, electrical, and fuel quantity indications.

*3. Crew, passengers, and mission equipment — Check.

*4. Avionics — As required.

8-20. TAKEOFF.

8-21. MAXIMUM PERFORMANCE.

A takeoff that demands maximum performance from the helicopter is necessary because of various combinations or heavy helicopter loads, restricted performance due to high—density altitudes, barriers that must be cleared, and other terrain features. The decision to use either of the following takeoff techniques must be based on an evaluation of the conditions and helicopter performance.

CAUTION

During takeoff, nose low altitudes close to the ground can result in ground contact of the WSPS.

a. *COORDINATED CLIMB.* Align the helicopter with the desired takeoff course at a stabilized hover of approximately 3 feet (skid height). Apply forward cyclic pressure smoothly and gradually while simultaneously increasing collective to begin a coordinated acceleration and climb. Adjust pedal pressure as necessary to maintain the desired heading. Maximum torque available should be applied is established that will permit safe obstacle clearance. The climbout is continued at that attitude and power setting until the obstacle is cleared. After the obstacle is cleared, adjust helicopter altitude and collective as required to establish a climb at the desired rate and airspeed. Continuous coordinated application of control pressures is necessary to maintain trim, heading, flight path, airspeed, and rate of climb. Takeoff may be made from the ground by positioning the cyclic control slightly forward of neutral, prior to increasing collective.

b. *LEVEL ACCELERATION.* Align the helicopter with the desired takeoff course at a stablized hover of approximately 3 feet (skid height). Apply forward cyclic pressure smoothly and gradually while simultaneously increasing collective pitch to begin an acceleration at approximately 3 to 5 feet skid height. Adjust pedal pressure as necessary, to maintain the desire heading. Maximum torque available should be applied (without exceeding translational lift). Additional forward cyclic pressure will be necessary to allow for level acceleration to the desired climb airspeed. Approximately 5 knots prior to reaching the desired climb airspeed, gradually release forward cyclic pressure and allow the helicopter to begin a constant airspeed climb to clear the obstacle. Care must be taken not to decrease airspeed during the climbout, since this may result in the helicopter descending (falling through). After the obstacle is cleared, adjust helicopter attitude and collective, as required, to establish a climb at the desired rate and airspeed. Continuous coordinated application of control pressures is necessary to maintain trim, heading, flight path, airspeed, and rate of climb. Takeoff may be made from the ground by positioning the cyclic control slightly forward of neutral, prior to increasing collective.

CAUTION

Do not exceed aircraft limits during power application.

c. COMPARISON OF TECHNIQUES. Where the two techniques yield the same distance over a 50-foot obstacle, the coordinated climb technique will give a shorter distance over lower obstacles and the level—acceleration technique will give you a shorter distance over obstacles higher than 50 feet. The two techniques give approximately the same distance over a 50-foot obstacle, when the helicopter can barely hover OGE. As hover capability is decreased, the level—acceleration technique gives increasingly shorter distances than the coordinated—climb technique. In addition to the distance comparison, the main advantages of the level—acceleration technique are as follows:

(1) It requires less or no time in the avoid area of the height—velocity diagram.

(2) Performance is more repeatable, since reference to attitudes which change with loading and airspeed is not required.

(3) At the higher climbout airspeeds (30 knots or more), reliable indicated airspeeds are available for accurate airspeed reference from the beginning of the climbout, therefore minimizing the possibility of settling.

The main advantage of the coordinated—climb technique is that the climb angle is established early in the takeoff, and more distance and more distance and time are available to abort the takeoff if the obstacle cannot be cleared. Additionally, large attitude changes are not required to establish the climb airspeed.

8-22. BEFORE LANDING.

Prior to landing, the following checks shall be accomplished:

1. Crew, passenger, and mission equipment — Check.

CAUTION

IR searchlight must be fully retracted prior to landing on unimproved surface.

8-23. ENGINE SHUTDOWN.

CAUTION

If the throttle is inadvertently rolled to the fuel cutoff position, do not attempt to roll it back on.

1. Throttle — Idle for two minutes.
2. Landing light — OFF.
O 3. IR searchlight — as required.
4. Controls — Set. The cyclic must be laterally in the center of the friction slot and longitudinally one—third from full aft to avoid droop stop damage; pedals neutral; collective pitch down and frictioned.
5. Overhead controls and switches — Set as follows:

a. Utility light — OFF.

b. CABIN HEAD and DE-FOG lever — OFF.

c. ENGINE DE-ICE lever — OFF.

d. BYPASS AIR control — Full aft position.

6. PITOT HEAT switch — OFF.
7. AVIONICS — OFF.
8. Throttle — Fuel cutoff. As N1 speed drops below 55%, the engine out warning system should activate. Check for NR, N2 needle split.
9. Instrument panel and console switches — Set as follows:

a. INVERTER switch — OFF.

b. GEN switch — OFF.

c. AUX TANK or UTILITY power switch — OFF.

d. FUEL PUMP switch — OFF.

e. Lights — OFF.

f. BATT switch OFF.

g. Ignition lock switch – OFF, remove key as required.

O 10. Doors – Close immediately after exiting aircraft.

8-24. BEFORE LEAVING THE HELICOPTER.

CAUTION

To prevent rotor damage from blade flapping (droop stop pounding) as a result of airturbulance from other aircraft landing, taking off, or sudden wind gusts, rotor blades should be secured whenever the aircraft is parked. Take up stack to tethers but not exert bending loads on blades.

1. Walk around inspection – Complete checking for damage, leaks, and fluid levels.

2. Main rotor blades – Tied down as required.

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

4. Secure helicopter – As required.

SECTION III. INSTRUMENT FLIGHT

8-25. INSTRUMENT FLIGHT—GENERAL.

This aircraft is restricted to visual flight conditions.

SECTION IV – FLIGHT CHARACTERISTICS

8-26. FLIGHT CHARACTERISTICS.

This section of this manual describes certain OH-6A flight characteristics that may be considered uncommon among single–rotor helcopters. The aircraft is stable and responsive in all flight conditions. The flight controls have good response during maneuvering flight and a high degree of control availability. The aircraft fuselage has exceptionally low drag and autorotative glide capability is very good.

8-27. BLADE STALL.

a. Blade stall is characterized by a buildup in medium frequency vibration and feedback forces through the cyclic stick. Heavy blade stall is characterized by feedback forces through the collective pitch control. Blade stall will not normally occur when flying in smooth air within the Vne flight envelope defined in Figure 5-3 but may occur when flying in turbulence or maneuvering at high speeds. Maintaining 103 percent N2 rpm will reduce the susceptibility to blade stall. During maneuvering flight, blade stall may be encountered as a function of the severity of maneuver, gross weight, and altitude.

b. If a sharp gust is encountered during high-speed flight, control feedback forces will be encountered and the aircraft will have a tendency to pitch up. Any aft movement of the cyclic stick will aggravate the pitch-up condition. When this occurs, maintain 103 percent N2 rpm and reduce collective pitch.

8-28. MANEUVERING FLIGHT.

a. Hovering In Winds. During crosswind and downwind hovering, or landings, there is an area of instability from 8 to 15 knots. This instability is characterized by random aircraft motions, large control requirements, and a general increase in pilot workload.

WARNING

Flight involving abrupt right turns should be avoided during downwind, low altitude, and low airspeed conditions.

b. Abrupt Turn Maneuvers. Abrupt turns to the right are more critical than those to the left. If an abrupt reversal turn is performed at low altitude and low airspeed, caution shall be exercised to prevent yawing the tail excessively into the wind during a 180-degree turn downwind or downwind approach to hover. Such a maneuver can produce lift on the horizontal stabilizer surface, which may require full aft cyclic to counteract. If excessive nose-down pitching is encountered, apply antitorque pedal to bring nose into the wind. Additional collective aggravates pitching and is not recommended. In addition, it is possible to runout of left pedal during turns in wind at high-weight/density-altitude conditions; to minimize this possibility, 103% N2 rpm should be use.

8-29. AUTOROTATION CHARACTERISTICS.

a. Lowering of collective to establish autorotation must be accompanied by approximately 2 to 3 inches aft movement of the cyclic. The amount of aft cyclic required will increase with higher entry speed. This coordinated action is necessary to counteract the tendency of the aircraft to nose down.

b. Excercise caution when lowering the collective and using aft cyclic, to avoid rairing the nose of the aircraft excessively. A sudden excessive nose-up attitude will increase the angle of attack on the rotor system and possibly cause a rotor overspeed. At high gross weights, the collective must be utilized to control rotor rpm within normal limits. When a pitch-down condition exists, it is imperative that abrupt lowering of the collective and erratic movement of the cyclic be avoided to prevent a rotor blade strike on the tailboom.

8-30. ROLLOVER CHARACTERISTICS.

WARNING

IF THE HELICOPTER REACHES 15 degrees of bank angle with one skid on the ground and thrust (lift) is approximately equal to the weight, the helicopter will roll over on its side.

CAUTION

WHEN LANDING OR TAKING OFF, WITH THRUST (lift) approximately equal to the weight and one skid on the ground, keep the helicopter level and do not allow helicopter rates to build up. Fly the helicopter smoothly off (or onto) the ground, carefully maintaining trim in all axes.

During normal or slope takeoffs and landings with some bank angle or side drift with one skid on the ground, the bank angle or side drift can cause the helicopter to get into the situation where it is pivoting about a skid. When this happens, lateral cyclic control response is more sluggish and less effective than for the free-hovering helicopter. Consequently, if the bank angle (the angle between the helicopter and the horizon) is allowed to build up past 15 degrees, the helicopter will enter a rolling maneuver that cannot be corrected with full cyclic and the helicopter will roll over on its side.

In addition, as the roll rate and acceleration of the rolling motion increases, the angle at which recovery is still possible is significantly reduced. The critical rollover angle is also reduced for a right skid—down condition, crosswinds, lateral center—of—gravity offset, and left—pedal inputs. For more information on dynamic rollover refer to FM 1-203.

8-31. LOSS OF TAIL—ROTOR EFFECTIVENESS.

WARNING

Low airspeed maneuvering flight at airspeeds below 35 knots are not recommended under conditions where the power required to hover out of ground effects exceeds the maximum continuous power.

a. Loss of tail-rotor effectiveness (LTE) is the occurrence of an uncommanded and rapid right — yaw rate which does not subside of its own accord and which, if not quickly reacted to, can result in loss of aircraft control. However, the term "loss of tail—rotor effectiveness" is misleading. The tail rotor on this aircraft has exhibited the capability to produce thrust during all flight regimes. Under varying combinations of wind azimuth and velocity, tail—rotor thrust variations can occur. When this occurs, the helicopter will attempt to yaw rate may rapidly increase to a point where recovery to the right. This yaw is usually correctable if immediate additional left pedal is applied. Correct and timely pilot response to an uncommanded right yaw is critical. If the response is incorrect or slow, the yaw rate may rapidly increase to a point where recovery may not be possible in the terrain flight regime. The pilot must anticipate these variations, concentrate on flying the aircraft, and not allow a yaw rate to build.

b. Other factors which may be present can significantly influence the severity of the onset of LTE. These factors are:

(1) Gross weight and density altitude. An increase in either or these factors will decrease the power margin between the maximum available and power required to hover.

(2) Low indicated airspeed. At airspeeds below ETL the tail rotor is required to produce nearly 100 percent of the directional control. If the required amount of tell rotor thrust is not available, for whatever reason, the aircraft will yaw to the right.

(3) Power droop. A rapid power application may cause a transient power droop to occur. Any decrease in main rotor RPM will cause a corresponding decrease in tail rotor thrust. The pilot must anticipate this and apply additional left pedal to counter the main rotor torque. All power demands should be made as smoothly as possible to minimize the effect of the power droop.

SECTION V. ADVERSE ENVIRONMENTAL CONDITIONS

8-32. COLD WEATHER OPERATION.

a. During cold weather operations, preflight and flight procedures are essentially the same as during normal operations with the exception of the necessity for removing all snow and ice accumulations, aircraft starting, and the use of engine—supplied anti—icing air during flight. Whenever possible, precautions should be taken to prevent the buildup of snow and ice on parked aircraft. Snow should be allowed to remain on the aircraft, even with covers installed, as ice can form from sun—melted snow.

b. During operation in temperatures below 5°C (40°F) with visible moisture or after the aircraft has been parked in blowing snow without inlet covers or with poorly fitted inlet covers, an automatic acceleration of the engine may occur during the first three minutes of engine operation. This occurs when ice forms in the fuel control, causing the engine to accelerate without any action by the pilot. If auto acceleration occurs, shut down and wait a minimum of 5 minutes before restart.

c. Remove and stow all protective covers.

d. Remove ice and snow from rotor blades, stablizers, fairing, inter bypass door, fuselage, all drain lines, vent lines, the pitot tube, the engine air inlet, and the static port.

e. Ensure that the air inlet is clear of any snow or ice accumulation. Access for inspection and/or cleaning may be gained by opening the bypass door (particle separator configuration) or removal of the access plate (barrier filter configuration). All snow and/or ice accumulation on the forward upper portion of the aircraft must be removed prior to flight to prevent chunks from entering the inlet and clogging the filter.

f. Check landing gear skids to ensure they are not frozen to the ground.

g. Ensure all engine controls are operable through the full range of travel without any binding or excessive stiffness.

h. If the engine is equipped with a fuel control heater, ensure that the valve is in the open position and safetied.

8-33. ENGINE STARTING (COLD WEATHER).

a. Battery Utilization. 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 the heat, the battery can be made self-warming to the point where it can be used to start the engine as described in b, below.

NOTE

Close attention should be given to the idle stop release ring during starting. Cold temperatures will make the ring stiffer and more difficult to operate. Rapid engine shutdown will be less easily executed in the event of a hot start.

b. Starting At -18°C to -32°C (0°F to -24°F). Starting a cold-soaked engine with a cold-soaked battery is accomplished by initiating the normal starting procedure described in Section II except as follows. 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 (O°C). 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—OFF—EXT) 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.

c. Starting at -32°C to -54°C (-24°F to -66°F). Starting in this temperature range is accomplished in the same manner as at temperatures from -18°C to -32°C (O°F to -24°F), except that external power (APU) must be provided for starting power. The minimum permissible light—off rpm remains 12% N1.

d. Engine Warmup (Oil Pressure and Temperature). During cold—weather operation, 150 psig engine oil pressure is allowed following an engine start. When the 130 psig limit is exceeded, operate engine at idle power until normal oil pressure limits are attained. When the engine oil pressure is within normal limits, engine may be operated when ambient temperature is -54°C (-66°F) or above.

e. During cold—weather operation, advance N1 to 70% prior to placing generator switch on.

8-34. MAINTAINING BATTERY IN CHARGED CONDITION.

Careful attention should be given the ammeter during cold-weather operation. To ensure a fully charged battery, the engine should be run long enough for the amperage to reach a stabilized requires only about 15—20 minutes; however, if engine is shut down before the battery is fully charged, cold restarting without external power may be impossible.

8-35. SNOW OPERATIONS.

There are no unusual flight operational characteristics in snow operations. Refer to FM 1-202, Environmental Flight, for operational characteristics.

8-36. DESERT AND HOT—WEATHER OPERATIONS.

There are no unusual flight characteristics in desert and hot—weather operations. The electric fuel pump must be used continuously whenever the ambient air temperature exceeds 40°C (104°F). Refer to FM 1-202, Environmental Flight, for operation technique.

8-36.1. DUSTY ENVIRONMENT.

During takeoff, landing, hovering, or cruise operation in dusty atmospheric conditions, the bleed air shut off valve should be opened by placing the switch to SCAV—AIR position.

8-37. TURBULENCE.

a. Intentional flight into moderate turbulence is prohibited when the report is based on airplanes over 12,500 pounds gross weight.

b. Intentional flight into moderate turbulence is permitted when the report is based on helicopters or airplanes under 12,500 pounds gross weight.

c. To minimize the adverse effects of turbulence encountered in flight, the helicopter should be flown at a torque value corresponding to maximum endurance airspeed. There will be a corresponding increase in control movements at the reduced airspeed.

d. Helicopter controllability is the primary consideration; therefore, if control becomes marginal, exit the turbulence as soon as possible.

8-38. THUNDERSTORMS.

a. To minimize the effects of thunderstorms inadvertingly encountered in flight, perform the following:

(1) Adjust torque to a value corresponding to maximum endurance airspeed.

(2) Check that all occupants are seated with seat belts and harnesses tightened.

(3) PITOT HEAT switch – PITOT HEAT.

(4) Avionics – Reduce volume on any equipment affected by static.

(5) Interior lights – Adjust to full bright at night to minimize blinding effect of lightning.

b. In the storm.

(1) Maintain a level attitude and constant power setting. Airspeed fluctuations should be expected and disreguarded.

(2) Maintain original heading, turning only when necessary.

(3) The altimeter is unreliable due to differential barometric pressures within the storm. An indicated gain air loss of several hundred feet is not uncommon and should be allowed for in determining minimum safe altitude.

8-39. LIGHTING STRIKES

a. Although the possibility of a lightning strike is remote, the helicopter could inadvertently be exposed to lightning damage.

b. Lightning strikes may damage helicopter rotors. The degree of damage will depend on the magnitude of the charge and the point of contact. Catastrophic structural failure is not anticipated. However, lightning damage to hub bearings, blade aft section, trim tabs, and blade tips is possible. Damage can aerodynamically produce severe structural vibrations and serious control problems which, if prolonged, could endanger the helicopter and crew.

WARNING

Avoid flight in or near thunderstorms especially in areas of observed or anticipated lightning discharges.

NOTE

Abnormal operation noises almost always accompany rotor damage, but loudness or pitch are not valid indications of the degree of damage sustained.

8-40. ICING CONDITIONS

a. Intentional flight in any icing condition is prohibited. If icing conditions are encountered during flight, effort should be made to vacate the icing environment.

b. If icing conditions become unavoidable, the pilot should turn on the pitot heat, windshield defroster, and the engine anti—ice system.

c. During flights in icing, the following condition may be experienced.

(1) Obscured forward field of view due to ice accumulation on the windscreens and chin bubbles.

(2) Rotor vibrations ranging from mild to severe caused by asymmetrical ice shedding from the main rotor system. The severity of the vibration will depend upon the temperatures and the amount of ice accumulation on the blades when the ice shed occurs. The possibility of an asymmetric ice shed occurring increases as the outside air temperature decreases.

(3) An increase in torque required to maintain a constant airspeed and altitude due to ice accumulation on the rotor system.

(4) Possible degradation of the ability to maintain autorotational rotor speed within operation limits.

WARNING

If an 8 PSI (or greater) torque pressure increase is required above the cruise torque setting used prior to entering icing conditions, it may not be possible to maintain autorotational rotor speed with operational limits, should an engine failure occur.

d. Control activity cannot be depended upon to remove ice from the main rotor system. Vigorous control movements should not be made in an attempt to reduce low—frequency vibrations caused by asymmetrical shedding of ice from the main rotor blades. These movements may induce more asymmetrical shedding of ice, further aggravating helicopter vibration levels.

WARNING

Ice shed from the rotor blades and/or other rotating components presents a hazard to personnel during landing and shutdown. Ground personnel should remain well clear of the helicopter during landing and shutdown and passengers/crewmembers should not exit the aircraft until the rotor has stopped turning.

8-41. ENGINE ICE.

Engine anti—icing should be used when operating in visible moisture at 5°C (40°F) FAT or below. During operation, the only indication of icing will be a gradual increase in TOT. Immediate application of engine anti—icing will eliminate compressor ice and restore TOT to the normal operating range.

8-57.2. LOSS OF TAIL ROTOR EFFECTIVENESS.

a. Loss of tail rotor effectiveness (LTE) is the occurrence of an uncommanded and rapid right yaw rate which does not subside of its own accord and which, if not quickly reacted to, can result in loss of aircraft control. Under varying combinations of wind azimuth and velocity, tail rotor thrust variations can occur. When this occurs, the helicopter will attempt to make a sudden quick yaw to the right. This yaw is usually correctable if immediate additional left pedal is applied. Correct and timely pilot response to an uncommanded right yaw is critical. If the response is incorrect or slow, the yaw rate may rapidly increase to a point where recovery may not be possible in the terrain flight regime. The pilot must anticipate these variations, concentrate on flying the aircraft, and not allow a yaw rate to build.

b. Other factors which may be present can significantly influence the severity of the onset of LTE. These factors are:

(1) Gross weight and density altitude. An increase in either of these factors will decrease the power margin between the maximum available and power required to hover. The pilot should conduct a low level, low airspeed mission with only minimum essential personnel and equipment on board.

(2) Low indicated airspeed. At airspeeds below ETL the tail rotor is required to produce nearly 100 percent of the directional control. If the required amount of tail rotor thrust is not available, for whatever reason, the aircraft will yaw to the right.

(3) Power droop. A rapid power application may cause a transient power droop to occur. Any decrease in main rotor RPM will cause a corresponding decrease in tail rotor thrust. The pilot must anticipate this and apply additional left pedal to counter the main rotor torque. All power demands should be made as smoothly as possible to minimize the effect of the power droop.

CAUTION

Low airspeed maneuvering flight at airspeeds below 35 knots are not recommended under conditions where the power required to hover out of ground effect exceeds the maximum continuous power.

SECTION IV — ADVERSE ENVIRONMENTAL CONDITIONS

8-58. COLD WEATHER OPERATION.

During cold weather operations, preflight and flight procedures are essentially the same as during normal operations with the exception of the necessity for removing all snow and ice accumulations, aircraft starting, and the use of engine-supplied anti-icing air during flight. Whenever possible, precautions should be taken to prevent the buildup of snow and ice on parked aircraft. Snow should not be allowed to remain on the aircraft, even with covers installed, as ice can form from sun-melted snow.

8-59. PREFLIGHT INSPECTION (COLD WEATHER).

In addition to normal exterior inspection covered in section II, be sure that the following are accomplished:

a. All snow and ice must be removed from the main rotor hub, main rotor and tail rotor blades, and all other exposed flight control linkage and surfaces.

b. During operation in temperatures below 5°C (40°F) with visible moisture or after the aircraft has been parked in blowing snow without inlet covers or with poorly fitted inlet covers, an automatic acceleration of the engine may occur during the first three minutes of engine operation. This occurs when ice forms in the fuel control, causing the engine to accelerate without any action by the pilot. If auto acceleration occurs, shut down and wait a minimum of 5 minutes before restart.

c. Remove and stow all protective covers.

d. Remove ice and snow from rotor blades, stabilizers, fairings, filter bypass door, fuselage, all drain lines, vent lines, the pitot tube, the engine air inlet, and the static port.

e. Ensure that the air inlet is clear of any snow or ice accumulation. Access for inspection and/or cleaning may be gained by opening the bypass door (particle separator configuration) or removal of the access plate (barrier filter configuration). All snow and/or ice accumulation on the forward upper portion of the aircraft must be removed prior to flight to prevent chunks from entering the inlet and clogging the filter.

f. Check landing gear skids to ensure they are not frozen to the ground.

g. Ensure all engine controls are operable through the full range of travel without any binding or excessive stiffness.

h. If the engine is equipped with a fuel control heater, ensure that the valve is in the open position and safetied.

8-60. INTERIOR CHECK (COLD WEATHER).

In addition to the normal interior inspection covered in section II, ensure the following conditions are satisfactory.

a. All flight and engine controls are operable through the full range of travel without binding or excessive stiffness.

b. All door handles and jettison release mechanisms are not frozen.

c. Fuselage heat and engine de-icing air controls move freely without binding.

8-61. ENGINE STARTING (COLD WEATHER).

a. Battery Utilization. The nickel-cadmium battey 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 *b*, below.

NOTE

Close attention should be given to the idle stop release ring during starting. Cold temperatures will make the ring stiffer and more difficult to operate. Rapid engine shutdown will be less easily executed in the event of a hot start.

b. Starting at -18°C to -32°C (0°F to -24°F). Starting a cold-soaked engine with a cold-soaked battery is accomplished by initiating the normal starting procedure described in section II except as follows. 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% N1 which is minimum light-off rpm at temperatures below -18°C (0°F). If 12% 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% N1, release the starter and allow the engine to coast to a stop. Place the electrical power (BATT-OFF-EXT) 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% N1 is permissible. If 12% N1 speed cannot be obtained on the second start attempt, external power should be used to start the engine. The engine anti-icing valve control should be aft position during operation in temperature below 5°C (22°F) with visible moisture.

NOTE

During cold weather operation, advance N1 to 70% prior to placing generator switch on.

c. Starting at -32°C to -54°C (-24°F to -66°F). Starting in this temperature range is accomplished in the same manner as at temperatures from -18°C to -32°C (0°F to -24°F), except that external power (APU) must be provided for starting power. The minimum permissible light-off rpm remains 12% N1.

d. Engine Warmup (Oil Pressure and Temperature). During cold weather operation, 150 psig engine oil pressure is allowed following an engine start. When the 130 psig limit is exceeded, operate engine at idle power until normal oil pressure limits are attained. When the engine oil pressure is within normal limits, engine may be operated when ambient temperature is -54°C (-66°F) or above.

8-62. ENGINE WARMUP TIME.

To prevent the possibility of auto acceleration after takeoff, engines shall be operated with the following engine warm-up:

Ambient temperature	Warm-up time
-30°C (-20°F) and below	10 min
-20°C (-4°F)	7 min
-10°C (+14°F)	5 min
0°C (32°F)	3 min
+10°C (+50°F) and above	1 min

8-63. MAINTAINING BATTERY IN CHARGED CONDITION.

Careful attention should be given the ammeter during cold weather operation. To ensure a fully charged battery the engine should be run long enough for the amperage to reach a stabilized 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 engine is shut down before the battery is fully charged, cold restarting without external power may be impossible.

8-64. HOVERING/TAKEOFF IN SNOW.

Takeoff is the same as described in section III except that hovering should be minimal to reduce the amounts of blowing snow and restricted visibility caused by rotor downwash.

8-65. LANDING IN SNOW.

a. All approaches and landings on snow should be executed without hovering to reduce the white-out condition caused by rotor downwash.

b. Avoid landing on surfaces covered with loose dry snow, if possible, because of depth perception (white-out) and visibility (blowing snow) hazards. If ground reference should become completely obscured, accomplish a go-around and make another approach.

8-66. BEFORE LEAVING THE AIRCRAFT.

Before leaving the aircraft during cold weather, open cabin air vents to permit free circulation of air and remove battery for storage in a heated area if the aircraft is expected to remain outside for a lengthy period at -18°C (0°F) or below.

8-67. DESERT AND HOT WEATHER OPERATION.

8-68. DESERT OPERATION.

a. Desert operation (operating from sandy and dusty terrain) is the same as normal operation, with the following additional precautions: Provide maximum possible protection for the aircraft on the ground during blowing sand conditions by keeping protective covers installed as long as possible. Observe hot weather starting procedures (when applicable), and unless absolutely necessary do not take off during a sand or dust storm or immediately following another aircraft.

b. Hovering should always be minimal to reduce the amount of blowing dust and restricted visibility caused by rotor downwash. Engine operation in dust and salt laden atmosphere will result in gradual engine power deterioration.

8-69. HOT WEATHER OPERATION.

NOTE

Flight performance will be significantly reduced during hot weather conditions because of the accompanying high density altitude conditions. Refer to chapter 7 for more detailed information regarding high temperature effects on performance.

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

b. During hot weather operation, aircraft performance can be engine temperature-limited rather than transmission torque-limited, therefore the TOT gage must be monitored as well as the torque gage to make certain neither limit is exceeded.

c. The electric fuel pump must be used continuously under the following conditions: (1) whenever the aircraft is operated on emergency fuel, and (2) whenever the operating altitude and ambient air temperature simultaneously exceed 15,000 ft MSL and 45 degrees C.

8-70. TURBULENCE AND THUNDERSTORM OPERATION.

a. Intentional flight into known or forecast severe or extreme turbulence is prohibited.

b. Intentional flight into known or forecast moderate turbulence is prohibited when the report or forecast is based on transport type aircraft.

c. Intentional flight into known or forecast moderate turbulence is permitted when the report or forecast is based on helicopter or light airplanes under 12,500 pounds gross weight.

d. To minimize the effects of moderate turbulence encountered in flight the helicopter should be flown at an airspeed corresponding to minimum torque required; maximum endurance airspeed. There will be a corresponding increase in control movements at the reduced airspeed.

e. Helicopter controllability is the primary consideration; therefore, if control becomes marginal, exit the turbulence as soon as possible.

f. In turbulence, check that all occupants are seated with seat belts and harnesses tightened.

8-71. THUNDERSTORMS.

a. Intentional flight into thunderstorms is prohibited. To minimize the effects of thunderstorms encountered in flight perform the following:

(1) Adjust torque to maintain maximum endurance airspeed.

(2) Check that all occupants are seated with seat belts and harnesses tightened.

(3) PITOT HEAT switch – PITOT HEAT.

(4) Avionics – Reduce volume on any equipment affected by static.

(5) Interior lights – Adjust to full bright at night to minimize blinding effect of lightning.

b. In the storm.

(1) Maintain a level attitude and constant power setting. Airspeed fluctuations should be expected and disregarded.

(2) Maintain original heading, turning only when necessary.

(3) The altimeter is unreliable due to differential barometric pressures within the storm. An indicated gain or loss of several hundred feet is not uncommon and should be allowed for in determining minimum safe altitude.

8-72. LIGHTNING STRIKES.

a. Although the possibility of a lightning strike is remote, the helicopter could inadvertently be exposed to lightning damage.

b. Lightning strikes may damage helicopter rotors. The degree of damage will depend on the magnitude of the charge and the point of contact. Catastrophic structural failure is not anticipated. However, lightning damage to hub bearings, blade aft section, trim tabs, and blade tips is possible. Damage can aerodynamically produce severe structual vibrations and serious control problems which, if prolonged, could endanger the helicopter and crew.

WARNING

Avoid flight in or near thunderstorms especially in areas of observed or anticipated lightning discharges.

NOTE

Abnormal operating noises almost always accompany rotor damage, but loudness or pitch are not valid indications of the degree of damage sustained.

c. If lightning strike occurs, or is expected, the following precautions are recommended to minimize further risk.

(1) Reduce airspeed as much as practical to maintain safe flight.

(2) Avoid abrupt control inputs.

(3) Record suspected lightning strike on DA Form 2408-13. Aircraft must be checked by maintenance personnel prior to resumption of flight.

8-73. STOPPING ROTORS DURING GUSTY OR WINDY CONDITIONS.

During gusty or windy conditions, accomplish the following steps in conjunction with normal engine shutdown procedure:

a. Position cyclic as required until rotor stops turning to prevent droop stop damage.

b. Place collective pitch full down.

c. Do not attempt to slow the rotors by application of collective pitch or anti-torque pedals.

d. Place cyclic in neutral with friction applied.

8-74. ICING CONDITIONS.

a. Intentional flight in any known icing condition is prohibited. If icing conditions are encountered during flight, effort should be made to vacate the icing environment.

b. If icing conditions become unavoidable the pilot should turn on the pitot heat, windshield defroster and the engine anti-ice system.

c. During flights in icing the following condition may be experienced.

(1) Obscured forward field of view due to ice accumulation on the windscreens and chin bubbles.

(2) Rotor vibrations ranging from mild to severe caused by asymmetrical ice shedding from the main rotor system. The severity of the vibration will depend upon the temperatures and the amount of ice accumulation on the blades when the ice shed occurs. The possibility of an asymmetric ice shed occurring increases as the outside air temperature decreases.

(3) An increase in torque required to maintain a constant airspeed and altitude due to ice accumulation on the rotor system.

(4) Possible degradation of the ability to maintain autorotational rotor speed within operating limits. If a 8 PSI (or greater) torque pressure increase is required above the cruise torque setting used prior to entering icing conditions, it may not be possible to maintain autorotational rotor speed within operational limits, should an engine failure occur.

NOTE

If the windshield defrosters fail to keep the windshield clear of ice, the side windows may be used for visual reference during landing.

d. Control activity cannot be depended upon to remove ice from the main rotor system. Vigorous control movements should not be made in an attempt to reduce low-frequency vibrations caused by asymmetrical shedding of ice from the main rotor blades. These movements may induce a more asymmetrical shedding of ice, further aggravating helicopter vibration levels.

WARNING

Ice shed from the rotor blades and/or other rotating components presents a hazard to personnel during landing and shutdown. Ground personnel should remain well clear of the helicopter during landing and shutdown and passengers/crewmembers should not exit the aircraft until the rotor has stopped turning.

8-75. ENGINE ICE AFTER STARTING.

After starting the engine (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.

8-76. ENGINE ICE DURING FLIGHT.

Engine anti-icing should be used when flying in visible moisture at 5°C (40°F) FAT or below. During flight operation, the only indication of icing will be a gradual increase in TOT. Immediate application of engine anti-icing will eliminate compressor ice and restore TOT to the normal operating range.

SECTION V — CREW DUTIES

8-77. PASSENGER BRIEFING.

The following is a guide that should be used in accomplishing required passenger briefings, when a unit passenger briefing is not available. Items that do not pertain to a specific mission may be omitted.

a. Crew Introduction.

b. Equipment.

(1) Personal to include ID tags.

(2) Professional.

(3) Survival.

c. Flight Data.

(1) Route.

(2) Altitude.

(3) Time en route.

(4) Weather.

d. Normal Procedures.

(1) Entry and exit of aircraft.

(2) Seating.

(3) Seat belts.

(4) Movement in aircraft.

(5) Internal communications.

(6) Security of equipment.

(7) Smoking.

(8) Oxygen.

(9) Refueling.

(10) Weapons.

(11) Protective masks.

(12) ALSE.

e. Emergency Procedures.

(1) Emergency exits.

(2) Emergency equipment.

(3) Emergency landing/ditching procedures.

CHAPTER 9

EMERGENCY PROCEDURES

SECTION I. HELICOPTER SYSTEMS

9-1. HELICOPTER SYSTEMS

This section describes the helicopter systems emergencies that may reasonably be expected to occur and presents the procedures to be followed. Emergency operation of mission equipment is contained in this chapter insofar as its use affects safety of flight. Emergency procedures are given in checklist form when applicable. A condensed version of the amplified checklist, omitting all explanatory text, is contained in the operator's checklist.

9-2. IMMEDIATE ACTION EMERGENCY STEPS.

Those steps that must be performed immediately in an emergency are underlined. These steps must be performed without reference to the checklist. When the situation permits, non—underlined steps will be accomplished with use of the checklist.

WARNING

Do not respond to warning or caution light illumination without conferning malfunction by other indications, if available.

NOTE

The urgency of certain emergencies require immediate and instinctive action by the pilot. The most important single consideration is helicopter control. All procedures are subordinate to this requirement. If time permits during an emergency transmit a May Day Call and lock your shoulder harness.

9-3. DEFINITION OF EMERGENCY TERMS.

For the purpose of standardization, the following definitions shall apply:

a. The term "LAND AS SOON AS POSSIBLE" is defined as executing a landing at the nearest suitable landing area (e.g., open field) without delay. The primary consideration is to assure the survival of occupants.

b. The term "LAND AS SOON AS PRACTICABLE" is defined as executing a landing at a suitable landing area. The primary consideration is the urgency of the emergency.

c. The term "AUTOROTATE" is defined as adjusting the flight controls as necessary to establish an autorotational descent and landing.

d. The term "EMER SHUTDOWN" is defined as engine shutdown without delay.

1. Throttle – Close.
2. FUEL VALVE handle – Close (UP).
3. BATT switch – OFF. Before turning the battery switch off during in—flight emergencies requiring EMER SHUTDOWN, the pilot should consider May-Day call, transponder EMER, and the possible adverse effects of total electrical failure.

TABLE 9-1 WARNING/CAUTION LIGHT TABLE

WARNING LIGHTS/Panel Lights

WARNING LIGHT	CORRECTIVE ACTION
XMSN/TRANS OIL PRESSURE	Land as soon as possible.
XMSN/TRANS OIL TEMP	Land as soon as possible.
ENGINE OUT	Verify condition. Autorotate.
PRESS TO TEST (if installed)	Take appropriate corrective action if test does not work correctly.

CAUTION LIGHTS

Series 1 and 2

CAUTION LIGHT	CORRECTIVE ACTION
MASTER CAUTION (if installed)	Check Caution Panel Segment Lights (if no Segment Lights are illuminated. Land as soon as possible.)
AC BUS (if installed)	Advisory only.
OIL CHIPS	Land as soon as possible.
FUEL FILTER	Land as soon as possible.
GENERATOR OUT	Refer to emergency procedure.
FUEL LOW	Information/System Status.
OIL CLR BYPASS	Land as soon as possible.
BYPASS AIR	Bypass handle open, land as soon as practicable.

CAUTION LIGHTS

Series 3

ENG CHIPS	Land as soon as possible.
TRANS CHIPS	Land as soon as possible.
TAIL CHIPS	Land as soon as possible.
IFF	Information/System Status.
FUEL LOW	Information/System Status.
FUEL FILTER	Land as soon as possible.
OIL CLR BYPASS	Land as soon as possible.
DC GEN	Refer to emergency procedure.

9-4. AFTER EMERGENCY ACTION.

After a malfunction of equipment has occurred, appropriate emergency actions have been taken and the helicopter is on the ground, an entry shall be made in the Remarks Section of DA form 2408—13 describing the malfunction. Ground and flight operations shall be discontinued until corrective action has been taken.

9-5. EMERGENCY EQUIPMENT.

The fire extinguisher and first—aid kit locations are illustrated in Figure 9-1.

9-6. EMERGENCY EXITS/EMERGENCY ENTRANCE.

Emergency exits are shown in figure 9-1. To exit the aircraft in the event of an emergency, first attempt to open doors. The crew and cabin doors can be jettisoned by pulling the door Emergency Release handles to the aft position (Figure 9-1). If doors will not open/jettison in an emergency, break plexi—glass to exit/enter the aircraft.

9-7. ENGINE MALFUNCTION — PARTIAL OR COMPLETE POWER LOSS.

a. The indication of an engine malfunction, either a partial or complete power loss are: left yaw, drop in engine RPM, drop in rotor RPM, low RPM audio alarm, illumination of the engine—out warning light, and change in engine noise.

WARNING

> Do not respond to the RPM audio and /or warning light illumination without first confirming engine malfunction by one or more of the other indications. Normal indications signify the engine is functioning properly and that there is a tachometer generator failure or an open circuit to the warning system, rather than an actual engine malfunction.

b. FLIGHT CHARACTERISTICS:

1. Control response with an engine inoperative is similar to descent with power.

2. Airspeed above minimum rate of descent (Figure 9-3) will result in greater rates of descent and may be used as necessary to extend glide distance.

3. Airspeeds below minimum rate of descent airspeeds will increase rate of descent and decrease glide distance.

4. Should the engine malfunction during a left—bank maneuver, right cyclic input to level the aircraft must be made simultaneously with collective pitch adjustment. If the collective pitch is decreased without a corresponding right cylic input, the helicopter will pitch down and the roll rate will increase rapidly, resulting in a significant loss of altitude.

c. PARTIAL POWER CONDITION. Under partial power conditions, the engine may operate smoothly at reduced power or it may operate erratically with intermittent surges of power. In instances where a power loss is experienced without accompanying power surging, the helicopter may be flown at reduced to a suitable landing area. Under this condition, the pilot should always be prepared for a complete power loss. In the event a partial power condition is accompanied by erratic engine operation or power surging, and flight is to be continued, the throttle may be adjusted in an attempt to correct the surging condition. If flight is not possible, close the throttle completely and complete an autorotational landing.

d. COMPLETE POWER LOSS. Under a complete power loss condition, delay in recognition of the malfunction, improper technique or excessive maneuvering to reach a suitable landing area reduces the probability of a safe autorotational landing. Flight conducted within the avoid area of the height—velocity chart (figure 9-2) exposes the helicopter to a hight probability of damage despite the best efforts of the pilot.

e. LOW AIRSPEED AND LOW ALTITUDE. Under low—altitude low—airspeed conditions, the deceleration capability is limited, and caution should be used to avoid striking the ground with the tail rotor. Initial collective reduction will vary after an engine malfunction, dependent upon the altitude and airspeed at the time of the occurrence. For example, collective should not be decreased when an engine failure occurs at a hover below 15 feet; whereas, during cruise flight conditions, altitude and airspeed are sufficient for a significant reduction will vary after an engine

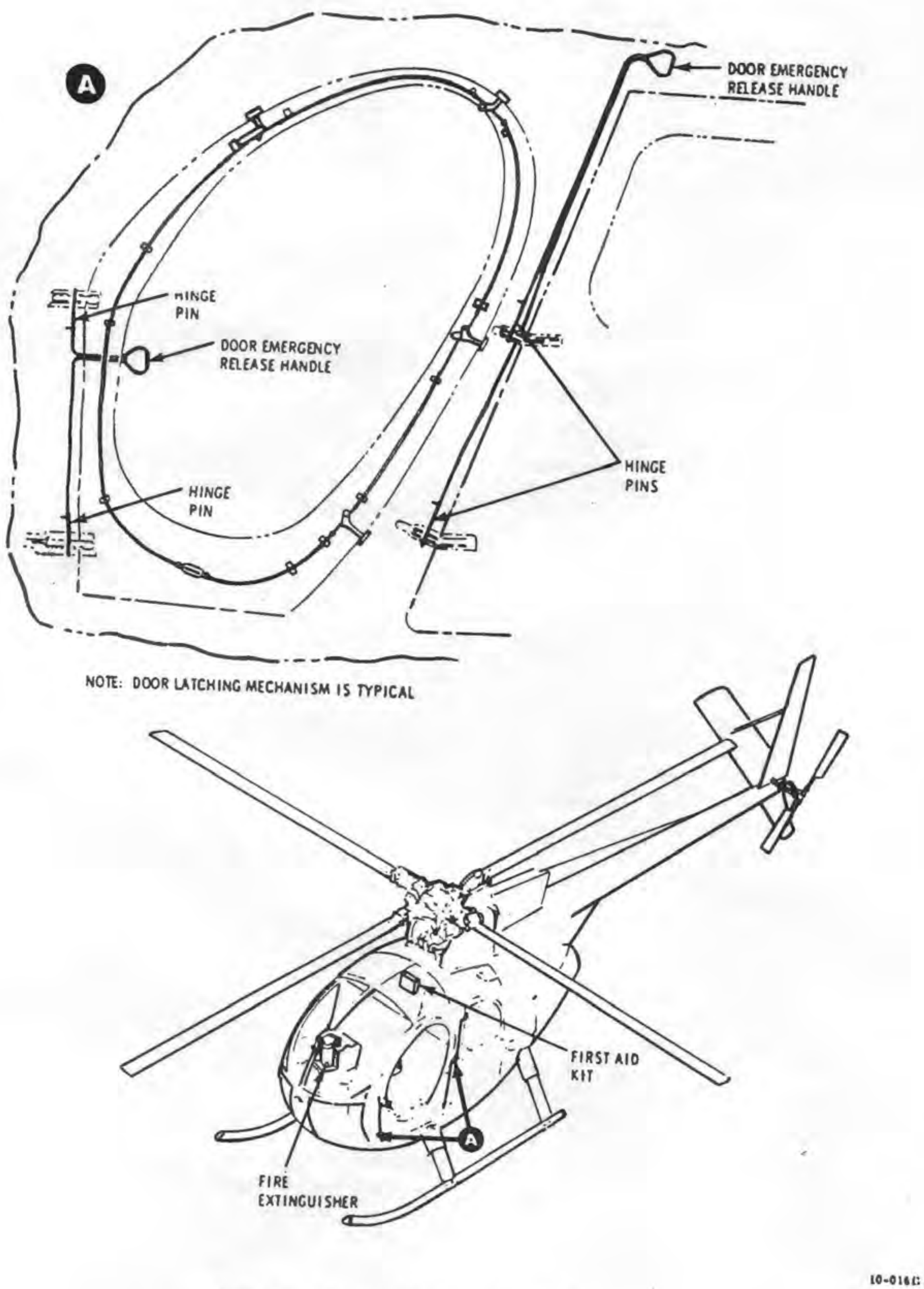


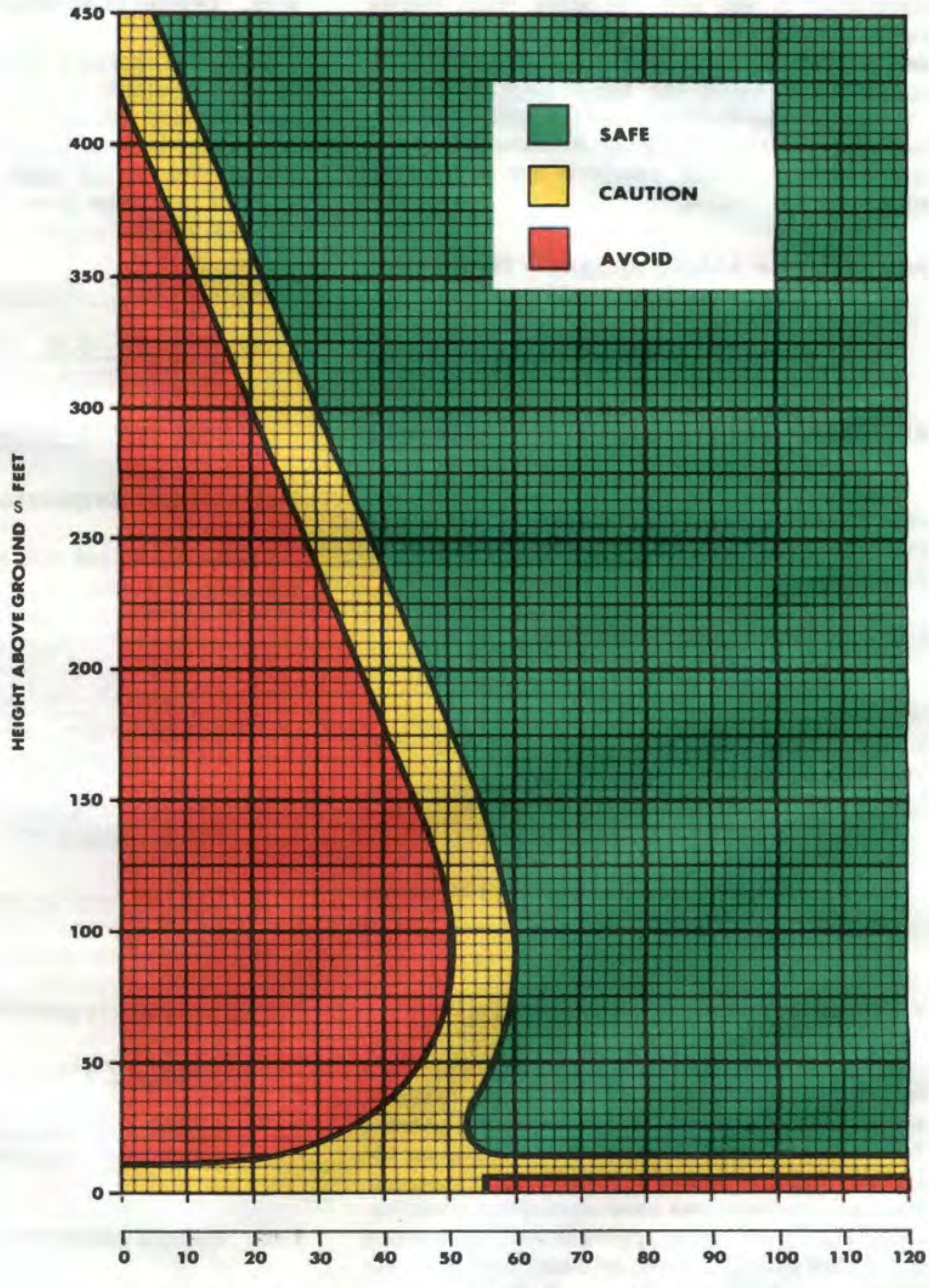
Figure 9-1. Emergency Equipment Locations.

R
Y
G

MIMIMUM HEIGHT
OH-6A
T63-A-6A/-700

MINIMUM HEIGHT FOR SAFE LANDING AFTER ENGINE FAILURE CHART

484 ROTOR RPM   CALM WIND
GROSS WT 2550 LB   SMOOTH HARD SURFACE



DATA BASS: FAA & HUGHES FLIGHT TEST, SEPT 1968, REPT. NO. 369-FT 8043

Figure 9-2. Minimum Height for Safe Landing After Engine Failure.

malfunction, dependent upon the altitude and airspeed at the time of the occurrence. For example, collective should not be decreased when an engine failure occurs at a hover below 15 feet; whereas, during cruise flight conditions, altitude and airspeed are sufficient for a significant reduction in collective, thereby, allowing rotor rpm to be maintained in the safe operating range during autorotational descent. The rotor may overspeed and require collective pitch application to maintain the rpm below the upper limit. Collective should never be applied to reduce rpm below normal limits for extending glide distance because of the reduction in rpm available for use during autorotational landing.

9-8. MINIMUM RATE OF DESCENT — POWER OFF.

The power—off minimum rate of descent is attained at an indicated airspeed of approximately 57 knots and 470 rotor rpm. Refer to Figure 9-3.

9-9. MAXIMUM GLIDE DISTANCE — POWER OFF.

The maximum glide distance is attained at an indicated airspeed of approximately 82 knots and 470 rotor rpm. Refer to Figure 9-3, Autorotative Rate of Descent.

9-10. ENGINE FAILURE — HOVER.

Autorotate.

9-11. ENGINE FAILURE — LOW ALTITUDE/LOW AIRSPEED OR CRUISE.

1. Autorotate.
2. EMER SHUTDOWN. Accomplish during descent if time permits.

9-12. ENGINE RESTART — DURING FLIGHT.

After an engine failure in flight, an engine start may be attempted. Because the exact cause of engine failure cannot be determined in flight, the decision to attempt the start will depend on the altitude and time available, rate of descent, potential landing areas, and crew assistance available. Under ideal conditions, approximately one minute is required to regain powered flight from the time the attempted start is begun. If the decision is made to attempt an in—flight start:

1. Attempt start.
2. Land as soon as possible — After the engine is started and powered flight is re-established, perform a power on approach and landing without delay.

9-13. ENGINE COMPRESSOR STALL.

Engine compressor stall may be characterized by a sharp rumble or a series of loud sharp reports, severe engine vibration and a rapid rise in TOT depending on the severity of the surge. After engine compressor stall, maneuvers requiring rapid or maximum power applications should be avoided. Should engine compressor stall occur:

1. Collective — Reduce.
2. ENG DE—ICE and CABIN HEAT and DEFOG levers — OFF.
3. Land as soon as possible.

9-14. ENGINE OVERSPEED.

Engine overspeed will be indicated by a right yaw, rapid increase in both rotor and engine rpm, and an increase in engine and rotor noise. If an engine overspeed is experienced:

1. Collective — Increase to load the rotor and sustain engine/rotor rpm below the maximum operating limit.
2. Throttle — Adjust until normal operating rpm is attained.
3. Land as soon as possible. Perform a power—on approach and landing by controlling the RPM manually with throttle.

If RPM cannot be controlled manually:

4. Autorotate when over a safe landing area.
5. EMER SHUTDOWN. Accomplish during descent if time permits.

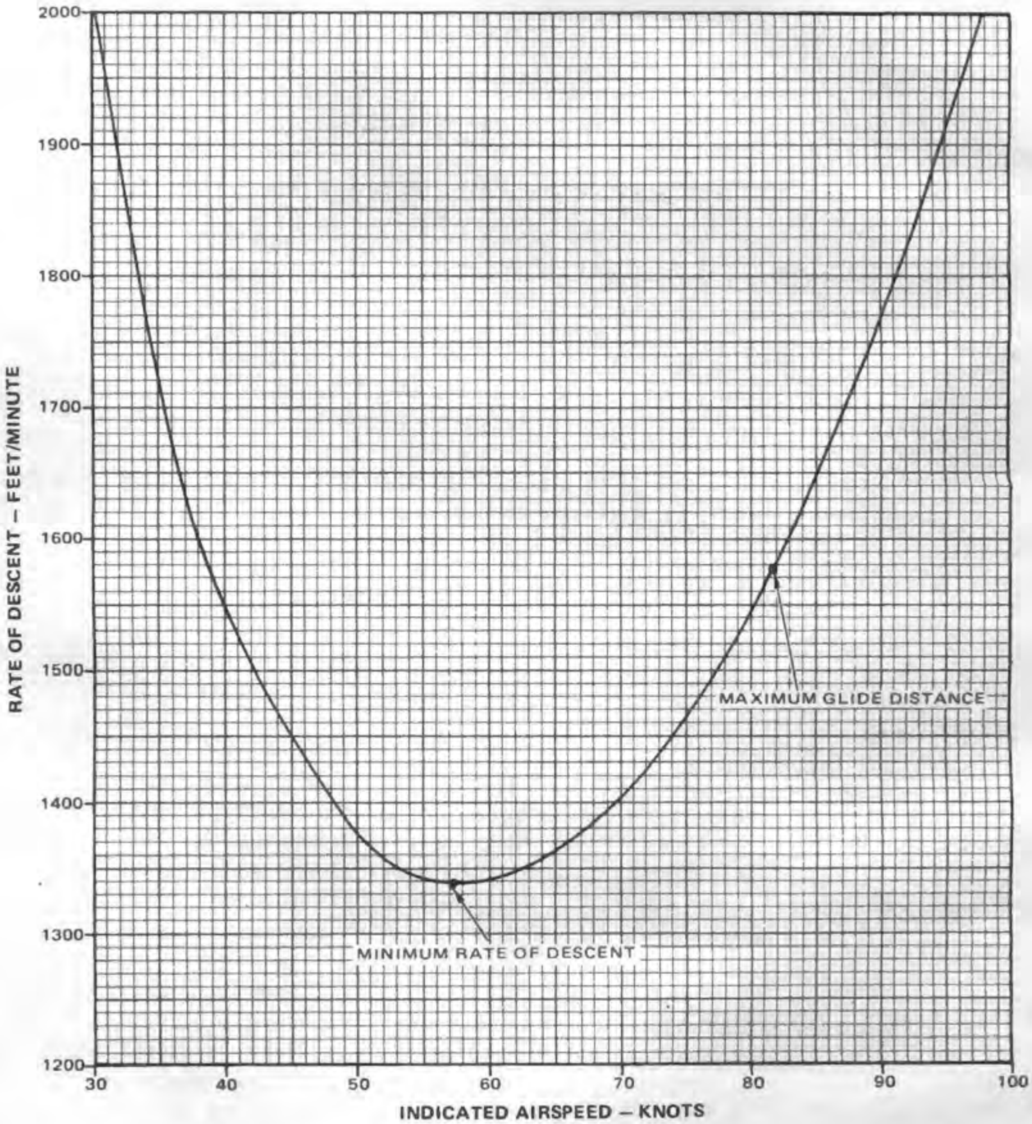
9-15. ENGINE UNDERSPEED

a. If an engine underspeed occurs, the collective must be adjusted downward to maintain ROTOR

AUTOROTATIVE RATE OF DESCENT

470 ROTOR RPM

RATE OF DESCENT
OH-6A
T63-A-5A/-700



NOTES:

1. AUTOROTATIONAL DESCENT PERFORMANCE IS A FUNCTION OF AIRSPEED AND IS ESSENTIALLY UNAFFECTED BY DENSITY ALTITUDE OR GROSS WEIGHT.
2. INCREASE RATE OF DESCENT 40 FEET/MINUTE FOR EVERY 20 RPM INCREASE IN AUTOROTATIONAL ROTOR SPEED.

DATA BASIS: DERIVED FROM FLIGHT TEST

Figure 9-3. Autorotative Rate of Descent.

10-163

RPM within limits. If powered flight with rotor in the green can be accomplished, land as soon as possible in an area that will permit a run—on landing.

b. An engine underspeed below 97° N2 results in rotor rpm decay below minimum safe limits. Should this occur:

1. Autorotate.
2. EMER SHUTDOWN. Accomplish during descent, if time permits.

9-16. ENGINE SURGES.

If engine surges in engine rpm are experienced:

1. GOV INCR switch – INCR for maximum rpm.
2. Throttle – Adjust to 100% N2.
3. Land as soon as possible.

If engine surges are not controlled in steps 1 and 2 above, proceed as follows:

4. Autorotate – When over safe landing area.
5. EMER SHUTDOWN. – Accomplish during descent if time permits.

9-17. AUTOACCELERATION.

If autoacceleration occurs during starting:

Throttle – Close.

9-18. ROTORS, TRANSMISSION, AND DRIVE SYSTEMS

9-19. TAIL ROTOR FAILURE AND DIRECTIONAL CONTROL MALFUNCTIONS.

Because of the many different malfunctions that can occur, it is not possible to provide a solution for every emergency. The success in coping with the emergency depends on quick analysis of the condition and selection of the proper emergency procedure. The following is a discussion of some types of malfunctions, probable effects, and corrective actions.

9-20. COMPLETE LOSS OF TAIL ROTOR THRUST.

This situation involves a break in the drive system, such as a severed driveshaft, causing complete loss of tail rotor thrust.

a. Powered flight or Power Off (Autorotation)

(1) Indications:

(a) Pedal input has no effect on helicopter trim.

(b) Nose of the helicopter turns to the right (left sideslip).

(c) Left roll of fuselage along the longitudinal axis.)

NOTE

Degree or roll and sideslip may be varied by varying throttle and/or collective. (At airspeeds below 40 knots, the sideslip may become uncontrollable, and the helicopter will begin to spin on the vertical axis.)

(2) Procedures:

(a) Maintain an airspeed above minimum rate of descent for autorotation.

(b) If powered flight can be sustained and a safe landing area is not immediately available, continue powered flight to suitable landing area. When landing area is reached, close the throttle and make an autorotative landing. If landing area is suitable for run-on landing, touch down above effective translational lift.

(c) If powered flight cannot be continued and a run-on landing is not possible, close the throttle and make an autorotative landing. Start to decelerate from about 75-feet altitude, so that forward ground speed is at a minimum when the helicopter reaches 10 to 20 feet. Execute the touchdown in a level attitude with minimum ground speed.

9-21. FIXED PITCH SETTINGS.

This is a malfunction involving a loss of control resulting in a fixed—pitch setting. Whether the nose of the helicopter yaws left or right is dependent upon the amount of pedal applied at the time of the malfunction. Regardless of pedal setting at the time of malfunction, a varying amount of tail rotor thrust will be delivered at all times during flight.

a. Reduced power (low torque).

(1) Indications: The nose of the helicopter will turn right when power is applied.

(2) Procedure:

(a) If helicopter control can be maintained in powered flight, the best solution is to maintain control with power and accomplish a run—on landing as soon as practicable.

(b) If helicopter control cannot be maintained, close the throttle immediately and accomplish an autorotational landing.

b. Increased power (high torque).

(1) Indications: The nose of the helicopter will turn left when power is reduced.

(2) Procedure:

(a) Maintain control with power and airspeed. (Between 40 and 70 knots.)

(b) If needed, reduce engine rpm manually.

(c) Continue powered flight to a suitable landing area where a run—on landing can be accomplished.

(d) Execute a run—on landing with power and a touchdown speed which will minimize side—slip. Use throttle and collective, as necessary, to control sideslip and heading.

c. Hover.

(1) Indication: Helicopter heading cannot be controlled with pedals.

(2) Procedure.

(a) Fixed pedal — Land.

(b) Loss of tail rotor thrust — Perform hovering autorotation.

9-22. LOSS OF TAIL ROTOR COMPONENTS.

The severity of this situation is dependent upon the amount of weight lost. Any loss of this nature will result in a forward center of gravity shift, requiring aft cyclic.

a. Indications:

(1) Varying degrees of right yaw depending on power applied and airspeed at time of failure.

(2) Forward CG shift.

b. Procedure:

(1) Enter autorotative descent (power off).

(2) Maintain airspeed above minimum rate of descent airspeed.

(3) If run—on landing is possible, complete autorotation with a touchdown airspeed above effective translational lift.

(4) If run—on landing is not possible, start to decelerate from about 75 feet altitude, so that forward groundspeed is at a minimum when the helicopter reaches 10 to 20 feet; execute the touchdown with a rapid collective pull just prior to touchdown in a level attitude with minimum ground run.

9-23. LOSS TAIL ROTOR EFFECTIVENESS (LTE).

This is a situation involving a loss of effective tail—rotor thrust without a break in the drive system.

If LTE is experienced, simultaneously:

1. Pedal — Full left.

2. Cyclic — Forward.

3. As recovery is effected, adjust controls for normal flight.

WARNING

Collective reduction will aid in arresting the yaw rate; however, if a rate of descent has been established, collective reduction may increase the rate of descent to an excessive value. The resultant large and rapid increase in collective to prevent ground or obstacle contact may further increase the yaw rate, decrease the rotor RPM and cause an overtorque and/or over—temperature condition. Therefore, the decision to reduce collective must be based on the pilot's assessment of the altitude available for recovery.

If spin cannot be stopped and crash is imminent, an autorotation may be the best course of action. Maintain full left pedal until the spin stops, then adjust to maintain heading.

9-24. MAIN DRIVESHAFT FAILURE.

A failure of the main drive shaft will be indicated by a sudden increase in engine rpm, decreased in rotor rpm, and left yaw. A transient overspeed of N,1 and N2 may occur but will stabilize. In the event of main drive shaft failure:

1. AUTOROTATE.

2. EMER SHUTDOWN. Accomplish during descent if time permits.

9-25. CLUTCH FAILS TO DISENGAGE.

A clutch failing to disengage in flight will be indicated by the rotor rpm decaying with engine rpm as the throttle is reduced to the engine idle position when entering autorotational descent. This condition results in total loss of autorotational capability. If a failure occurs:

1. Throttle — Open.

2. Land as soon as possible.

9-26. FIRE.

The safety of helicopter occupants is the primary consideration when a fire occurs; therefore, it is imperative that every effort be made by the flight crew to put the fire out. On the ground, it is essential that the engine be shut down, crew and passengers evacuated and fire fighting begun immediately. If time permits, a "May Day" radio call should be made before the electrical power is off to expedite assistance from fire fighting equipment and personnel. If the helicopter is airborne when a fire occurs, the most important single action that can be taken by the pilot is to land the helicopter.

WARNING

Toxic fumes of the extinguishing agent may be cause injury, and liquid ageny may cause frostbite or low—temperature burns.

CAUTION

If aircraft fire occurs on ground while using Ground Power Unit (GPU), the GPU should be shutdown immediately.

9-27. HOT START.

CAUTION

During engine starts using a Ground Power Unit (GPU), failure of the GPU could possibly result in an engine hot start. After GPU failure during start, the pilot must turn the battery switch on before accomplishing the procedure described below.

During engine starting or shutdown, if TOT limits are exceeded, or it becomes apparent that TOT limits may be exceeded.

1. Starter switch — Press until TOT is less than 200°C.

2. Throttle — Close.

9-28. ENGINE/FUSELAGE ELECTRICAL FIRE — GROUND

EMER SHUTDOWN.

9-29. ENGINE/FUSELAGE FIRE — LOW/CRUISE ALTITUDE.

If a fire is observed during flight, prevailing circumstances such as VMC, IMC, night, altitude, and landing areas available must be considered in order to determine whether to execute a power—on, or power—off landing.

If Power—On landing:

1. Land as soon as possible.

2. EMER SHUTDOWN after landing.

If Power—Off landing:

1. Autorotate.

2. EMER SHUTDOWN. Accomplish during descent if time permits.

9-30. ELECTRICAL FIRE — FLIGHT.

Prior to shutting off all electrical power, the pilot must consider the equipment that is essential to a particular flight environment that will be encountered. In the event of electrical fire or suspected electrical fire in flight:

1. BAT and GEN switches — OFF.

2. Land as soon as possible.

3. EMER SHUTDOWN after landing.

9-31. SMOKE AND FUME ELIMINATION.

Smoke and/or toxic fumes entering the cockpit and cabin can be exhausted as follows:

CAUTION

Do not jettison doors in flight above effective translational lift.

1. Vents — Open.

2. CABIN HEAT and DEFOG handle — Adjust as required.

9-32. FUEL SYSTEM MALFUNCTION.

9-33. ELECTRICAL SYSTEM MALFUNCTIONS.

9-34. GENERATOR FAILURE — NO OUTPUT.

A no—output malfunction of the generator will be indicated by a zero indication on the DC AMMETER and a DC GENERATOR caution light illumination. An attempt may be made to put the generator back on line by accomplishing the following:

1. GEN FLD, circuit breaker — Check IN.

2. GEN Switch — OFF then GEN — If the generator is not restored, or if it goes off the line again.

3. Turn OFF all unnecessary electrical equipment.

4. Land as soon as practiable.

9-35. OVERHEATED BATTERY.

An abnormally high DC AMMETER indication is evidence of a high battery charging rate or a battery thermal runaway. High battery charging amperage is normal immediately after engine start and should dissipate within minutes. DC AMMETER indication of 30 AMPS of below is normal after 15 minutes of aircraft operation with all systems operating.

WARNING

Do not open battery compartment or attempt to disconnect or remove overheated battery. Battery fluid will cause burns and overheated battery will cause thermal burns and may explode.

If high DC amperage does not dissipate:

1. BAT Switch – OFF.

If high DC amperage indication disappears with BAT Switch OFF, a high battery charging rate and possible battery thermal runaway is confirmed, in this event:

2. Land as soon as possible.

3. EMER SHUTDOWN after landing.

9-36. LANDING AND DITCHING

9-37. LANDING IN TREES.

A landing in trees should be made when no other landing area is available. In addition to accomplishing engine malfunction emergency procedures, select a landing area containing the least number of trees of minimum height. Decelerate to a minimum forward speed at tree—top level and descent into the trees vertically. Apply all of the remaining collective prior to the main rotor blades entering the trees.

9-38. DITCHING — POWER ON.

If ditching becomes necessary, with power available accomplish an approach to a hover above the water and:

1. Doors – Jettison when aircraft nears the water.

2. Crew (except pilot) and passengers – Exit.

3. Hover a safe distance away from personnel.

4. Autorotate. Apply all remaining collective as the helicopter enters the water. Maintain a level attitude as the helicopter sinks and until it begins to roll, then apply cyclic in direction of the roll.

5. Pilot – Exit when the main rotor stops.

9-39. DITCHING — POWER OFF.

If an engine failure occurs over water and ditching is imminent, accomplish engine failure emergency procedures and proceed as follows:

1. AUTOROTATE. Decelerating to minimum forward speed as the helicopter nears the water. Apply all remaining collective as the helicopter enters the water. Maintain a level attitude as the helicopter sinks and until it begins to roll, then apply cyclic in the direction of the roll.

2. Doors – Jettison.

3. Crew and passengers – Exit when the main rotor stops.

9-40. FLIGHT CONTROL MALFUNCTIONS

Failure of components within the flight control system may be indicated through varying degrees of feedback, binding, resistance, or sloppiness.

1. Land as soon as possible.

2. EMER SHUTDOWN after landing.

9-41. CYCLIC TRIM ACTUATOR FAILURE

If unwanted (runaway) cyclic trim force occurs, as the result of cyclic trim switch malfunction or electrical wiring defect, the CYCLIC TRIM (or TRIM CYCLIC) circuit breaker should be pulled OUT to stop any further movement of the actuator. However, any unwanted cyclic trim force may be readily overridden by increasing the manual control force applied to the cyclic stick.

9-42. GROUND RESONANCE DURING ENGINE STARTING

A combination of faulty rotor—blade dampers and faulty landing—gear dampers could induce ground resonance during the initial acceleration of the main rotor before the engine reaches ground idle speed. The onset of ground resonance would be recognized by a heavy and rapidly increasing rocking vibration of the aircraft. Ground resonance should not be confused with the slight rocking motion of the aircraft that sometimes occurs during engine starting. Unless the engine start is aborted immediately, the ground resonance could increase to the point of the aircraft destruction. When it is suspected that ground resonance is beginning, take the following action immediately:

1. EMER SHUTDOWN.

2. Remain seated in aircraft with safety belt and shoulder harness fastened until rotor stops.

9-43. LIGHTNING STRIKE

Land as soon as possible.

9-44. IN—FLIGHT WIRE STRIKE

Land as soon as possible.

Appendix A
References

AR 50-4
Safety Studies and Reviews of Nuclear Weapon Systems

AR 50-5
Nuclear Surety

AR 70-50
Designating and Naming Military Aircraft, Rockets, and Guided Missiles

AR 95-1
Army Aviation General Provisions and Flight Regulations

AR 95-16
Weight and Balance—Army Aircraft

AR 95-3
Operational Procedures for Aircraft Carrying Dangerous Materials

AR 385-40
Accident Reporting and Records

TB 55-9150-200-24
Engine and Transmission Oils, Fuels and Additives for Army Aircraft

TB MED 501
Noise and Conservation of Hearing

TM 9-1005-224-10
Operators Manual for M60, 7.62-MM Machine Gun (NSN 1005-00-605-7710)

TM 9-1005-224-12
Operator and Organizational Maintenance Manual Including Repair Parts and Special Tool Lists: Machine Gun 7.62-MM M60, and Mount, Tripod, Machine Gun M122

TM 9-1345-201-12
Operators and Organizational Maintenance Manual: Mine Dispersing Subsystem, Aircraft: M56 and M132

TM 11-5810-262-OP
Loading Procedures

TM 55-1500-342-23
Army Aviation Maintenance Engineering Manual—Weight and Balance

TM 55-1500-334-25
Conversion of Aircraft to Fire Resistant Hydraulic Fluid

TM 55-1520-210-CL
Operators and Crewmembers Checklist—UH-1H/V Helicopters

TM 57-220
Technical Training of Parachutists

TM 750-244-1-5
Procedures for the Destruction of Airçraft and Associated Equipment to Prevent Enemy Use

DA Pam 738-751
Functional Users Manual for the Army Maintenance Management System-Aviation (TAMMS-A)

DOD FLIP
DOD Flight Information Publication (Enroute)

FM-1-202
Environmental Flight

FM-1-203
Fundamentals of Flight

FM-1-204
Night Flight Techniques and Procedures

FM-1-240
Instrument Flying and Navigation for Army Aviators

FM 10-68
Aircraft Refueling

FM 10-1101
Petroleum Handling Equipment and Operation

ALPHABETICAL INDEX

Paragraph

☆U.S. GOVERNMENT PRINTING OFFICE: 1990 754-125/00088

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
Commander
Aviation Company
4th Infantry Division
Fort Carson, CO 80913

DATE

PUBLICATION NUMBER	DATE	TITLE
TM 55-1520-210-PMS	22 Sep 75	Preventive Maintenance Services

BE EXACT. . .PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	
13				Item No. 5.7 Recommend that X's be added to Sequence Number 5.7 under D (daily) and I (intermediate). The teardown analysis result from Corpus Christi Army Depot for engine number LE 21632 from aircraft 69-15324 revealed packed hard dirt had formed over the selfpurging port. This prevented sand and dust from being ejected overboard and eventually recirculated until ingested into the engine. This caused an excessive amount of erosion on internal components preventing the engine from producing maximum power. This inability contributed to a major accident involving fatalities. Increasing the inspection frequency would preclude a reoccurance of this malfunction.

SAMPLE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

TEAR ALONG DOTTED LINE

DA FORM 1 AUG 74 2028-2 *(TEST)* P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD-314

Department of the Army
HQ, US ARMY TROOP SUPPORT & AVIATION MATERIEL
READINESS COMMAND, ATTN: DRSTS-MTPS
4300 GOODFELLOW BOULEVARD
ST. LOUIS, MISSOURI 63120

TEAR ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)

DATE

PUBLICATION NUMBER	DATE	TITLE

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

DA FORM 1 AUG 74 2028-2 *(TEST)*

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

TEAR ALONG DOTTED LINE

FILL IN YOUR UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DOD-314

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE, $300

Department of the Army
HQ, US Army Troop Support & Aviation Materiel
Readiness Command, ATTN: DRSTS-MTPS
4300 Goodfellow Boulevard
St. Louis, Missouri 63120

TEAR ALONG DOTTED LINE

FOLD BACK

REVERSE OF DA FORM 2028-2 (TEST)

022137-000